

Choosing the Right Visual



The Art of Visualizing Data

- Storytelling is an art
- Visualization is a form of storytelling

Why should we be interested in visualization? Because the human visual system is a pattern seeker of enormous power and subtlety. The eye and the visual cortex of the brain form a massively parallel processor that provides the highest-bandwidth channel into human cognitive centers.... If we can understand how perception works, our knowledge can be translated into rules for displaying information.... [W]e can present our data in such a way that the important and informative patterns stand out. If we disobey the rules, our data will be incomprehensible or misleading.

-- Colin Ware (*Information Visualization: Perception for Design*)

Data is the art of storytelling

Let's really make it ART

When we present data, we are trying to tell a story.

- Kids prefer stories with illustrations, because they are only just learning about how the world looks and works
- Visualization aids unfamiliar audiences

Find a clear story to tell, and let your visuals help you tell it.

The challenges of visualization

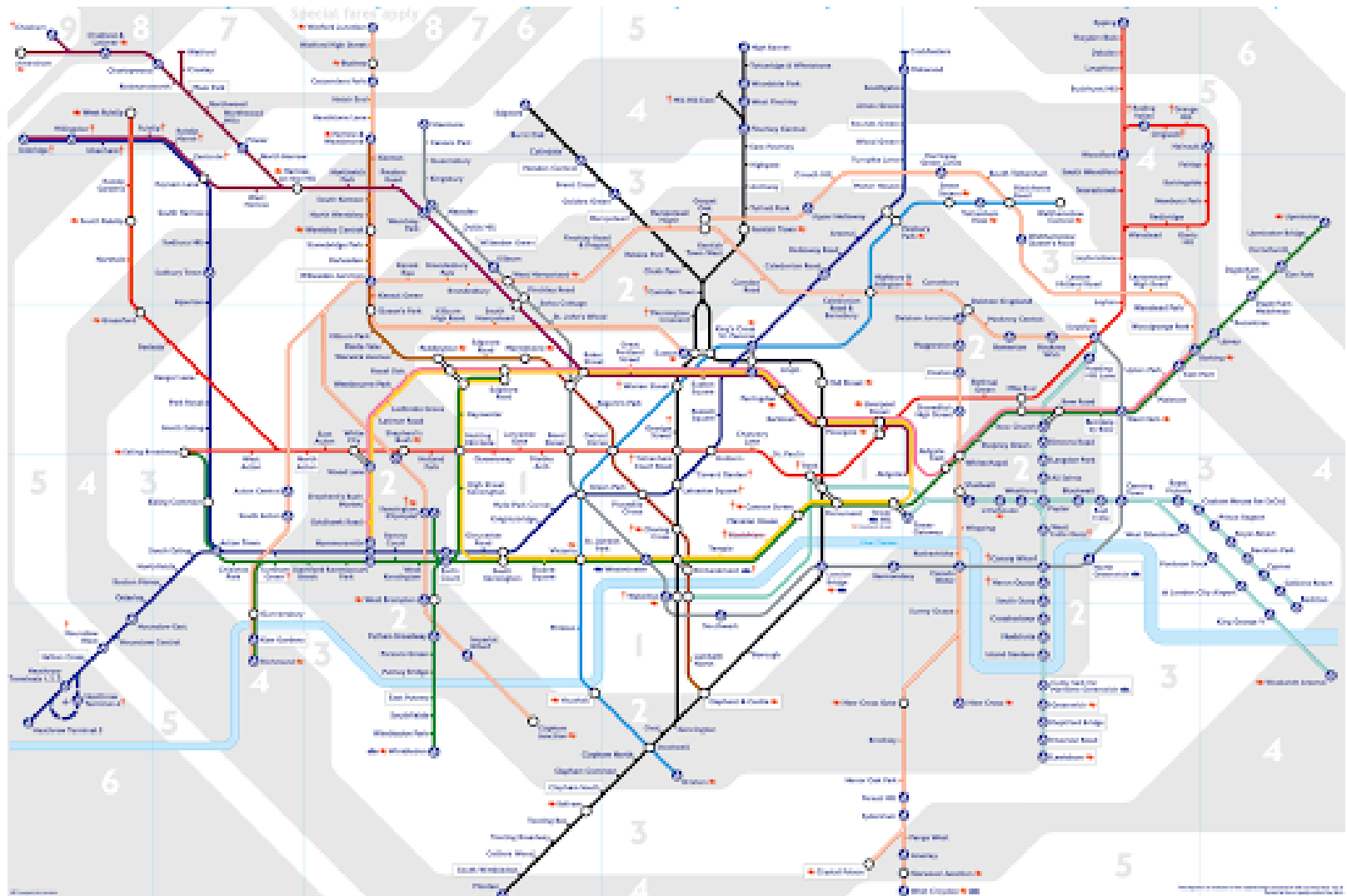
1. Dimensionality

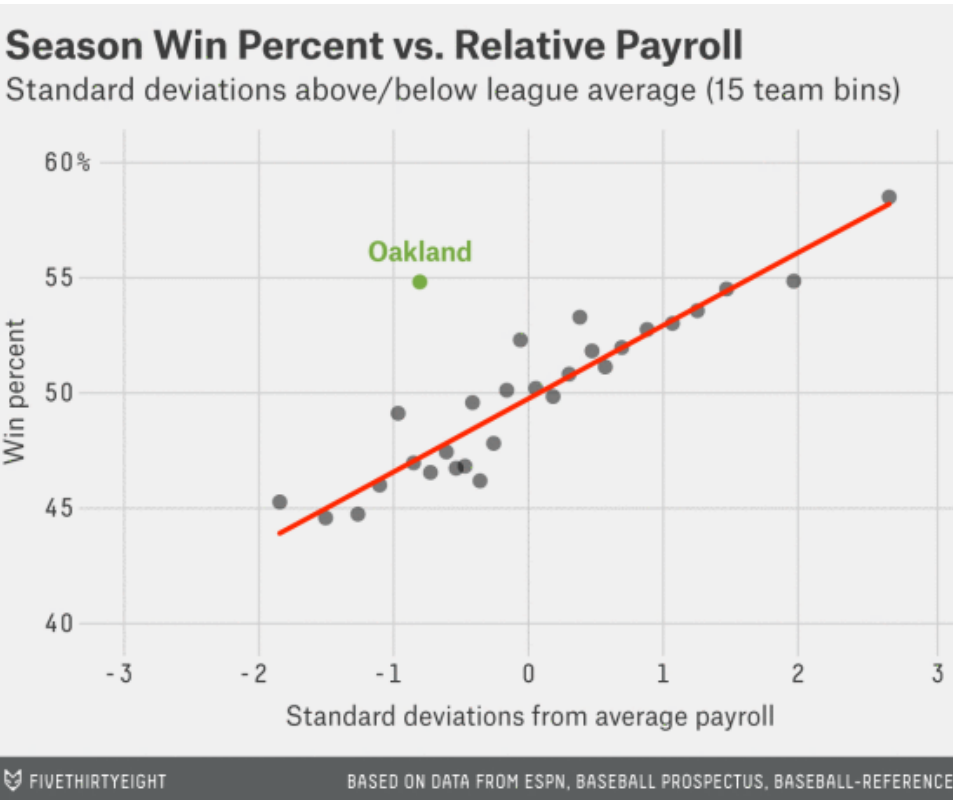
- We often have a lot of different features in our data
- We can't easily process more than 2 or 3 at once

2. Context

- It can be hard to understand a figure's context

Classic Visuals





Classic Visuals

Our visuals should be

1. Aesthetically Pleasing
2. Novel
3. Informative
4. Efficient

Aesthetically Pleasing

- Don't let beauty overwhelm data
- Aesthetics should accentuate the information
- Familiar looks and feels can help!

Novel

A visual can be novel in many ways:

- Novel Data
- Novel Insights
- Novel Presentation

Most often, designs that delight us do so not because they were designed to be novel, but because they were designed to be effective -- Beautiful Visualization

