

Effective Data Visualization 2nd Edition
The Right Chart for the Right Data
By Stephanie D.H. Evergreen
(A book review by R. Max Wideman, FPMI)

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Introduction

As a child, I was always fascinated by numbers – how many of this, how many of that. Like how many ants are there in an anthill based on a sample area? And how many know how to all stream in the same direction? Or how many bugs must bump into one another when flying at high speed round a light bulb at night, especially in the tropics? Or how many nuts and bolts of my beloved Meccano set that now seem to be missing? Or how many steps will it take today to walk round the block that I have chosen for my daily exercise, how long did it take today compared to previous days, and am I getting better or worse?¹

Even today, I have difficulty in *not* counting, I often have to tell my self to "Stop counting!" When our babies came along, they were carefully weighed and the results plotted on a graph and, of course the second was compared to the first. In later years, a regular plot of the annual rate of inflation² compared to my yearly income growth was carefully followed. Indeed, for several of the early years, if my income-adjusted-for-inflation fell below "the horizontal"³ I would actively seek redress from my manager. I remember one particular response: "It's the same for all of us!" In short order, I moved on.

Plotting the data so that others could share it was a whole new challenge – especially in my early working life. At one of my first assignments to a large construction job, I still recall seeing a rough progress chart showing the rate of buildup of how many man-hours were being spent day-by-day. And while the progress tended to be somewhat erratic, I marveled at the idea⁴ but questioned whether that was what we really wanted to know – and what else could be plotted and how.

Today, to see data plotted in some graphical form is quite common, often with some artistic embellishment – I suppose to make the picture "interesting" to attract attention. Equally often we see two or more sets of data on the same presentation but plotted to two different sets of scales and, worse yet, only parts of the scales displayed at different spreads. In the end, all you get is the concept of lines wiggling around.⁵

In pursuit of this interest, I have three marvelous books by Edward R. Tufte. The first is *The Visual Display of Quantitative Information* published in 1983. Tufte's illustrations were mostly pictures of numbers, how to depict data with columns and bars, but often shown with some artistic form or background. For example, one such clever depiction conveyed the annual life cycle of the Japanese beetle both monthly, size, and location above a below ground, see Figure 1.⁶

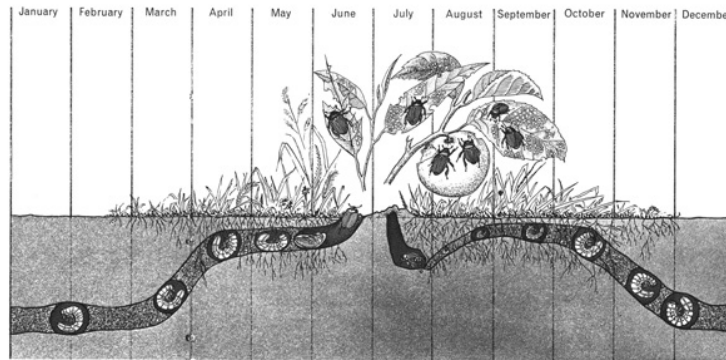


Figure 1: The Life Cycle of the Japanese Beetle

Tufte's second book, *Envisioning Information*, was published in 1991. In his Introduction he says: "Revealed here are design strategies for enhancing the dimensionality and density of portrayals of information – techniques exemplified in maps, the manuscripts of Galileo, timetables, notation describing movements, aerial photographs, the Vietnam Veterans Memorial, electrocardiograms, drawings of Calder and Klee, computer visualizations, and a textbook of Euclid's geometry."

As you may imagine, the book does take some time to digest and, interestingly, repeats the graphic shown in our Figure 1.

Tufte's third book is *Visual Explanations*, published in 1997. The contents are clarified by the subtitle: "Images and Quantities, Evidence and Narrative." As Tufte explains in his *Introduction*:⁷

"This book describes design strategies – the proper arrangement of space and time of images, words, and numbers – for presenting information about motion, process, mechanism, cause and effect. These strategies are found again and again in portrayals of explanations, quite independent of the particular substantive content or technology of display."

