An Introduction to Analytical Design

Analytical design is an ancient practice. People have been visualizing information and data since the first person drew a map. In the second half of the 18th century, people began “charting” numbers. More recently, the field has undergone rapid and dramatic changes with the development of information technology. A wide variety of people now have access to many, large data sets, an increasing number of visualization techniques and tools, and many options for widely and quickly distributing their work. However, like the relationship between writing and blogging, the new opportunities afforded by advancements in technology have not fundamentally changed the principles of analytical design. Like good writing, good analytical design is a result of clear thinking not the means of production.

Edward Tufte, a professor emeritus of statistics and political science at Yale, has developed a body of work over the last thirty years dealing with issues related to the visual display of data and information. Tufte has been referred to as the Da Vinci of data. However, his approach is more similar to Strunk and White than Da Vinci. Tufte examined examples of information design from different fields, time periods, and cultures. He then developed broad principles based on patterns of effective design that emerged from the works he examined.

In August 2007, a group of employees from the University of Michigan attended a one day analytical design course taught by Tufte. Course attendees were given all four of Tufte’s books as course materials. This handout and accompanying presentation are no substitute for either Tufte’s works or the works of others in this field. Below are two excerpts from Tufte’s books. The first details the qualities of excellent statistical graphics. The second describes the relevance of principles of analytical design.

Graphical Excellence, from The Visual Display of Quantitative Information page 1

Excellence in statistical graphics consists of complex ideas communicated with clarity, precision, and efficiency. Graphical displays should:

- show the data
- induce the viewer to think about the substance rather than about methodology, graphic design, the technology of graphic production, or something else
- avoid distorting what the data have to say
- present many numbers in a small space
- make large data sets coherent
- encourage the eye to compare different pieces of data
- reveal the data at several levels of detail, from a broad overview to the fine structure
- serve a reasonably clear purpose: description, exploration, tabulation, or decoration
- be closely integrated with the statistical and verbal descriptions of a data set.

Relevance of Principles of Analytical Design, from Beautiful Evidence page 137

The purpose of an evidence based presentation is to assist thinking. Thus presentations should be constructed so as to assist with the fundamental intellectual task in reasoning about evidence: describing the data, making multivariate comparisons, understanding causality, integrating a diversity of evidence, and documenting the analysis. Thus the Grand Principle of analytical design: The principles of analytical design are derived from the principles of analytical thinking. Cognitive tasks are turned into principles of evidence presentation and design.

Because these principles are rooted in fundamental cognitive tasks, they are relevant for producing presentation and for consuming presentations. Thus consumers of evidence presentations should look for appropriate comparisons, assessments of causality, multivariateness, use of relevant data, credible documentation, content-reasoning. There is a symmetry of thinking in the wise production and the wise consumption of evidence. At a good evidence presentation, we’re all in it together.

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Prophets, Practitioners, and Toolmakers

Reading
Read Tufte’s first book, The Visual Display of Quantitative Information (1983). His other books build on the material presented there and are worthwhile reads; however, if you have a limited amount of time for or interest in this subject, read The Visual Display of Quantitative Information. Tufte has a moderated discussion board on his site with many good post and contributions from people trying to apply what Tufte teaches. www.edwardtufte.com

Stephen Few, a UC Berkley business professor and consultant, demonstrates practical application of analytical design for dashboards in his book Information Dashboard Design.

Useful Tools and Advice
Juice Analytics is a business intelligence consultancy located in Herndon, VA. They provide two free tools to aid with data visualization. The first one is the Chart Cleaner. It is an Excel add-in that removes most of the automatic Excel chart formatting to make less cluttered looking charts. The second tool is the Chart Chooser. It is a web based interface that helps guide users in choosing a chart for their data. Use the Chart Chooser very cautiously. Don’t forfeit your design to any program even one by the talented team at Juice. The Juice Team also has an excellent blog with many good articles and Excel tips. www.juiceanalytics.com/

Nicolas Bissantz is a business intelligence consultant from Germany. He sells an Excel add-in that creates sparklines in Excel, Word, and PowerPoint. The tool is available for a free 40 day trial. Bissantz also has one of the better visualization blogs called Me, Myself, and BI. Check out his post on the case of a “Can we steer banks like cars?” on the pitfalls of taking the “dashboard” analogy too literally. www.bissantz.com/en/

The team at Many Eyes, an IBM experiment in social data visualization, has created an interesting site where anyone can upload data sets, visualize them, and then post them for comment by other users. They have created some very useful visualization tools. They also do a great job educating users about different visualization techniques. Be very aware that any data posted on this site is accessible to anyone who visits the site, it is not secured. The site is a rare example of a data visualization tool built by data visualization experts/practitioners. Dr. Martin Wattenberg is one of the researchers who started Many Eyes. He has some interesting visualizations at his personal site, www.bewitched.com/index.html. The Many Eyes site http://services.alphaworks.ibm.com/manyeyes/home

Gapminder is a non-profit venture promoting sustainable global development and achievement of the United Nations Millennium Development Goals making development statistics more accessible. They use a technology that Google bought called Trendalyzer. www.gapminder.org/

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