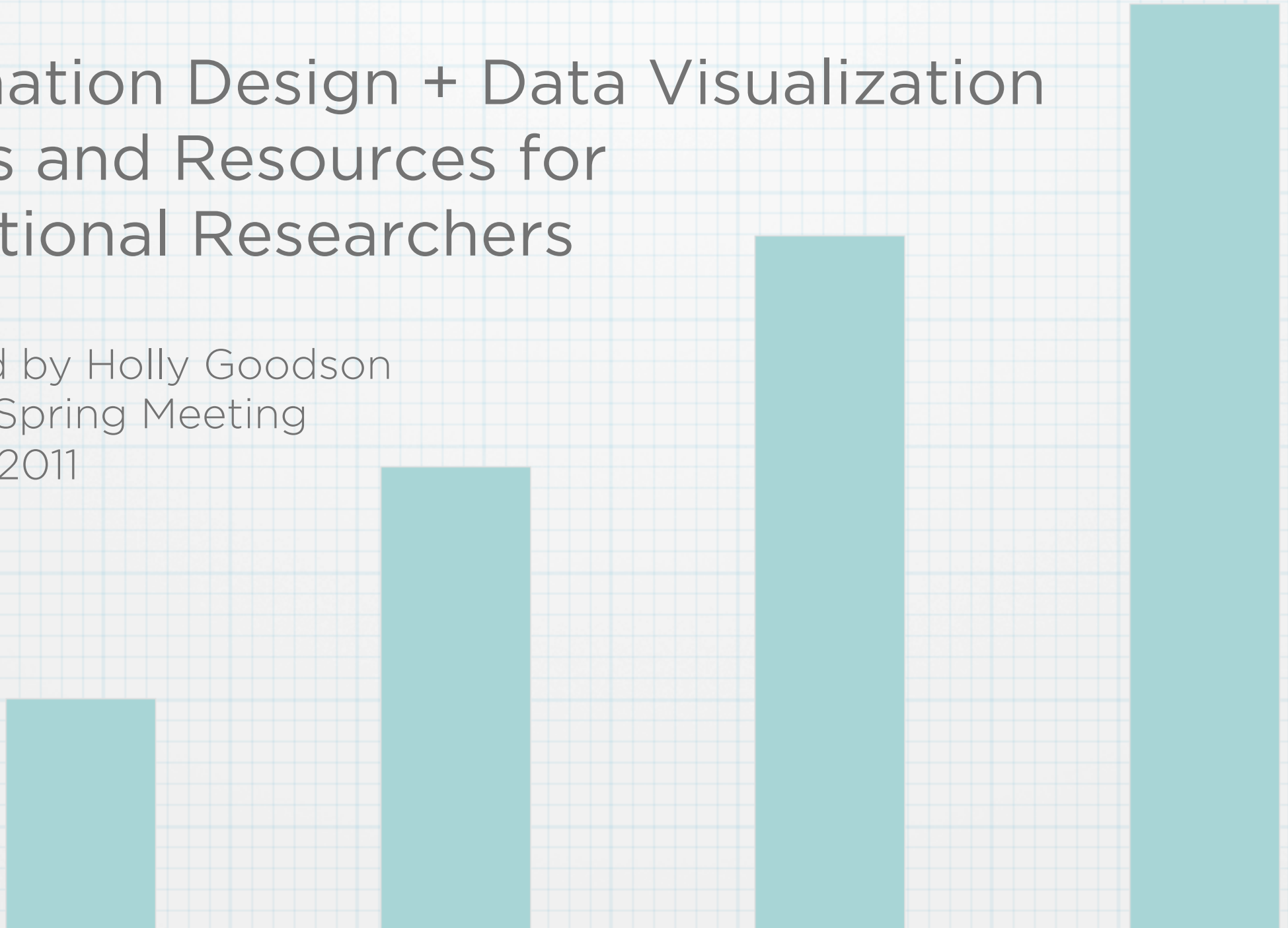# The Art and Science of Communicating Data

Information Design + Data Visualization Trends and Resources for Institutional Researchers

Presented by Holly Goodson
USG-IRP Spring Meeting
March 17, 2011

What is this talk about?

- Impact of information age

- What is information design?

- Basic design principles and considerations

- Lessons from the greats

- Data visualization trends

Impact of Information Age

Information overload is not just **hype**.

- 3,000+ books are published daily across the globe

- 540,000 words in the English language, more than 5 times as many as in Shakespeare's time

Impact of Information Age

http://www.youtube.com/user/xplanevisualthinking#p/u/2/6ILQrUrEWe8

Why we need to think about information design

"What we need is not more information but the ability to present the right information to the right people at the right time, in the most effective and efficient form."

-- Robert E. Horn
   from *Information Design*

What is information design?

"Information design is defined as the art and science of preparing information so that it can be used by human beings with efficiency and effectiveness. Information design's primary products appear as documents and as presentations on computer screens."

-- Robert E. Horn
    from *Information Design*

History of Information Design

Joseph Priestley (1733-1804), England, natural philosopher, theologist, political theorist, and educator. He designed a timeline chart (1765), with bars to indicate longevity of famous people.
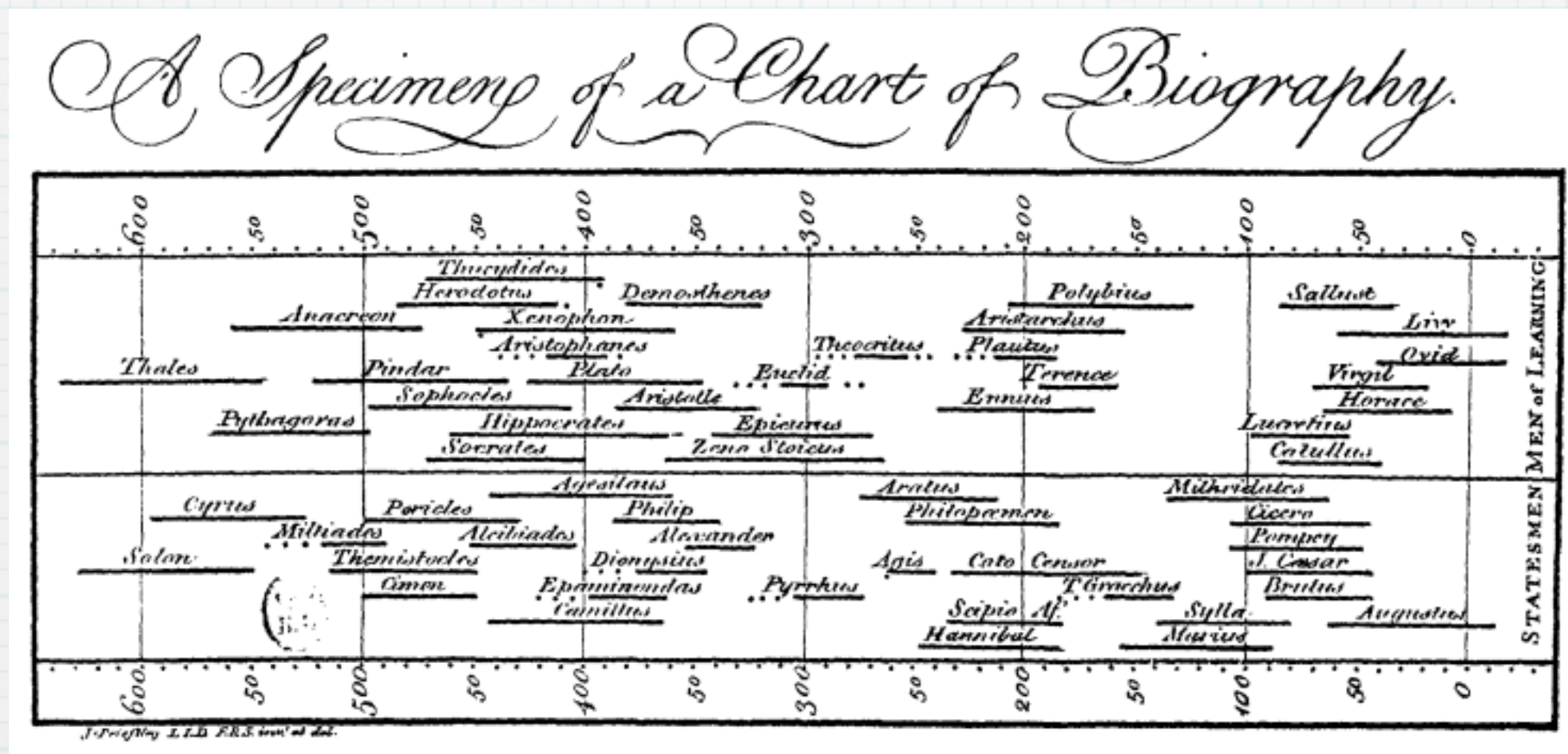
History of Information Design