Generally, I found Tufte's third book difficult to follow as it really consists of six different essays, each of which go into exasperating detail. Still, it is all good background as we move into the digital age.

So, now we have author Stephanie D. H. Evergreen's new book *Effective Data Visualization: The Right Chart for the Right Data* shows readers how to create charts and graphs that meaningfully display their creators' data findings to best advantage.⁸ Welcome to the computer age of Data Visualization.

About the author

Dr. Stephanie Evergreen is an internationally-recognized data visualization and design expert. She has trained future data nerds worldwide through keynote presentations and workshops, for clients including Facebook, Mastercard, Adobe, Verizon, Rockefeller Foundation, Brookings Institute, and the United Nations. She writes a popular blog on data presentation at StephanieEvergreen.com. Her two books on designing high-impact graphs, slideshows, and reports both hit #1 on Amazon bestseller lists weeks before they were even released. This past Spring Dr. Evergreen published the second edition of one of those bestsellers and a brand new sketchbook with templates for making infographics and dashboards.

Book Structure

In pictorializing data, author Stephanie Evergreen's purpose in this book is to teach readers how to select from the specific range of charts that are most suited to the type of data being presented. Not only that, but also to present the chosen chart in such a way that clearly draws attention to the particular point that the creator wishes to emphasize using all the attributes of computer color printing. Accordingly, the content of this book is set out in 11 chapters as follows:

1. Our Backbone: Why we visualize
2. When a single Number is Important: Showing Mean, Frequency, and Measures of Variability
3. How Two or More Numbers are Alike or Different: Visualizing Comparisons
4. How we are Better or Worse than a Benchmark: Displaying Relative Performance
5. What the Survey says: Showing Likert,⁹ Ranking, Check-All-That-Apply, and more
6. When there are Parts of a Whole: Visualizing beyond the Pie Chart
7. How This Thing changes when That Thing does: Communicating Correlation and Regression
8. When the Words have the Meaning: Visualizing Qualitative Data
9. How Things changed over Time: Depicting trends
10. Reporting Out: Sharing your Data with the World
11. It's about More than Buttons

Stephanie's book has a total of 328 pages. Each chapter¹⁰ begins by listing a set of Learning Objectives and concludes with *Exercises* for the reader; *Resources* – where to go for further information; and *References*, the source of Stephanie's information. The book does not include a Glossary of Terms, but instead, the back of the front cover displays a graphical *Quantitative Chart Chooser*, while the front of the back cover displays a graphical *Qualitative Chart Chooser*.

What we liked

This book is well written on quality glossy paper suited to the frequent colorful display of detailed graphics that are required to illustrate the accompanying text. Each page has wide outer margins to its texts, useful for the reader to add marginal notes and, with the increased white space, makes what turns out to be a complex in-depth subject, into comfortable reading. Moreover, the author has a friendly style of writing that makes it easier to digest what is really an abstract topic.

Figure 1 shows the *Quantitative Chart Chooser* on the Book's inside cover that was mentioned in the previous section. This is a really valuable reference for all project managers needing to report project progress of one sort or another to upper management – and everyone else for that matter. Data illustrated by an appropriate graphic is much more likely to be digested and retained by the recipient, than several unread paragraphs. The trick is to represent the data with the right graphic and the relevant focus.

For those who cannot wait, yes, there is also a *Qualitative Chart Chooser* on the inside of the back cover. The graphical display of this type of non-numerical data¹¹ is described, explained and recommended in Chapter 8: *When the Words have the Meaning*.¹² Incidentally, this new or heavily revised chapter is the

longest chapter in the whole book. It is well worth reading because, at the very least, it will help you to distinguish between the good, bad, and terrible ads-on-TV for example, and why.

