Choosing the Right Visualization Design

Abstract Visualization Exercise

- Close your eyes, think about a 1 year timespan and a typical set of events of 1 year. What does your mental visualization of this look like?
- Grab some paper & markers/crayons/etc. and spend ~10 minutes drawing this mental picture. Don't discuss or share with your neighbors… Yet.
- We'll tape them up on the board and look at & discuss them as a collection (so make sure it is reasonably legible from a distance)

"Eenie, Meenie, Minie, Moe: Selecting the Right Graph for Your Message", Stephen Few, Intelligent Enterprise, 2004

- Nice reference for basic visualizations & terms
  - Quantitative vs. Qualitative, more than just values, how best to display those values
- Dots vs. lines vs. bars & impact the meaning
  - Similar to gestalt principles (shape, structure, etc.)
  - Two graphs might convey exactly the same information, but one be ineffective if the graph type is wrong, can send a different message by simply changing the graph type
- Familiar, intuitive, common sense suggestions
  - Ok for simple data
  - Inefficient use of space (bigger datasets will require much more complex visuals)
  - "Good" examples were obvious, including "bad" examples might have been more educational?
  - Could have included even more diagrams
- Location & line length most effective visually (human perception?)
  - Pie charts are bad because they use color & size (less effective visually)
- What is the origin of these rules (time must be x-axis)? Is this a convention? Or is it an aesthetic choice?

About the writing

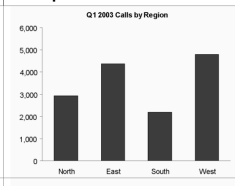
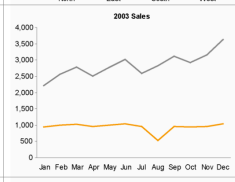
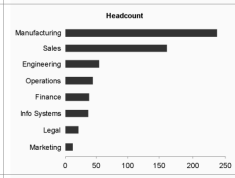
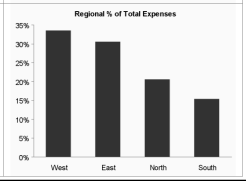
"Eenie, Meenie, Minie, Moe: Selecting the Right Graph for Your Message", Stephen Few, Intelligent Enterprise, 2004

- Provided table is very helpful/immediately useable
  - Good for business data – all graphs you can make in Excel
  - Mastering this "how to & why" information is important for scientists writing reports & research papers
  - "For this message/purpose use this graph" (rather than the other way around)
  - "Cheat sheet" of 7 types was good, but little prose description of this information
- Article was narrow in focus
- Overall flow of article was good
  - easy to read (unlike some of those SIGGRAPH papers from ACG)
- Lacking references (except to author's prior work)
- Fig 2. Interval scales example was confusing
  - Bug in figure?
  - Is itself an example of a misleading, poorly explained figure/caption
  - Data is not altered, just organized differently, differently organized is not misinformation, just conveying different meanings, may or may not be useful

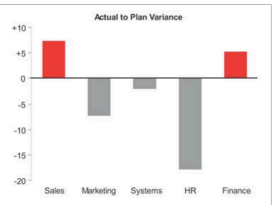
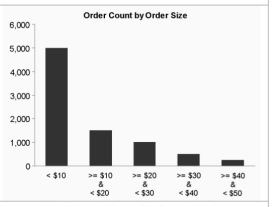
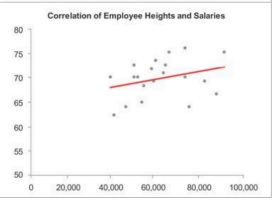
Want even more…

"Eenie, Meenie, Minie, Moe: Selecting the Right Graph for Your Message", Stephen Few, Intelligent Enterprise, 2004

- What about data with >= 2 categories of data?
- What about color? Too important to leave out!
- What about interactivity?
  - Article is dated. We spend so much of our life in front of screens now, static information is under-utilization of this interface.
- What about more complex data sets?
- 7 categories… too limited
  - What about creativity? These "rules" are an ok place to start, but sometimes breaking a rule can lead to a very powerful visualization
  - Focuses on scientific data (natural spatial coordinate system), not on abstract information visualization.