William Playfair (1759-1823), engineer and economist, is credited with inventing data graphics (time series 1786, pie chart 1801, and bar charts).
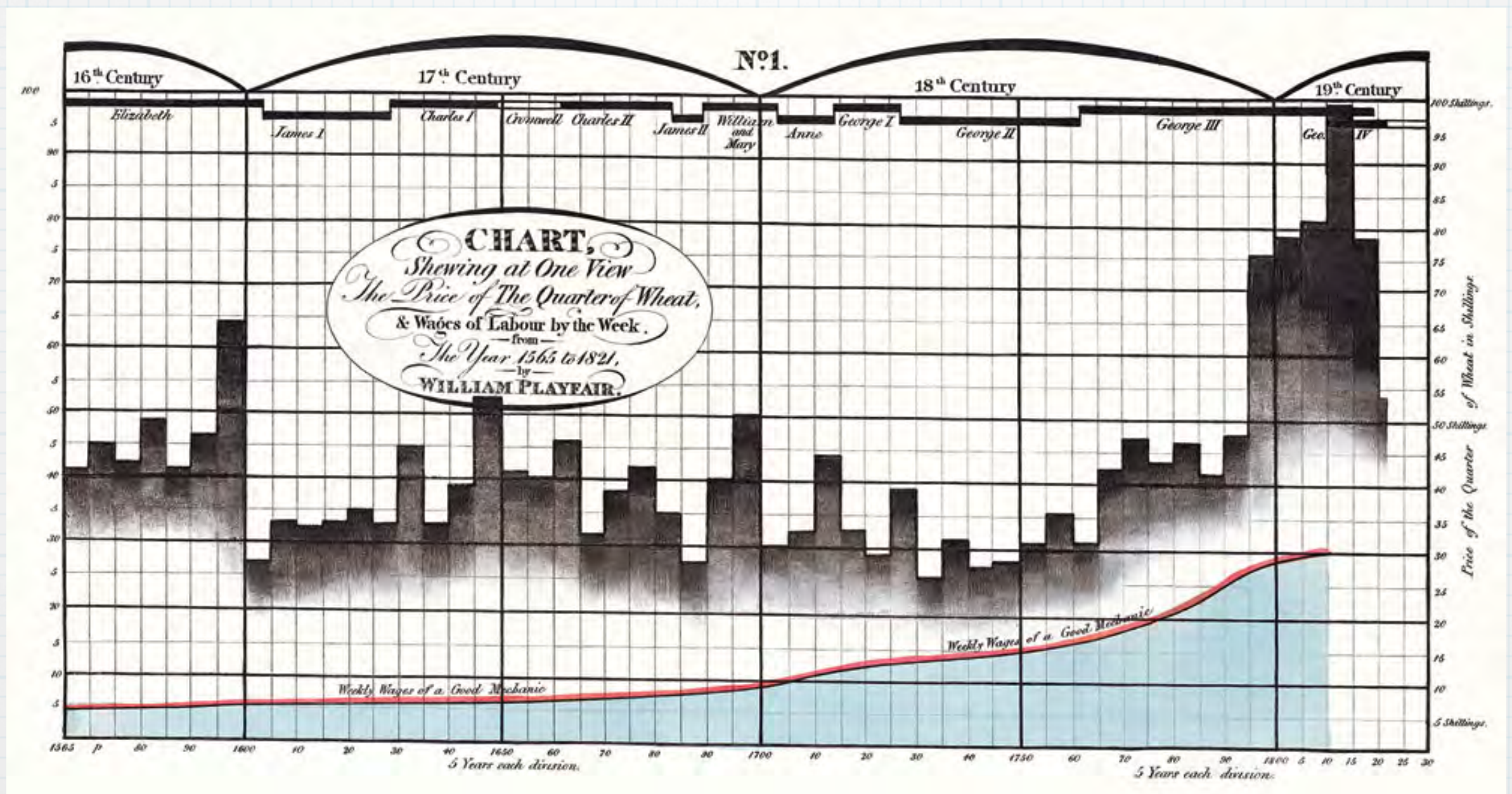
History of Information Design

Charles-Joseph Minard (1781-1870), inspecteur général des Ponts et Chaussées, is credited with inventing the flowchart to depict Napoleon's retreat from Russia (1861).
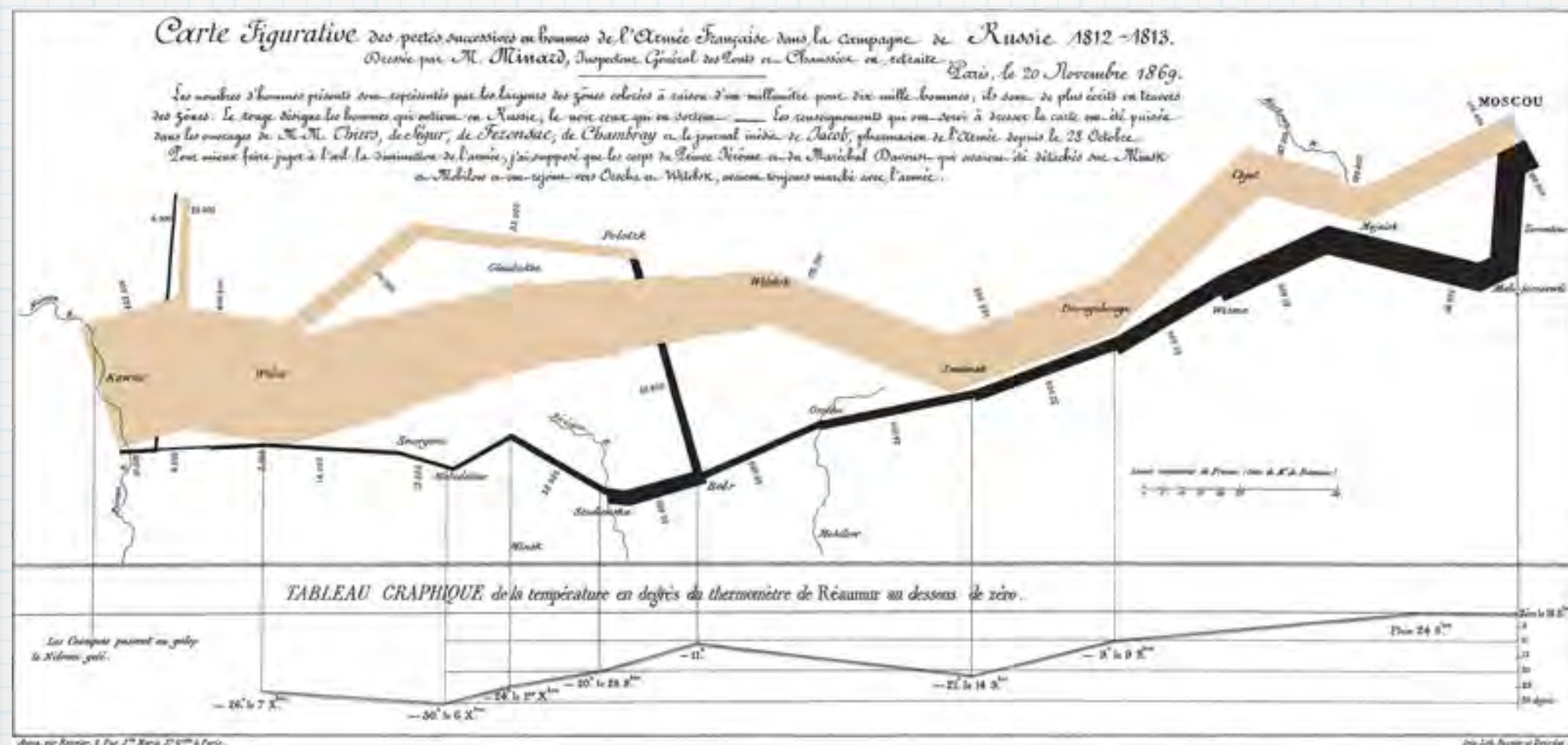
History of Information Design
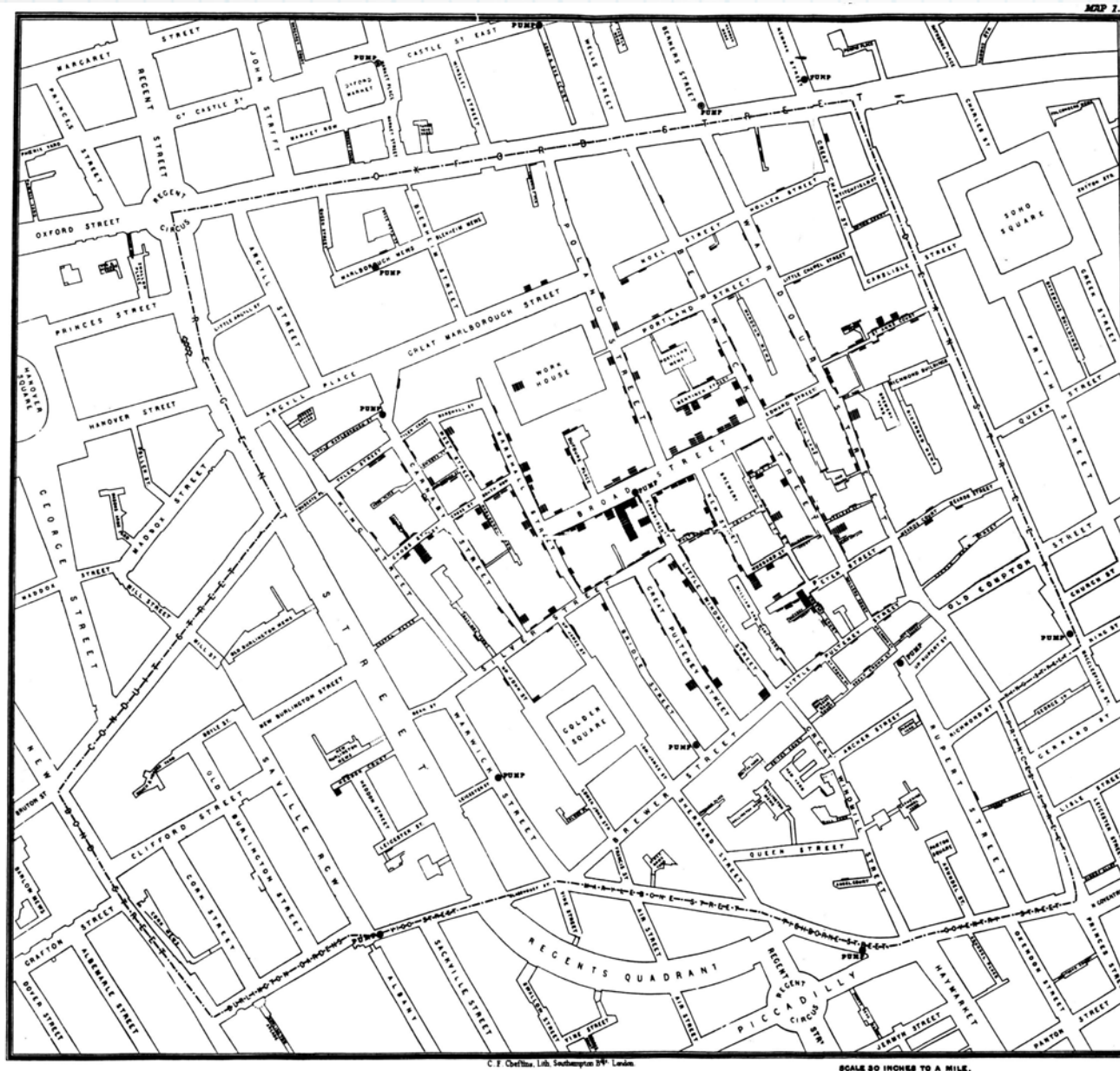
John Snow (1813-1858), physician specialist in epidemiology, used simple mapping to display statistical evidence from cholera outbreaks to point out the role of water sources (1854).