By the way, you can download an updated sample data set from this book's associated website: <https://stephanievergreen.com/books> so you can build your own amazing visuals.¹³

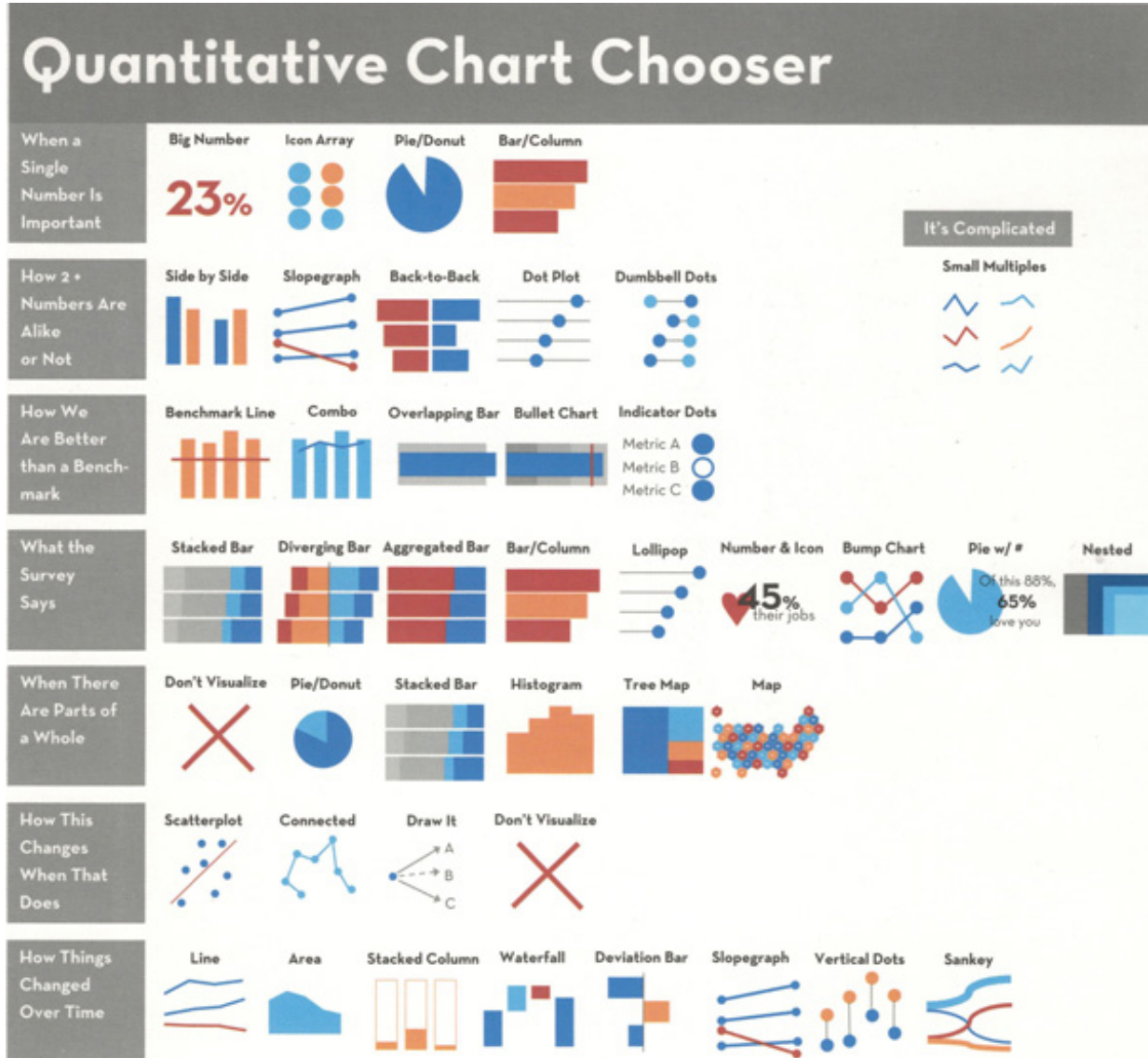


Figure 1: Quantitative Chart Chooser

Why we visualize

To ask this question is almost to suggest that "There are none so blind as those unwilling to see", but the intent here is to enable our audience *to see better*. It is easy to product graphics with software. It is more difficult to produce good graphics, and challenging to produce *effective* graphics. Stephanie displays a chart showing data that you could be proud of, see Figure 2.¹⁴