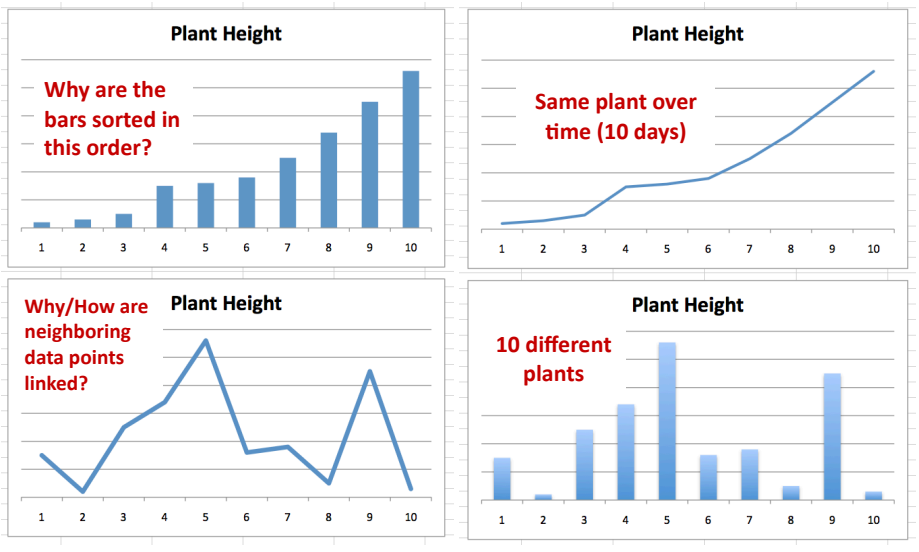
Type/Description	Encoding Methods	Example
Nominal Comparison A simple comparison of the categorical subdivisions of one or more measures in no particular order	• Bars only (horizontal or vertical)	
Time Series Multiple instances of one or more measures taken at equidistant points in time	• Lines to emphasize overall pattern • Bars to emphasize individual values • Points connected by lines to slightly emphasize individual values while still highlighting the overall pattern • Always place time on the horizontal axis	
Ranking Categorical subdivisions of a measure ordered by size (either descending or ascending)	• Bars only (horizontal or vertical) • To highlight high values, sort in descending order • To highlight low values, sort in ascending order	
Part-to-Whole Measures of individual categorical subdivisions as ratios to the whole	• Bars only (horizontal or vertical) • Use stacked bars only when you must display measures of the whole as well as the parts	

"Eenie, Meenie, Minie, Moe: Selecting the Right Graph for Your Message", Stephen Few, Intelligent Enterprise, 2004