Information Design Artifacts

Information designers consider which artifacts and communication channels will relay their message effectively. Examples include:

- Tables

- Charts and graphs

- Maps

- Diagrams and schematics

- TImelines

- Interfaces like dashboards or forms

Design Thinking

"Nobody wants to run an organization on feeling, intuition, and inspiration, but an over-reliance on the rational and the analytical can be just as risky. Design thinking provides an integrated third way."

—Tim Brown, president and CEO of IDEO
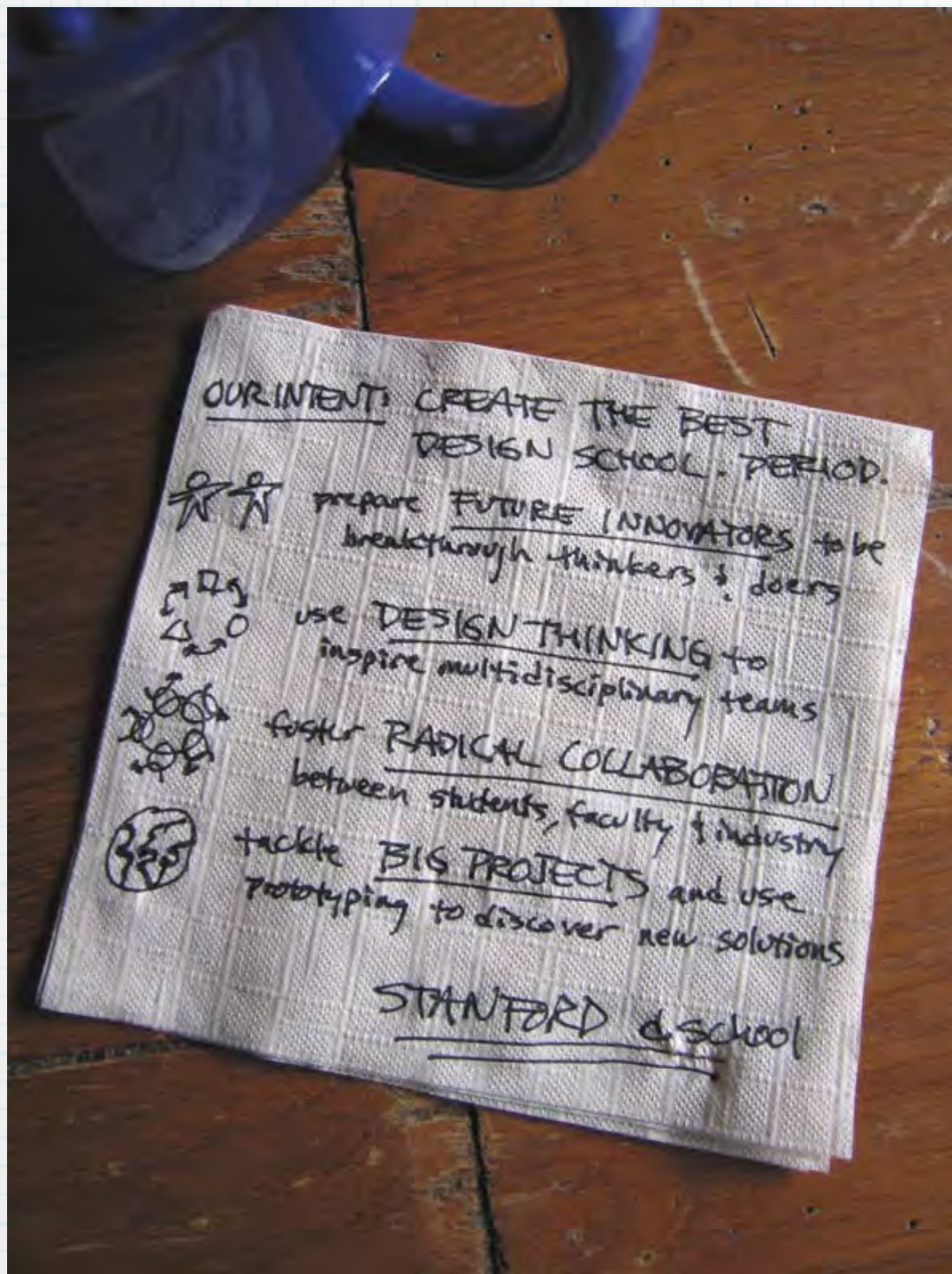
Design Considerations

- Audience Analysis

- Format / Output

- Color

- Typography

- Usability / Feedback

"The commonality between science and art is in trying to see profoundly - to develop strategies of seeing and showing."

-Edward Tufte

Information Design Giant Edward Tufte

Professor, author, lecturer; key ideas:

- Information density

- Sparklines

- Chartjunk

- Problem with PowerPoint

Tufte: Information Density

"To clarify, add more detail."
While it is only possible to retain 7 +/- 2 thoughts in short-term memory, visual perception is vast

Tufte: Sparklines

- Little data lines that move over time

- Datawords: data-intense, design-simple, word-sized graphics

- Aimed at financial and sports pages of newspapers, medical records, historical trends
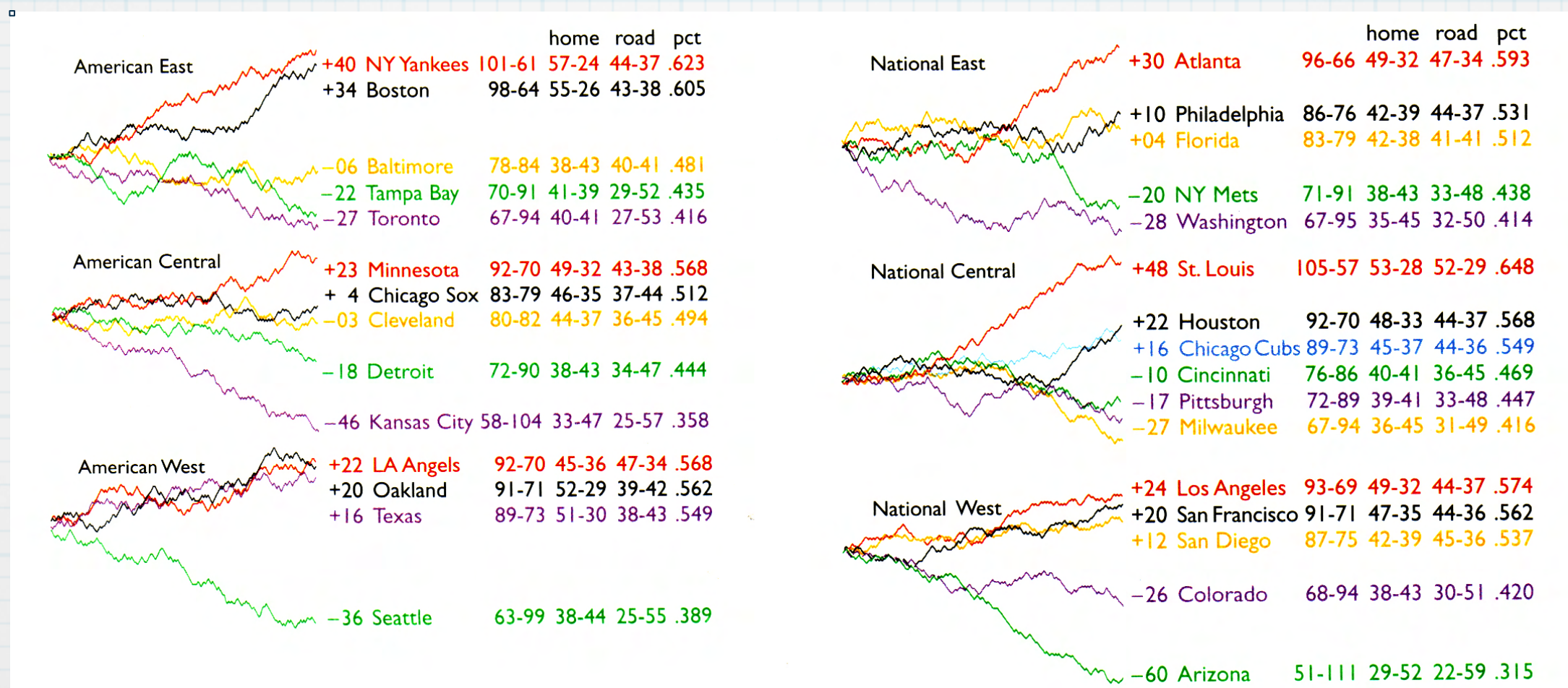
Tufte: Chartjunk

- Garish colors
- Corny clip-art
- Phony dimensionality

- Useless grids with too many borders
- Boxes and frames around graphs
- Redundant representation of data

Tufte: Problems with PowerPoint

- Very loud, very slow, very simple

- Belief that people are capable of comprehending vast amounts of information (examples New York Times, Google and Yahoo)