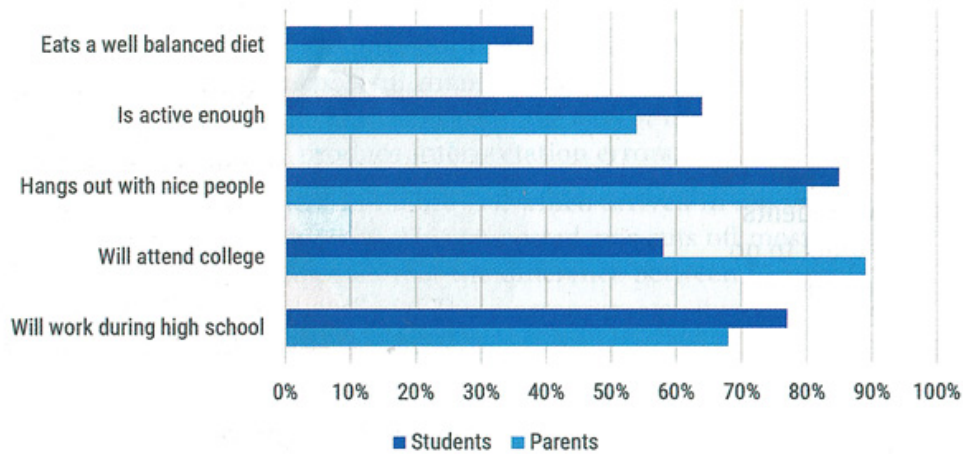


Figure 2: Parent vs. Student Perspectives

However, if your intent is to show particularly that only 58% of students expect to attend college compared to their parents that score 89%, then your chart has missed the point completely. And that's the point – keep asking that question: "What am I really trying to say, what is my point?". As Stephanie says: "If you don't have a point, you probably shouldn't bother graphing the data."¹⁵

Bullet graphs

As another useful example, you have probably seen a *Bullet Graph* before, although the name requires some degree of imagination. Stephanie's example is shown in Figure 3.¹⁶

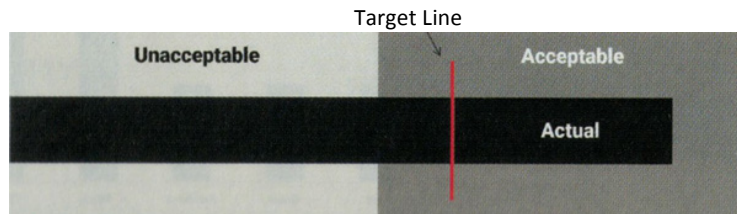


Figure 3: The Bullet Graph showing several key design elements

This is a very simple device that conveys four aspects of a single measurement, which is obviously more informative than a single reading. This is done by capturing and using the reading's background. Here's what Stephanie has to say:¹⁷

"A bullet Chart encodes your actual data as a bar (usually black), plotted with a target line (usually red) against grey ranges of performance, like unacceptable/acceptable or poor/satisfactory/good. You don't usually see a single bullet graph isolated like this. More commonly, they are packed into data dashboards where each variable has its own bullet graph, all arranged on one sheet of paper."

Just imagine how powerful that can be when reporting progress of a project, or a particularly significant project activity, by presenting it against the relevant schedule or cost!

Timeline

Possibly, one of the most important dimensions for the project manager is time, simply because time is inflexible, and it is what you do with it that counts. It is not uncommon for plans and proposals to be presented along with lists of performance target dates, such as "We'll start now, and get this done by (soon), then we'll do this by (date), followed by (another date) and get done by (target end date)." Whether listed horizontally or vertically, the result is not very attractive and unlikely to register with

most people, being displaced by "Ah well. It'll be when it be."