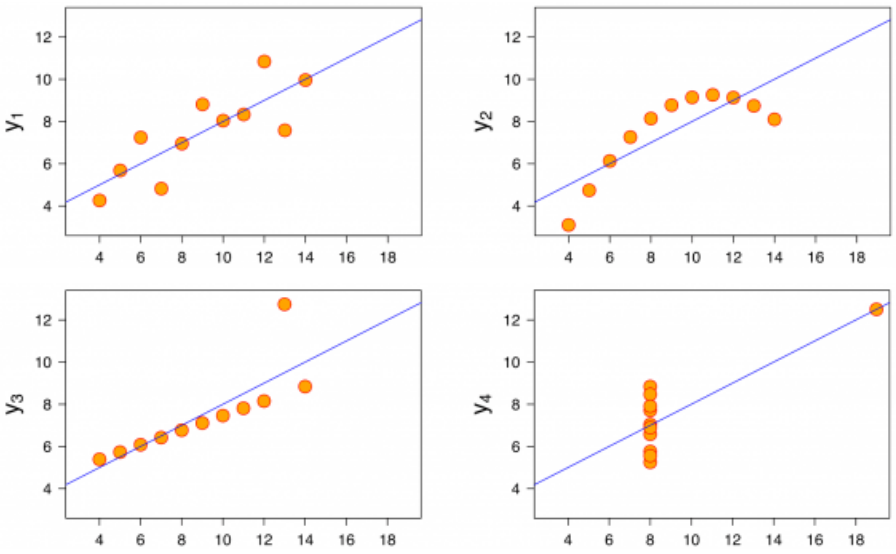
Deviation Categorical subdivisions of a measure compared to a reference measure, expressed as the differences between them	• Lines to emphasize the overall pattern only when displaying deviation and time-series relationships together • Points connected by lines to slightly emphasize individual data points while also highlighting the overall pattern when displaying deviation and time-series relationships together • Bars to emphasize individual values, but limit to vertical bars when a time-series relationship is included • Always include a reference line to compare the measures of deviation against	
Frequency Distribution Counts of something per categorical subdivisions (intervals) of a quantitative range	• Vertical bars to emphasize individual values (called a *histogram*) • Lines to emphasize the overall pattern (called a *frequency polygon*)	
Correlation Comparisons of two paired sets of measures to determine if as one set goes up the other set goes either up or down in a corresponding manner, and if so, how strongly	• Points and a trend line in the form of a scatter plot • Bars may be used, arranged as a *paired bar graph* or a *correlation bar graph*, if scatter plots are unfamiliar • (Note: For descriptions of these graphs, see my book *Show Me the Numbers*.)	

"Eenie, Meenie, Minie, Moe: Selecting the Right Graph for Your Message", Stephen Few, Intelligent Enterprise, 2004

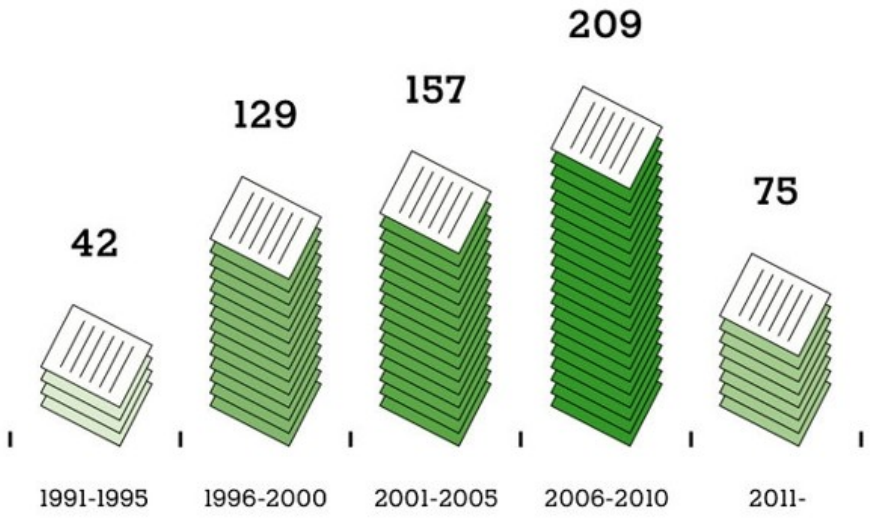
What I learned in 7th grade Science Fair: Presenting Scientific Results



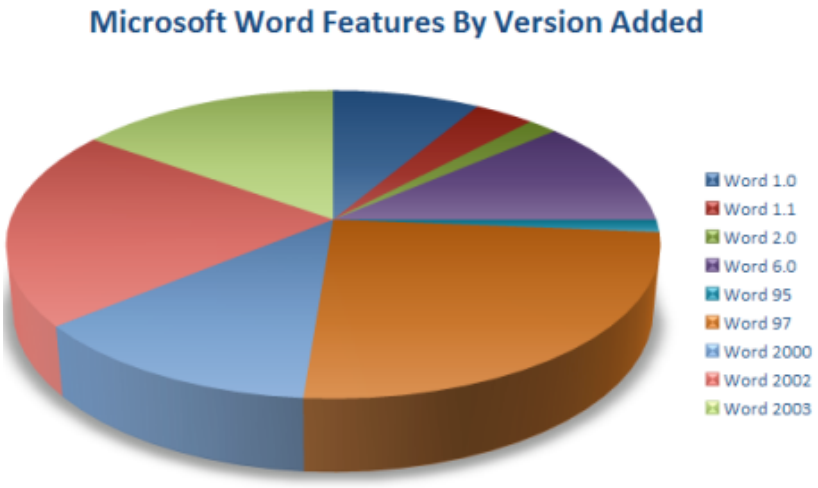
These 4 data sets while quite different, coincidentally all have the same mean, variance, correlation, and regression.