- Screen size, format, paper version are confining to presentation of evidence, require oversimplification
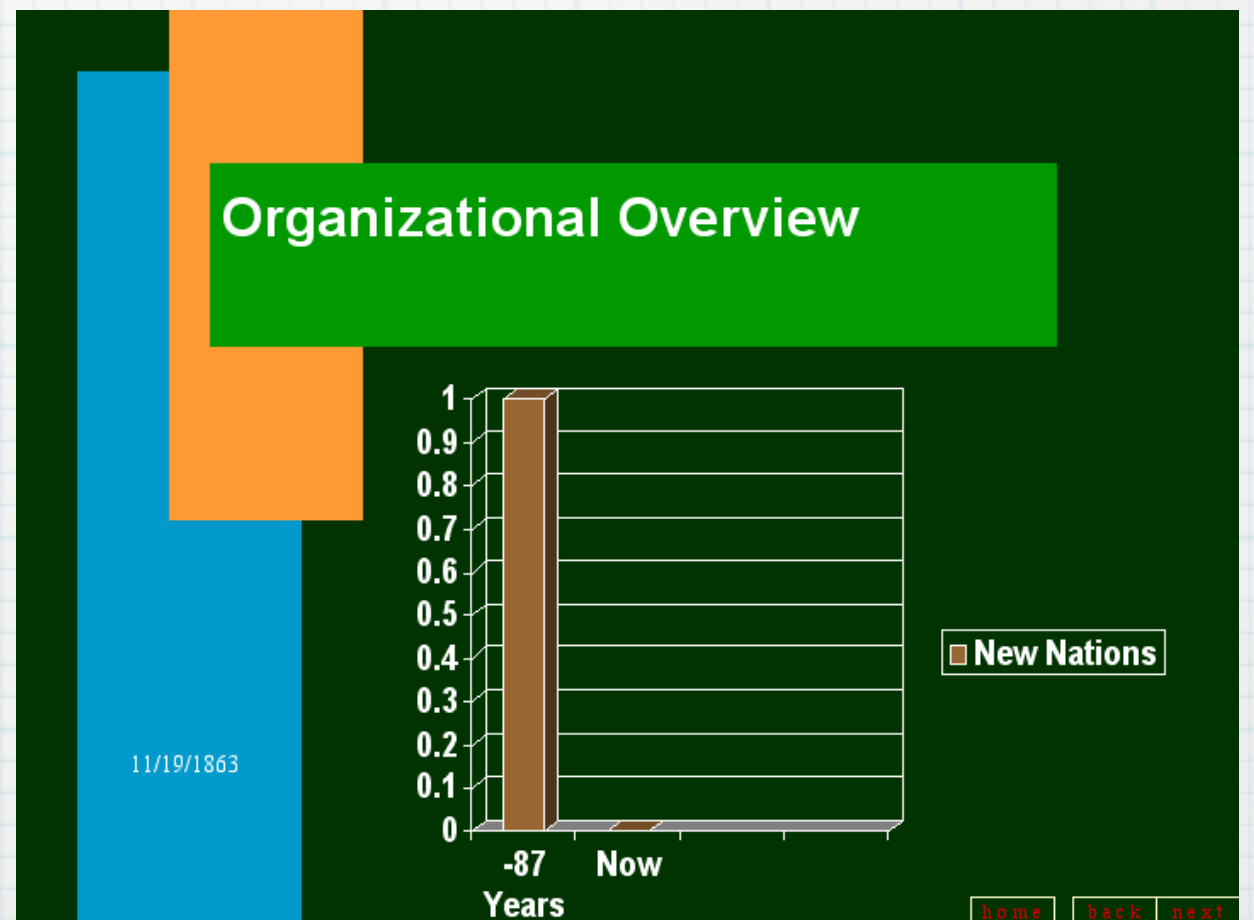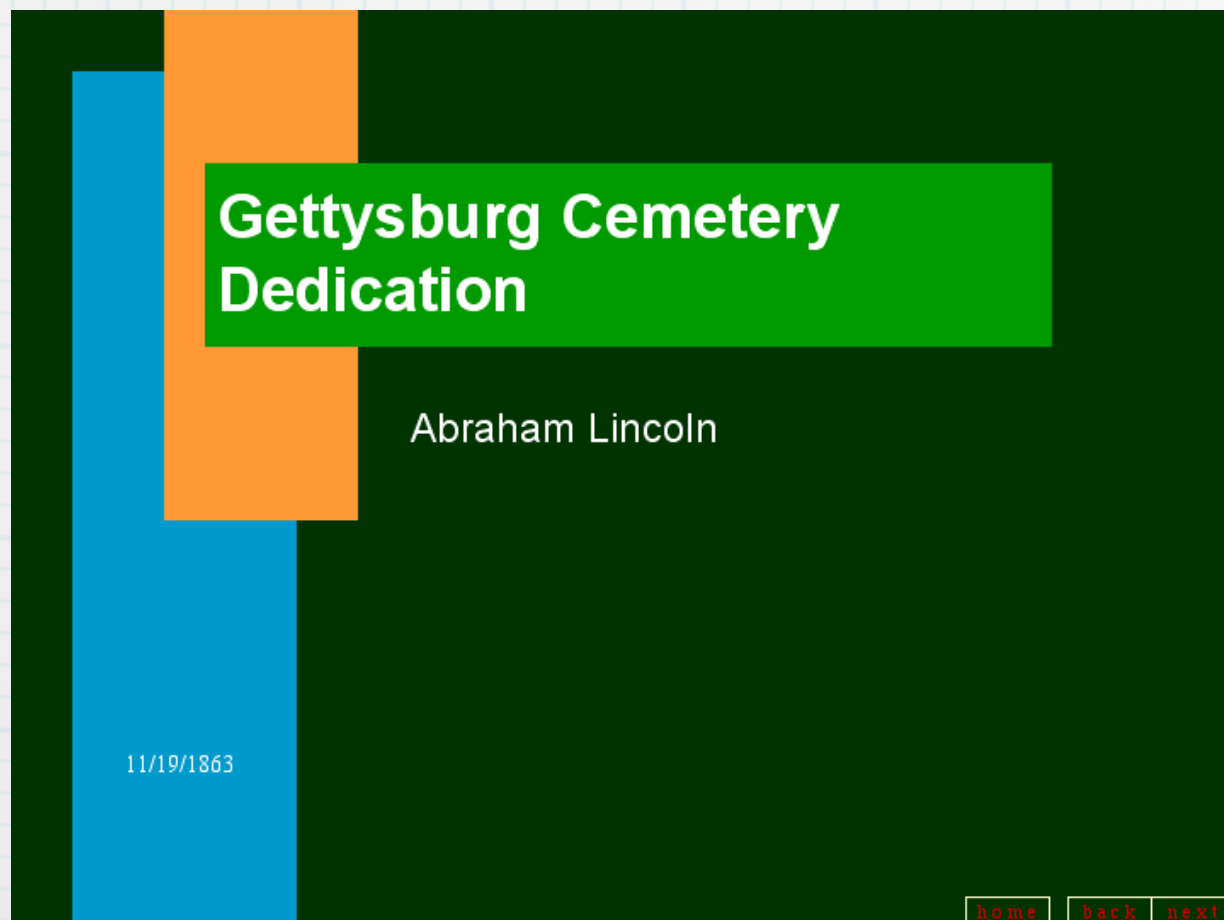
Analytical Design Master Stephen Few

Author, professor and lecturer most reknowned for analytical design; key ideas:

- Simplicity – strip away excess

- Clean table design

- Thoughtful charts and graphs

- One-screen dashboard

Few: Designing Tables

A table works best when it is used to look up individual values, compare individual values or the values must be expressed precisely.

Question 3: Which of these two tables is easier to read?

Top Table

Sales Summary by Region
1st Quarter, 2007
Regions are Sorted by Revenue

Region	Revenue	% of Total Revenue	Expenses	Profit	% of Total Profit
Europe	$75,904,604.00	31.06%	$40,988,486.16	$34,916,117.84	22.31%
Canada	$51,572,694.00	21.10%	$17,534,715.96	$34,037,978.04	21.75%
Western U.S.	$42,660,178.00	17.46%	$11,944,849.84	$30,715,328.16	19.63%
Eastern U.S.	$33,977,385.00	13.90%	$7,135,250.85	$26,842,134.15	17.15%
Central U.S.	$26,139,598.00	10.70%	$3,920,939.70	$22,218,658.30	14.20%
Asia	$14,135,278.00	5.78%	$6,360,875.10	$7,774,402.90	4.97%
Total (or Avg)	$244,389,737.00	100.00%	$87,885,117.61	$156,504,619.39	100.00%

Sales Summary by Region (USD)
1st Quarter, 2007
Regions are Sorted by Revenue

| Region	Revenue	% of Total Revenue	Expenses	Profit	% of Total Profit
Europe	75,904,604	31.1%	40,988,486	34,916,118	22.3%
Canada	51,572,694	21.1%	17,534,716	34,037,978	21.7%
Western U.S.	42,660,178	17.5%	11,944,850	30,715,328	19.6%
Eastern U.S.	33,977,385	13.9%	7,135,251	26,842,134	17.2%
Central U.S.	26,139,598	10.7%	3,920,940	22,218,658	14.2%
Asia	14,135,278	5.8%	6,360,875	7,774,403	5.0%
Total (or Avg)	$244,389,737	100.0%	$87,885,118	$156,504,619	100.0%