By comparison, plotting the timeline proportionally is much more persuasive, because it forces the reader to peer into the future, see Figure 4.¹⁸

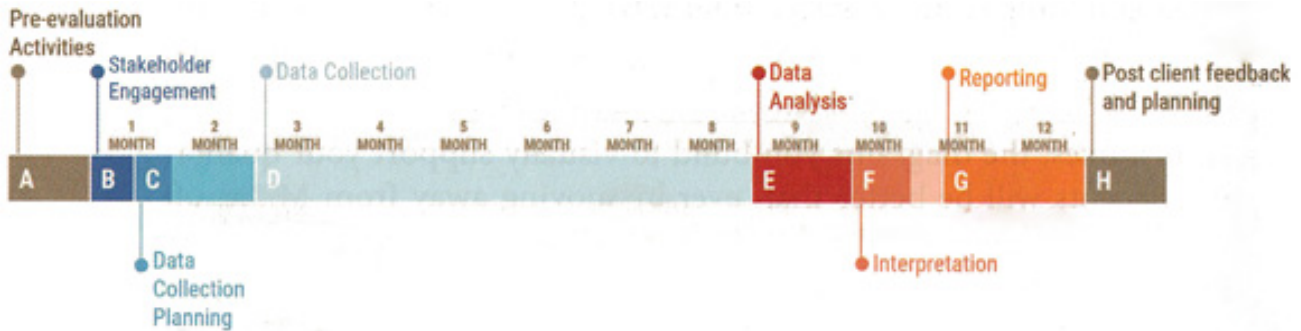


Figure 4: Timeline for key activities laid out proportionately

Here, Stephanie cautions that if such a chart is used to accompany some form of presentation or in a lengthy text or discussion, parts of the timeline should be exhibited as the presentation progresses. It is too much to expect your audience to retain all that information in only one showing.

Downside

To understand and absorb the contents of this book requires a lot of effort and enthusiasm, but you don't have to read it cover to cover. Choose your needs and follow the advice closely. Project management is essentially based on communication and the more effectively that you can do that, the greater your chances of project success — which, after all, is the whole object of the project management exercise.

Summary

Author Stephanie Evergreen advocates for "Building a Culture of Effective Data Visualization". In her closing chapter she says:¹⁹

"Whether data visualization and good design make a difference in communicating data almost shouldn't ever be a question. It has a sort of validity that hits you right between the eyeballs. Once you see what good graphic design can do to data, it can be difficult to go back to the traditional way of reporting. Beyond how good it looks, we have strong evidence that elements like color and font impact comprehension, that the presence of graphs and photographs increases credibility and persuasiveness, and that certain graph types will be better than others at telling an accurate data story."

Scanning Stephanie's book is definitely worth the effort. Remember, the object of this book is to show you "How to select from the specific range of charts available that are most suited to the type of data being presented."

R. Max Wideman
Fellow, PMI

¹ At age 93, that number is becoming a serious issue.

² In the UK.

³ In other words, my purchasing power was falling in spite of modest increases in pay, and not rising in spite of my increasing experience.

⁴ It was quite unique at the time.

⁵ News papers seem to be particularly fond of this.

⁶ *The Life Cycle of the Japanese Beetle*, The Visual Display of Quantitative Information, E. R. Tufte, Graphics Press, Cheshire, Connecticut, US, 1983, p43

⁷ Visual Explanations of Quantitative Information, E. R. Tufte, Graphics Press, Cheshire, Connecticut, US, 1997, p9

⁸ Stephanie uses Excel software to demonstrate her ideas. The level of skill required is described variously as "Ninja Level: #" where "#" represents a level of skill from 0 (low) to 10 (high). "Ninja" is really a fancy descriptor adopted from the Japanese characters "nin" and "ja" meaning to move stealthily. Ninjas originated in the mountains of Japan over 800 years ago, but the label was only recently introduced into the English language around 1964 implying some special skills – <https://www.merriam-webster.com/dictionary/ninja#h1>

⁹ For those who may not know, "Likert" refers to a survey scale that offers options, for selection by a contributor to respond to some particular statement, typically on a scale of one (low) to five (high).

¹⁰ With the exception of the last chapter.

¹¹ That is, *Qualitative Data*. Qualitative Data can be defined as non-numerical data that approximates and characterizes and can be observed and recorded. It can be arranged categorically, based on the attributes and properties of a thing or phenomenon. It is most marked in opinion surveys.

¹² Effective Data Visualization, Chapter 8, p207.

¹³ Ibid, p xv

¹⁴ Ibid, p3

¹⁵ Ibid, p5

¹⁶ Ibid, p105

¹⁷ Ibid.

¹⁸ Ibid, p224

¹⁹ Ibid, p320