Informative

A visual that [is not informative] has failed. -- Beautiful Visualization

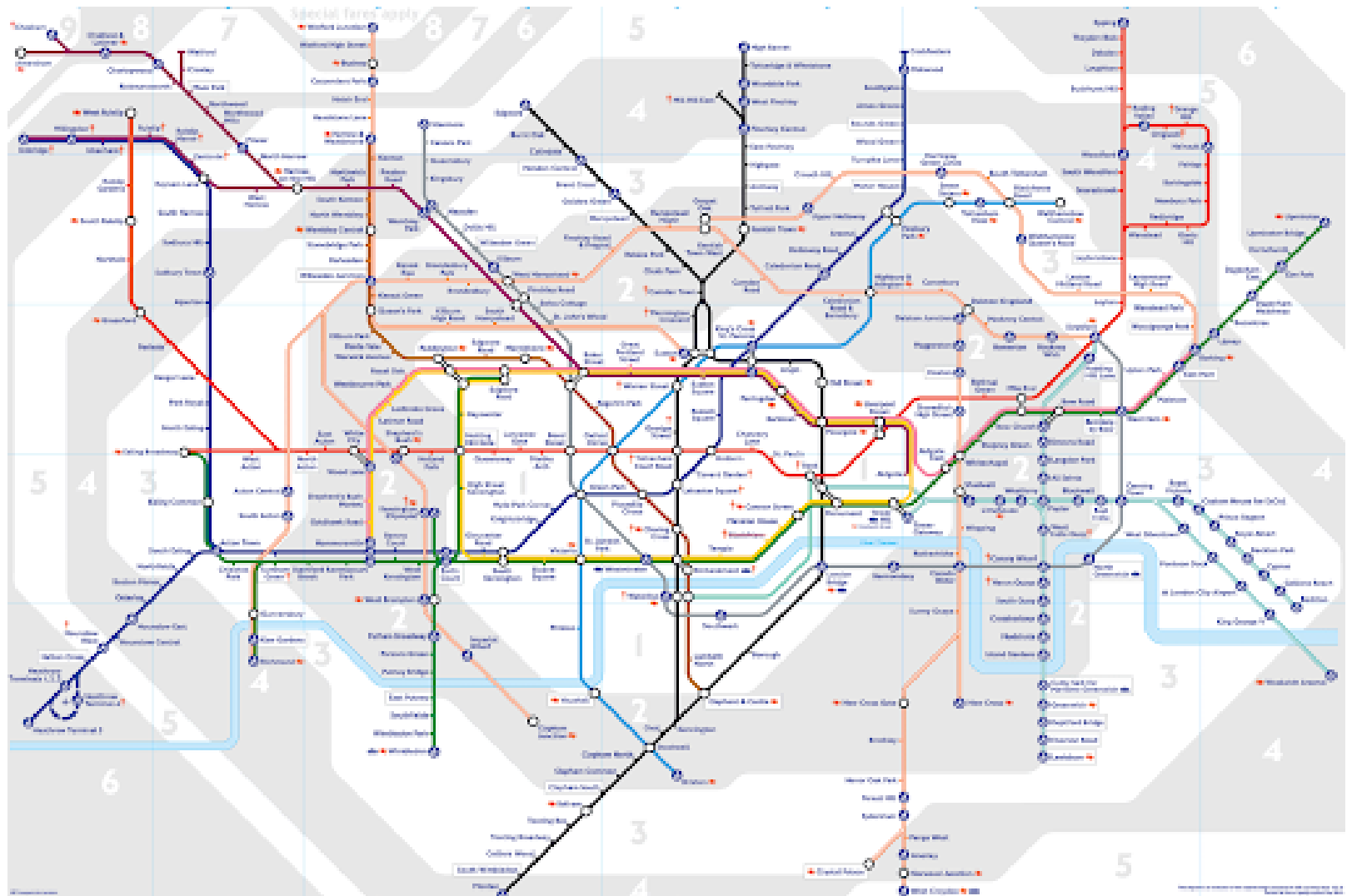
Ask: What is the intended usage of our visual?

My goal is to display _____ so that _____ can _____.

- What is our context of use?
- Is it for presentation or exploration?

Catering a visual to our audience ensures that they can quickly obtain the most valuable information.

Informative



Informative

An example I made: [Dash4Hank](#)

Why do firms struggle to hire CS talent in Omaha/Nebraska?