Bottom Table

Back   Next

Few: Designing Charts
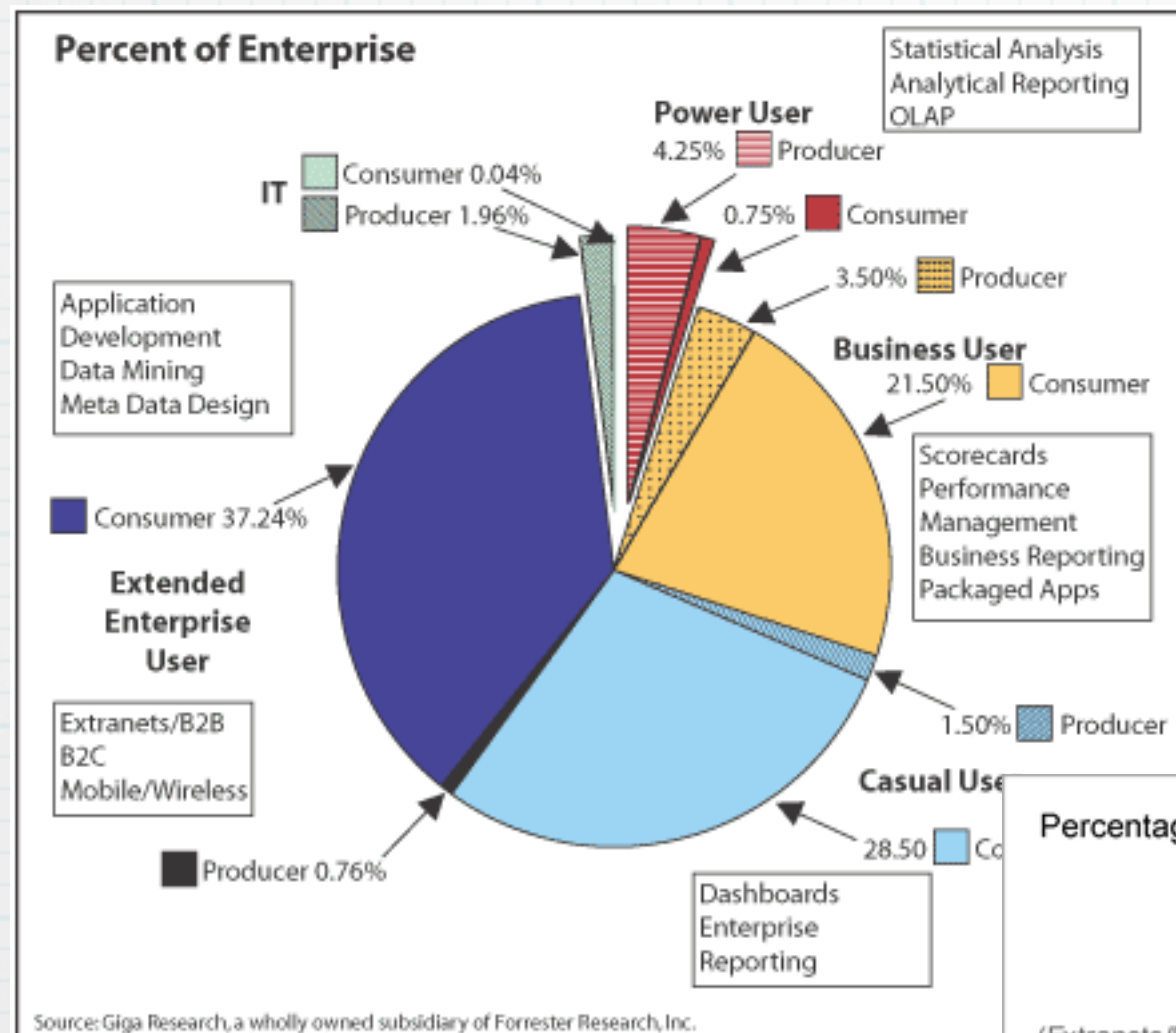
A graph works best when the message is contained in the shape of the data, such as patterns, trends, co-relationships, and exceptions to the norm.

- Choose lighter or darker colors, not primary

- Use a single color and vary intensity for distribution
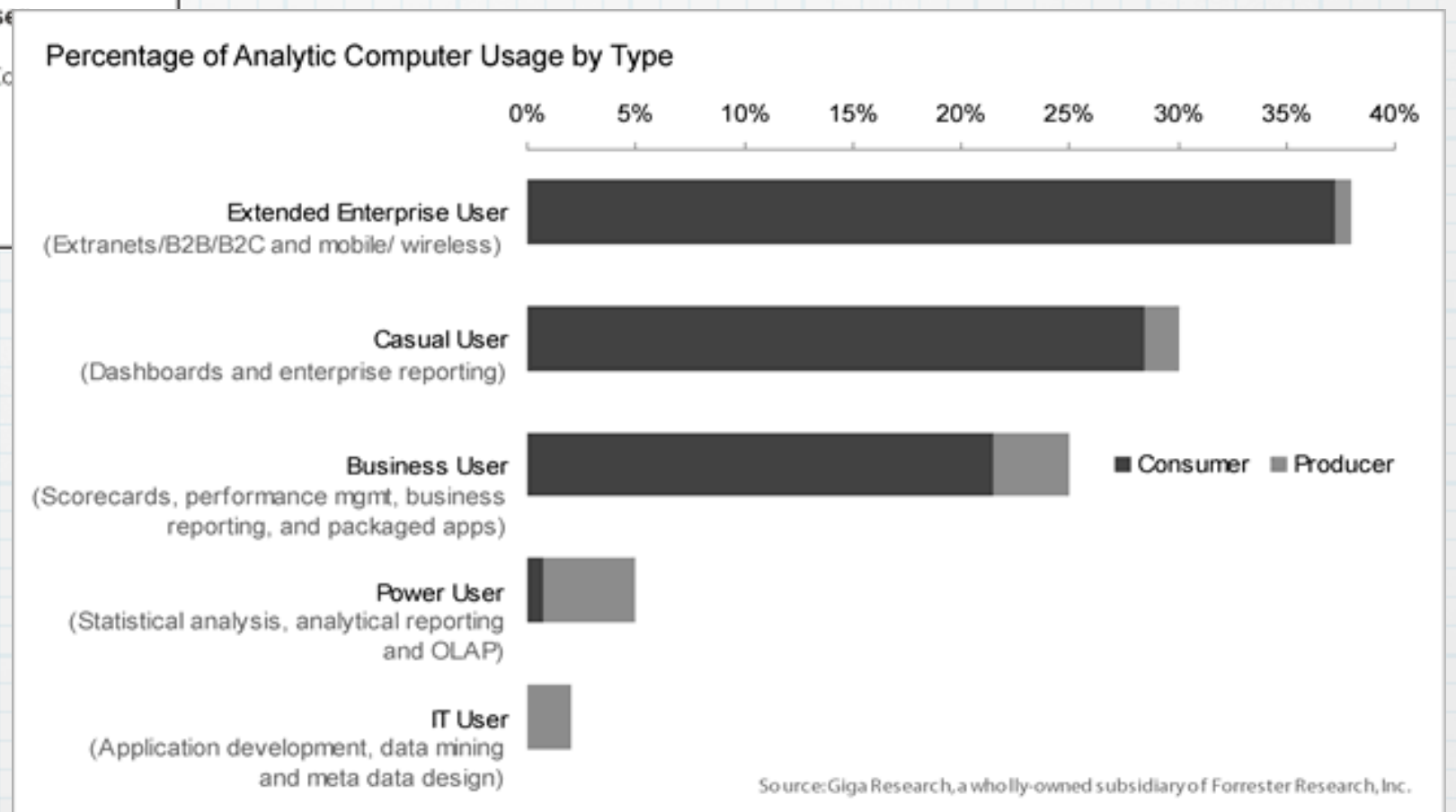
Few: Designing Dashboards