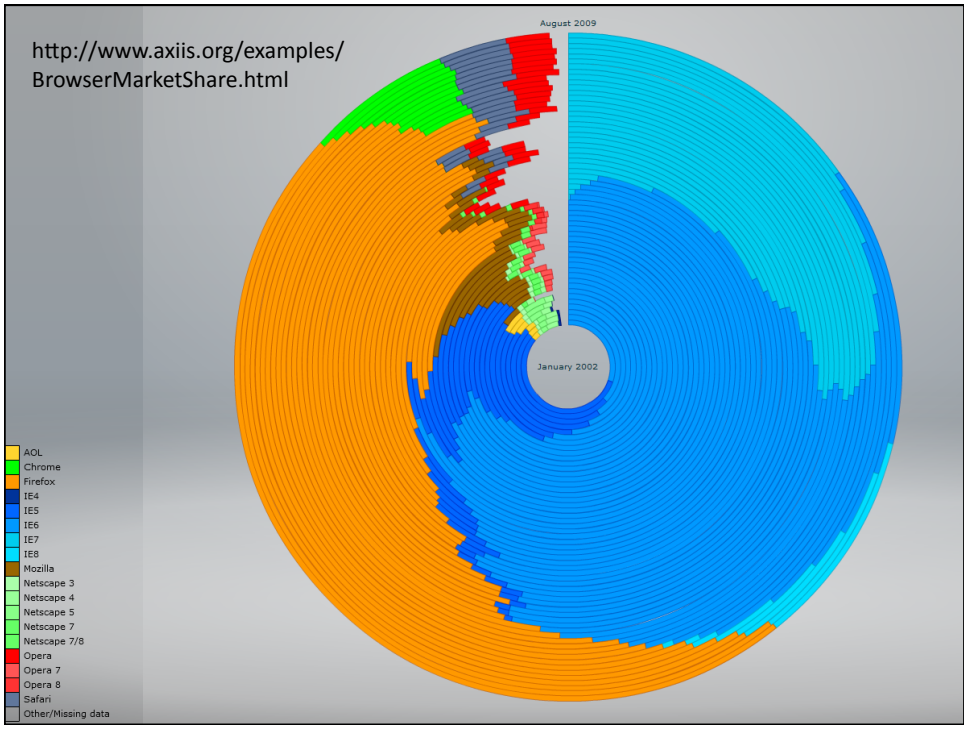
Francis Anscombe http://en.wikipedia.org/wiki/File:Anscombe%27s_quartet_3.svg