Dashboard design: single screens of information that people monitor to maintain the situation awareness that enables them to do their jobs effectively.
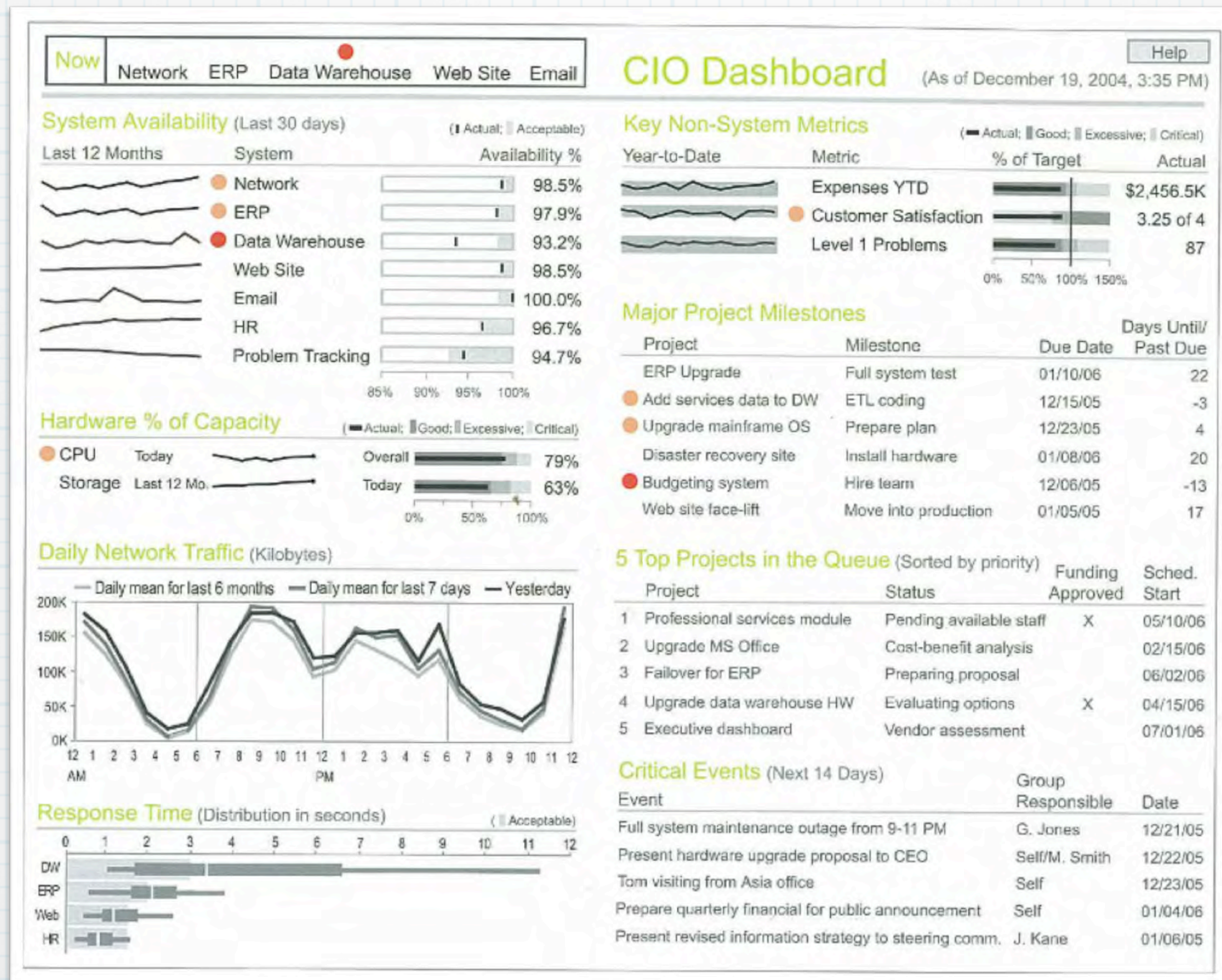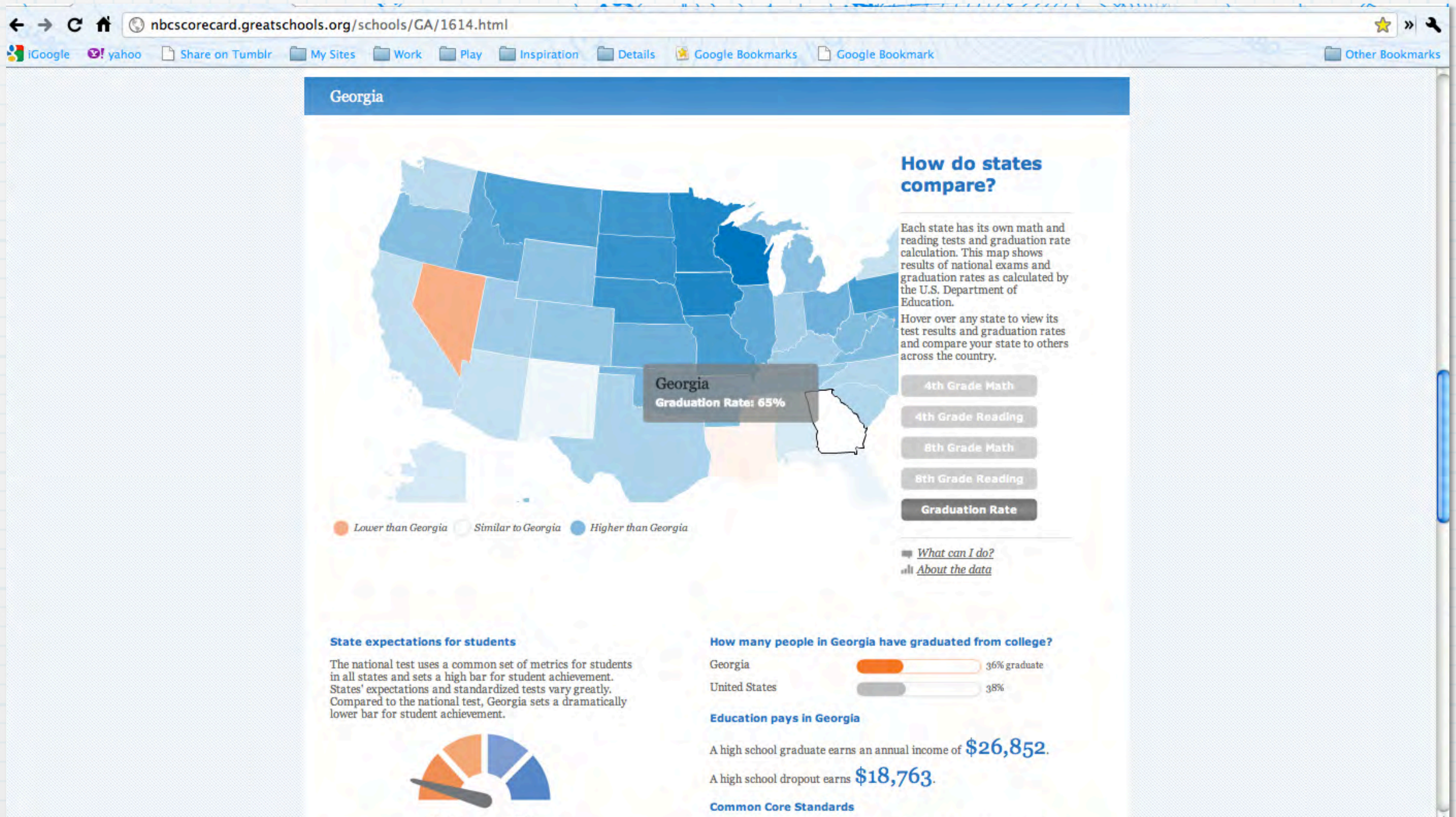
Data Visualization Trends

- Data Journalism / Infographics

- Social Network Analytics

- Open Data

- Visualization Community

- Data Visualization Studios

- Data Visualization Blogs

- Personal Data Collection

Data Journalism

Education Nation Scorecard
www.nbcscorecard.greatschools.org/

Data Journalism

The Guardian Data Store
www.guardian.co.uk/data/

Data Journalism

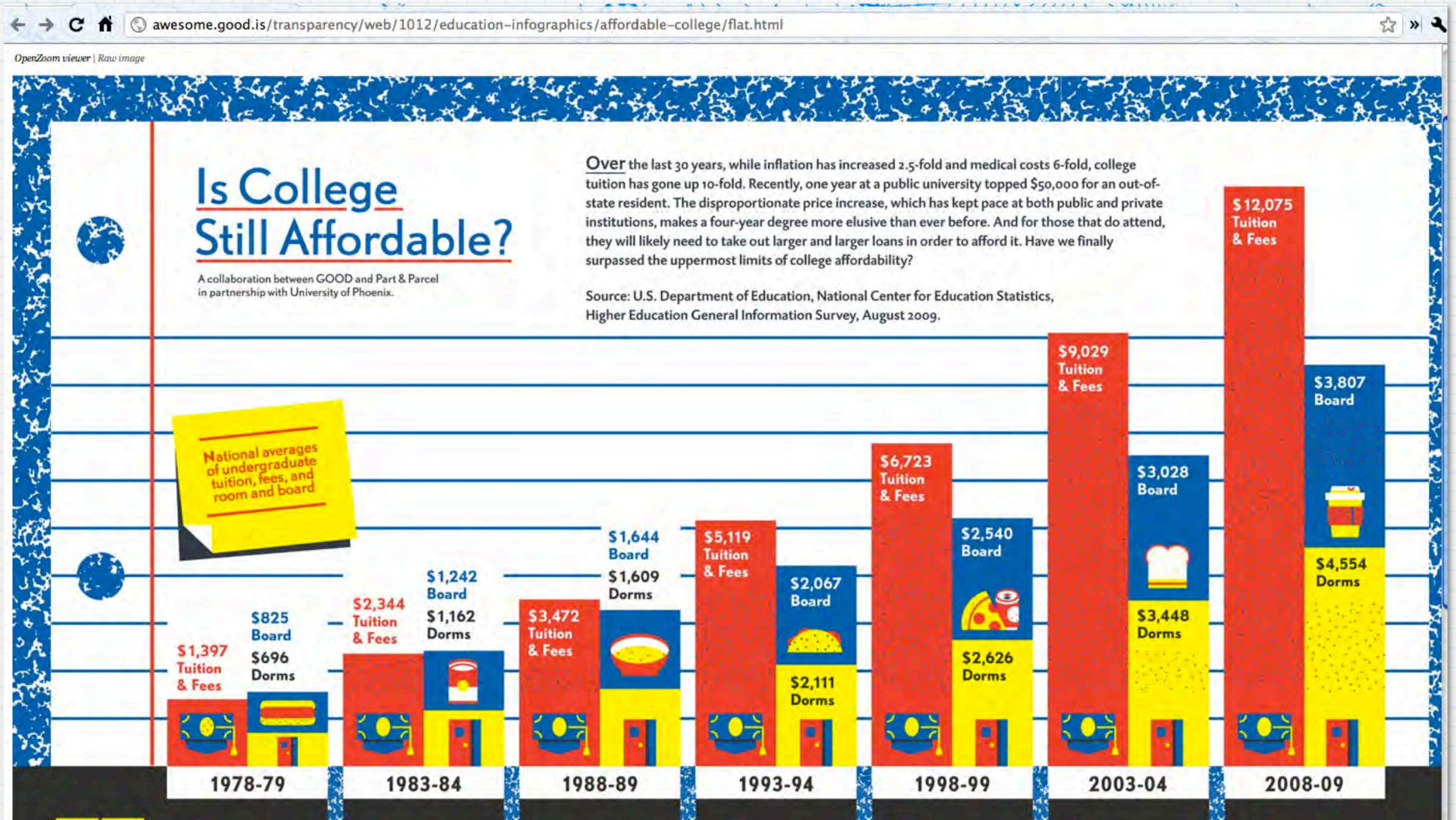The Guardian SOU address wordle
www.guardian.co.uk/datablog/2010/jan/27