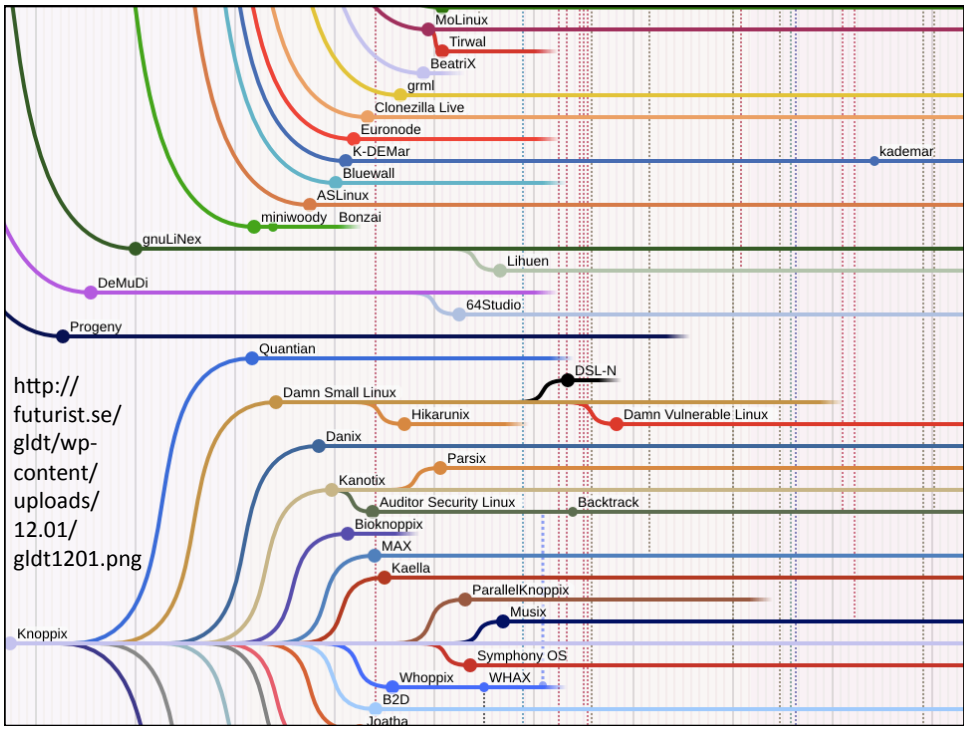


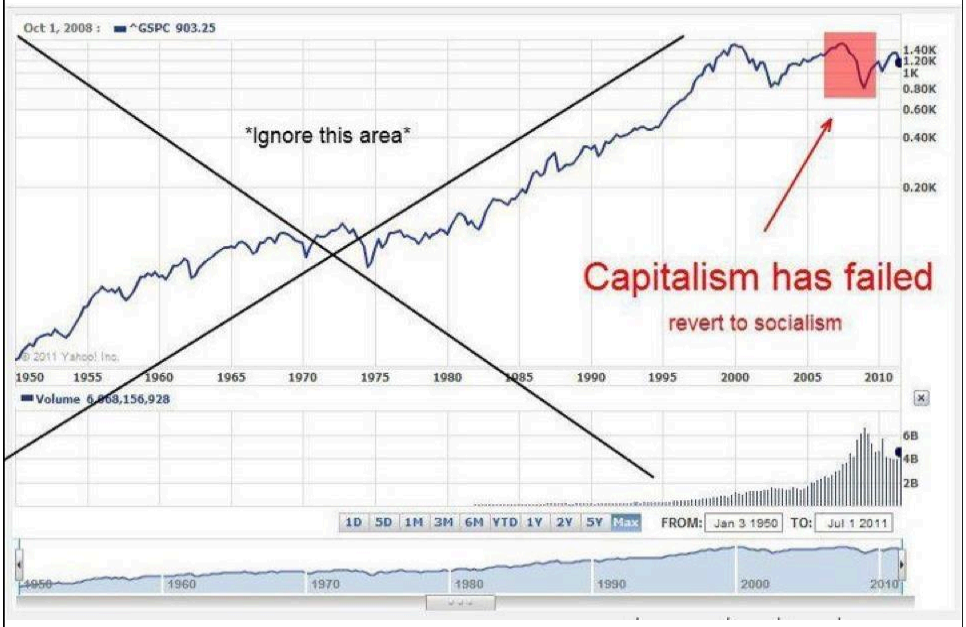
http://www.nytimes.com/imagepages/2011/11/06/magazine/06davidson_graphic.html?ref=magazine



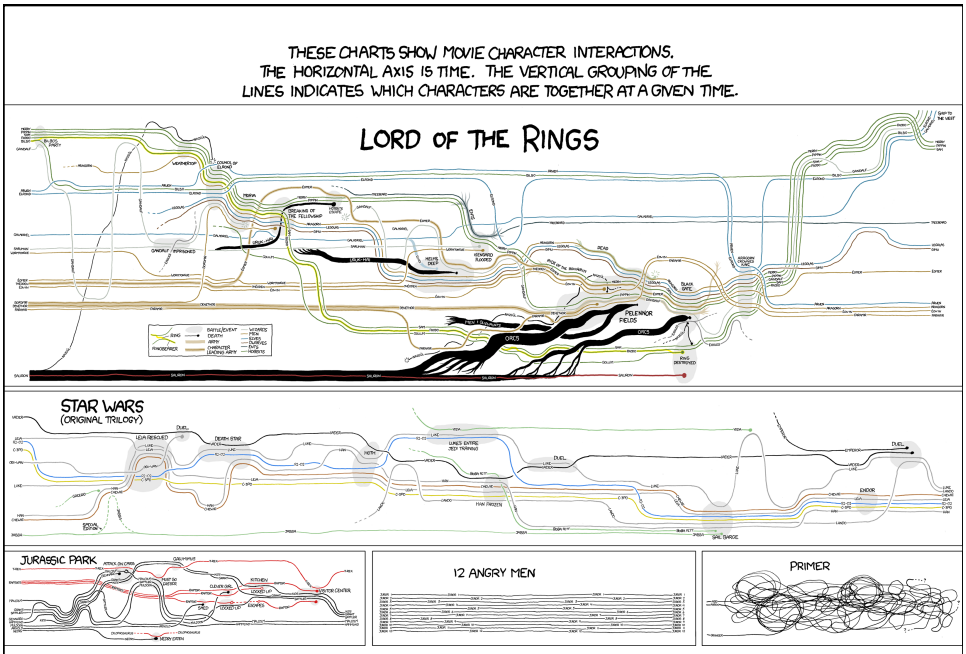
http://ndevisual.files.wordpress.com/2010/09/pie_microsoft.png


http://www.axiis.org/examples/
BrowserMarketShare.html
August 2009
January 2002
AOL
Chrome
Firefox
IE4
IE5
IE6
IE7
IE8
Mozilla
Netscape 3
Netscape 4
Netscape 5
Netscape 7
Netscape 7/8
Opera
Opera 7
Opera 8
Safari
Other/Missing data


http://
futurist.se/
gldt/wp-
content/
uploads/
12.01/
gldt1201.png
MoLinux
Tirwal
BeatriX
grml
Clonezilla Live
Euronode
K-DEMar
kademar
Bluewall
ASLinux
miniwoody
Bonzai
gnuLiNex
Lihuen
DeMuDi
64Studio
Progeny
Quantian
DSL-N
Damn Small Linux
Hikarunix
Damn Vulnerable Linux
Danix
Parsix
Kanotix
Auditor Security Linux
Backtrack
Bioknoppix
MAX
Kaella
ParallelKnoppix
Musix
Knoppix
Symphony OS
Whoppix
WHAX
B2D
Joatha



Modified from: http://finance.yahoo.com/echarts?

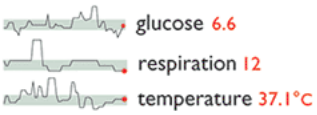


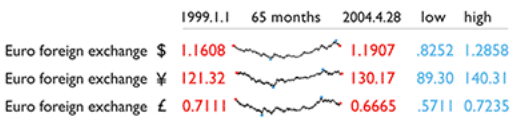
http://imgs.xkcd.com/comics/movie_narrative_charts_large.png

Spark Lines – intense word size graphics

- Current: Word & number
  - + Over time!
  - + Quantified (last measurement)
  - + Range of what's normal

Term coined by Edward Tufte book *Beautiful Evidence*





- High resolution
- Integrated with prose
- Multiple spark lines compared to each other