Infographics
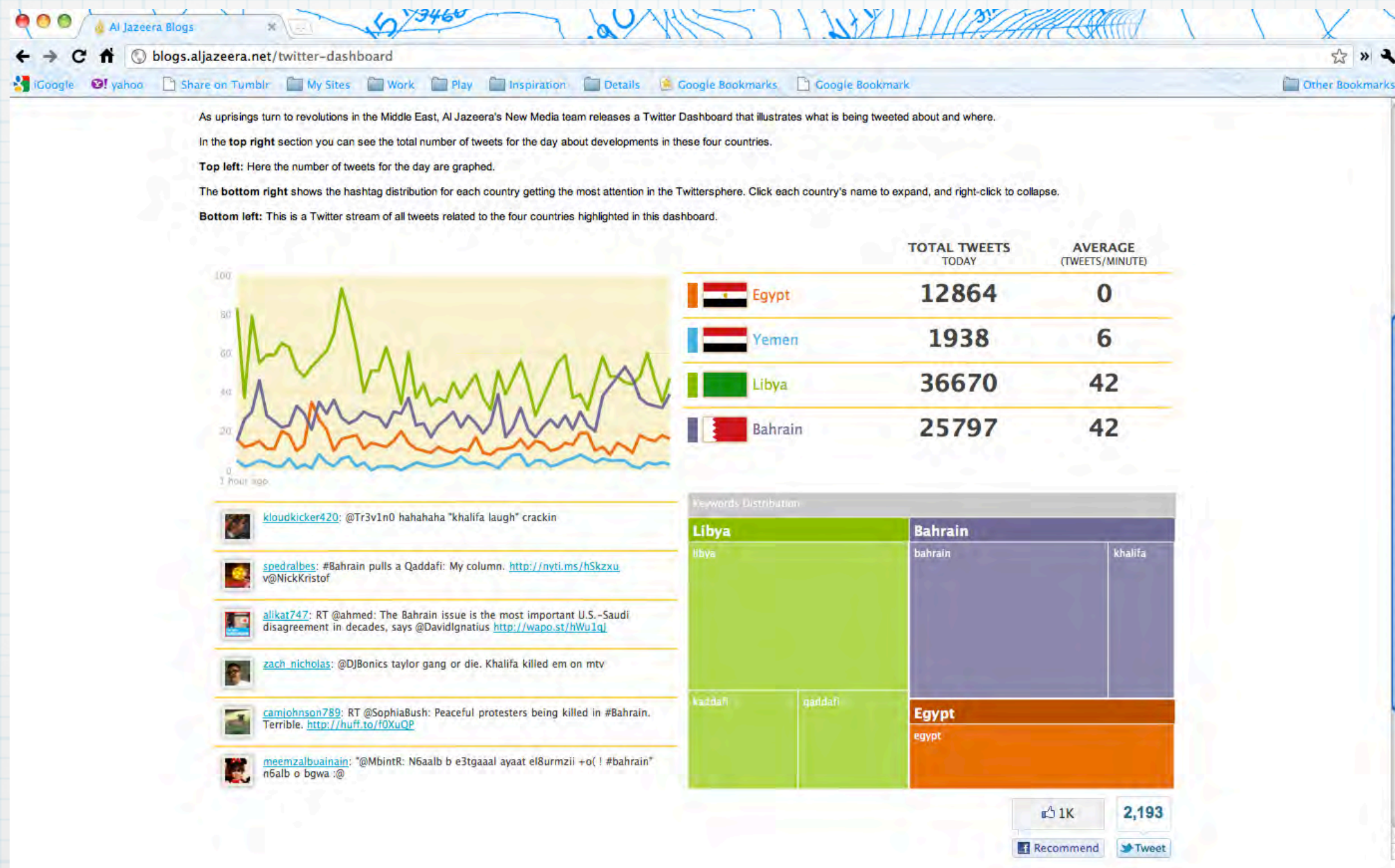
GOOD magazine infographics
www.good.is/infographics

Social Network Analytics

AlJazeera
blogs.aljazeera.net/twitter-dashboard

Open Data: data.gov

Data.gov
The data.gov site stores public data for consumption

Open Data: Hans Rosling

Gapminder.org documentary *The Joy of Stats*
www.gapminder.org/videos/the-joy-of-stats/

Visualization Community: Many Eyes

IBM Research Many Eyes
www-958.ibm.com/software/data/cognos/manyeyes

Data Visualization Blogs: Flowing Data

projects.flowingdata.com/walmart/

Data Visualization Studios: JESS3

http://jess3.com/the-state-of-the-internet/
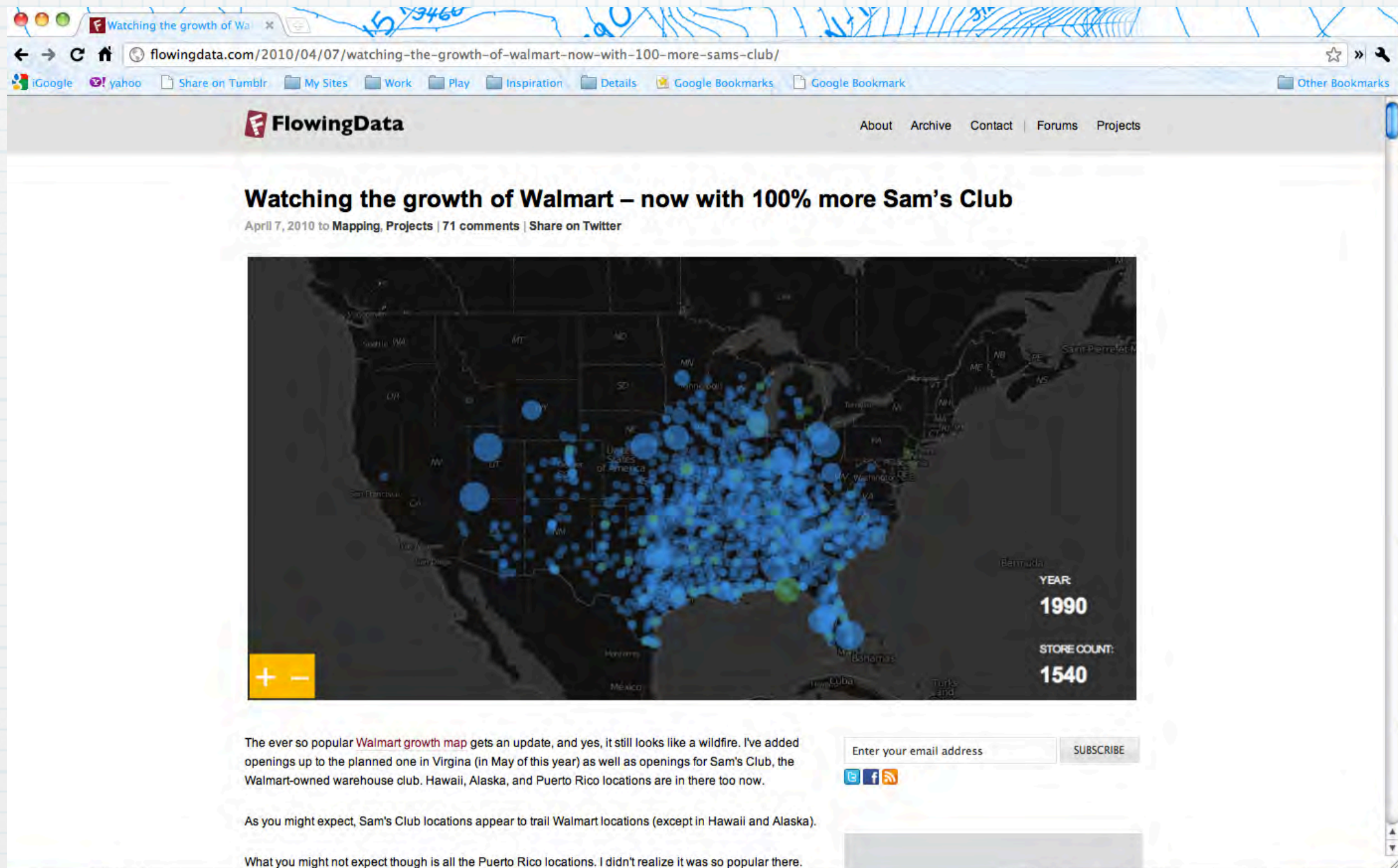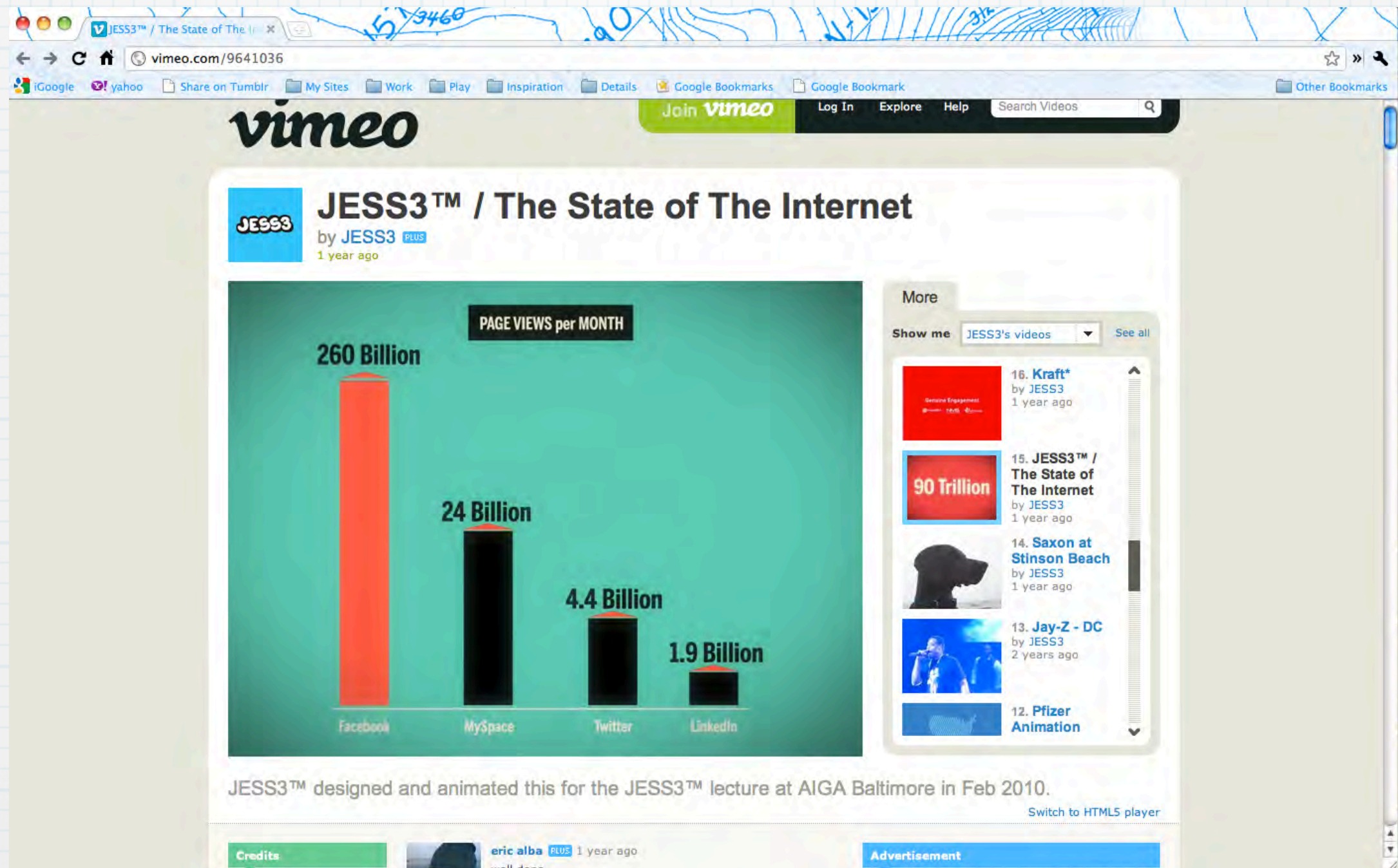
Personal Data Collection

Feltron – feltron.com
Nicholas Felton's personal annual reports

Personal Data Collection

Daytum – daytum.com
Site allows users to enter personal data – graphical display

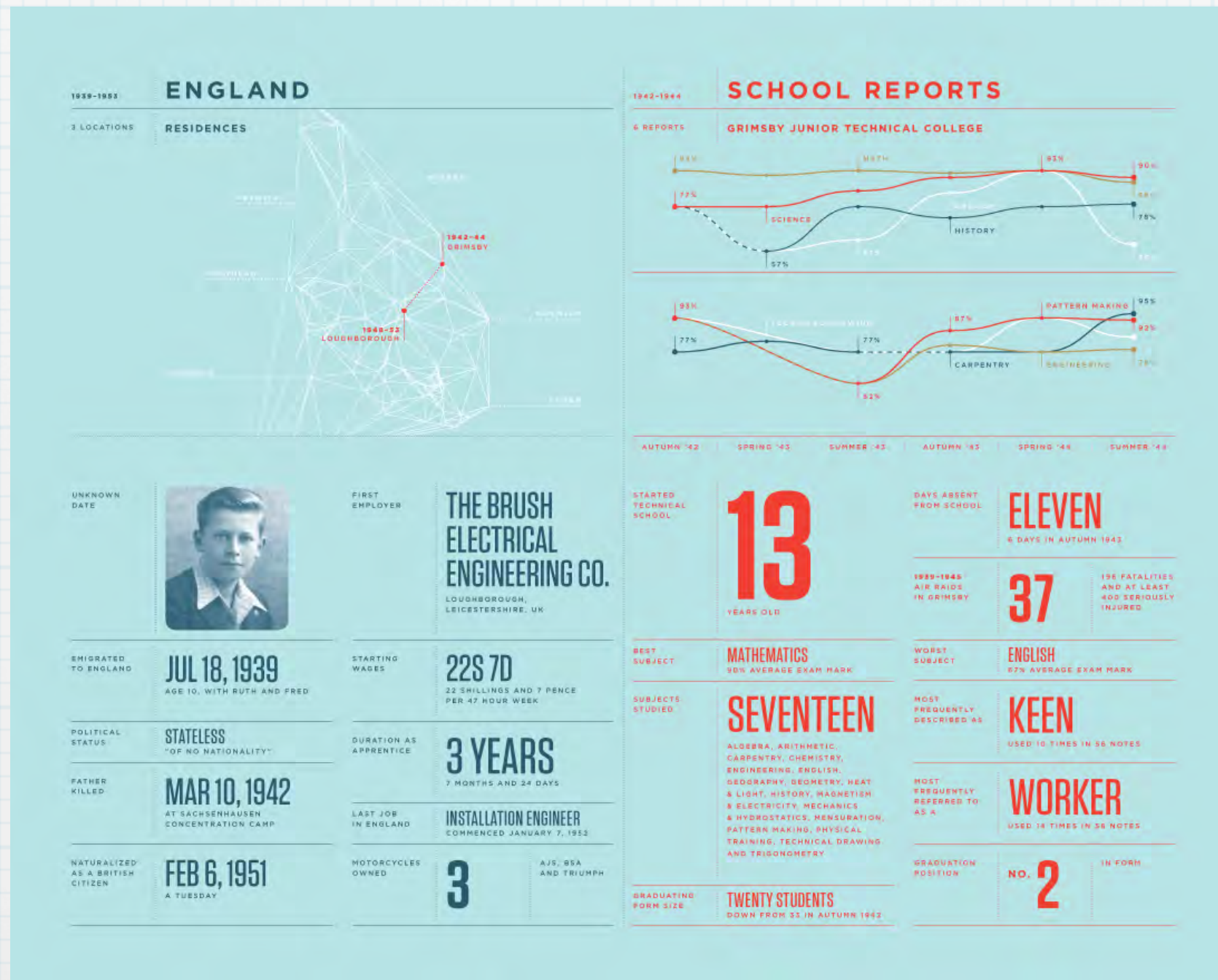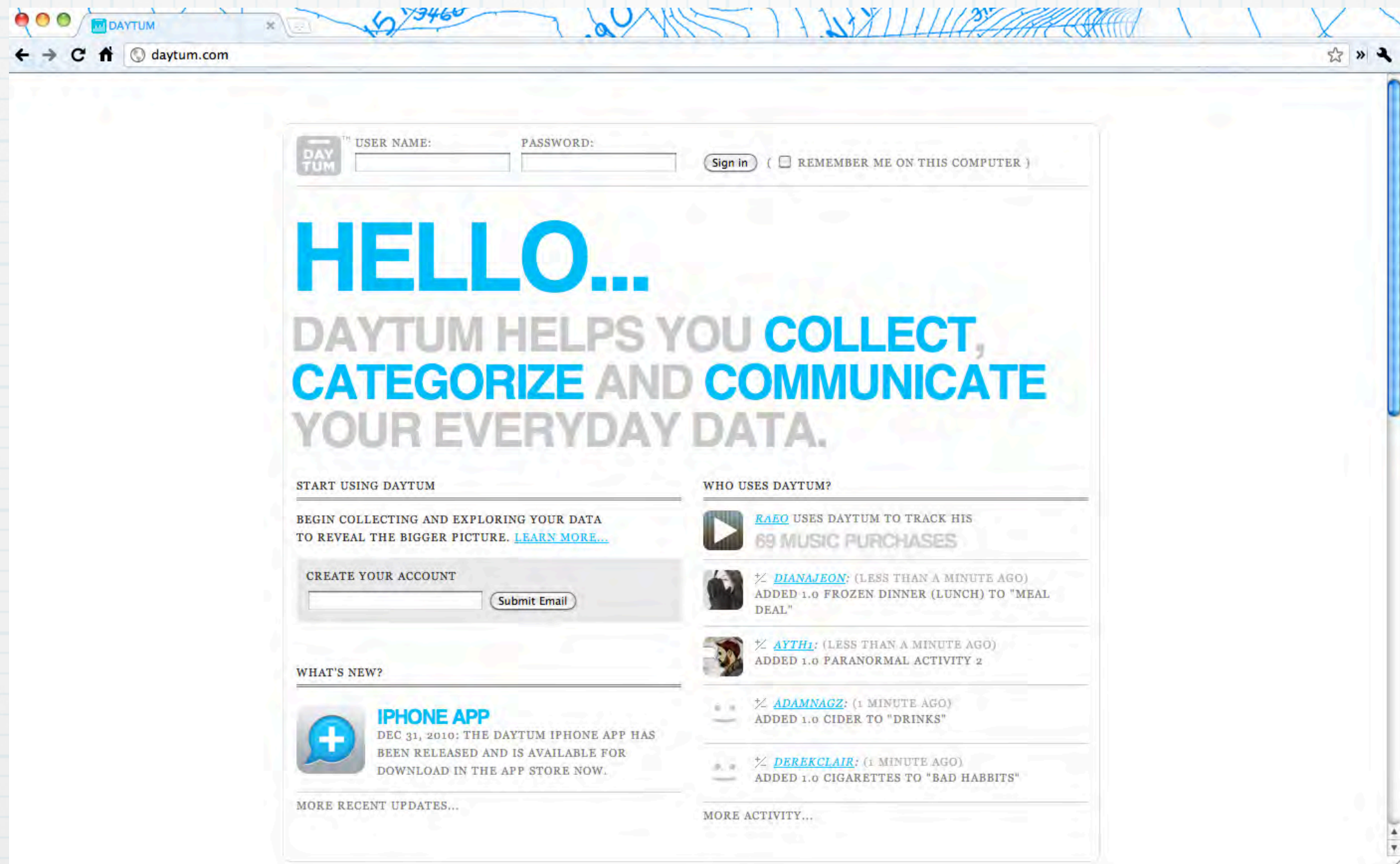# Advances in Data Visualization

- The growth of the internet encourages data visualization

- Advances in technology can be harnessed to take full advantage of rich datasets for maximum interactivity

  - Live government data system that tracks services on a city map interface

  - Public citizen and advocacy groups creating innovative data systems using open data discovery

Thank you!
Input Welcome!

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