Win/Loss over sports season

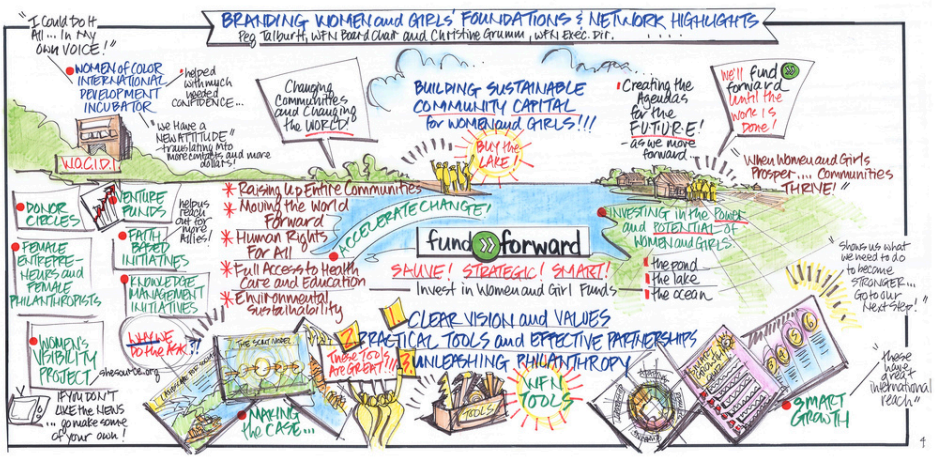
http://www.edwardtufte.com/bboard/q-and-a-fetch-msg?msg_id=0001OR&topic_id=1

Drawing for Communication

http://arterior-motives.blogspot.com/

http://idcminnovations.com/facilitation/facilitation-services

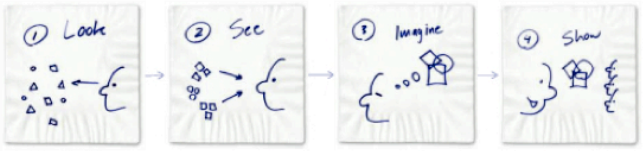
Drawing for Communication



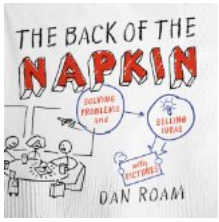
http://www.visualcoaches.com/training/fundamentals/

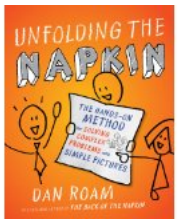
Drawing for Communication

The 4 steps of visual thinking:



1 Look	2 See	3 Imagine	4 Show
What is out there?	What do I see?	How can I manipulate these patterns?	This is what I saw, and this is what I think it means.
What am I looking at?	Have I seen this before?	Can I fill in the gaps?	Is this what I expected... or not?
What are the limits?	What patterns emerge?	Have I seen enough – or do I need to go back and look at more?	When you look at this, do you see the same things?
Which way is up?	What stands out?		
	What seems to be missing?		





http://www.danroam.com/the-back-of-the-napkin/

Brainstorming Other Visualization Conventions for Abstract Data

- A day
- Government Hierarchy/Company Org Chart
- How to: prepare food/drink – *or* – do your laundry
- ToDo list for the day – *or* – what you accomplished today
- Course pre/co-requisites
- God
- Yourself,
- Bank account (where does the money come from)
- Ideal house
- An emotion, like happiness

Homework Assignment 1: due Monday @ 11:59pm Inspirational Visualization Images

- Find two example visualization *images*:
  - one great visualization
  - one example that needs revision to be effective
- For each example write a paragraph or two describing:
  - the author, context, audience, original media format and purpose of the visualization
  - your analysis of the positive and negative aspects of each example and how it could be improved, and
  - any generalizations you can make about what makes for a compelling, high-quality visualization

Tuesday mini-presentations

- 3-5 volunteers to do 5 minute presentation on their "Assignment #1: Inspiration Visualization Images" submission (due Monday @ 11:59pm)
  - Rebecca, Altan, Jaron, Jesse
- Send me a .pdf or .ppt or URL before class.
  Or just present directly from LMS.

Reading for Next Thursday 11:59pm

- "Force Directed Graph Drawing"
  chapter by Steven Kobourov
  form the book
  Handbook of Graph Drawing and Visualization
  2013