Efficient

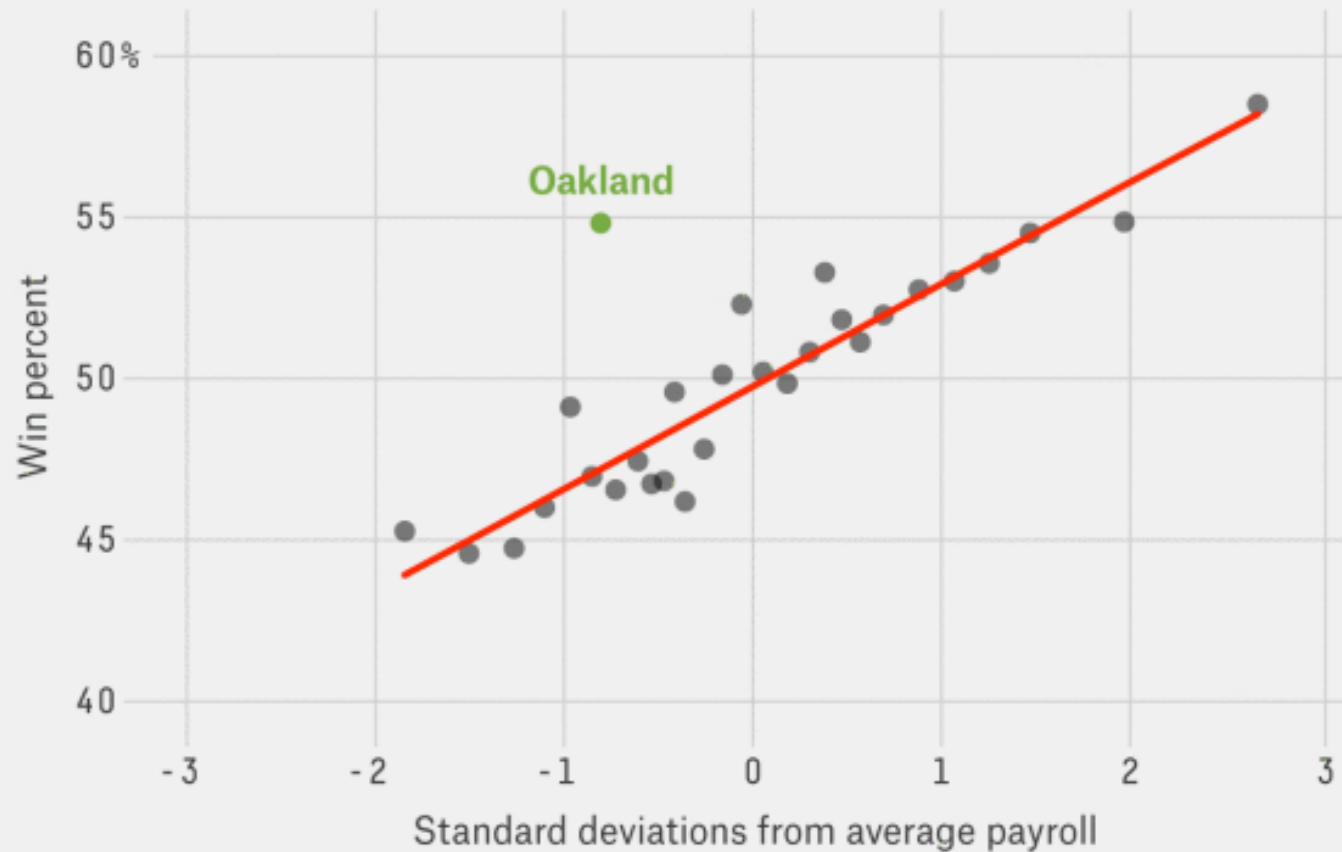
Irrelevant data is the same thing as noise. If it's not helping, it's probably getting in the way. -- Beautiful Visualization

- The minimum viable product concept is critical in visualization of data
 - Each new element slows your audience's perception of the important points
 - BUT! Don't omit critical components

Efficient

Season Win Percent vs. Relative Payroll

Standard deviations above/below league average (15 team bins)



An amazing visual

Periodic Table of the Elements

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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Alkali Metals

Alkali Earth Metals

Transition Metals

Other Metals

Metalloids

Other Non Metals

Halogens

Noble Gases

Lanthanides & Actinides

A Bad Copycat



So terrible...

A PERIODIC TABLE OF VISUALIZATION METHODS

| | | | | | | | | | | | | | | | | | |
|---|--|--|--|--|--|---|--|--|---|---|--|---|---|---|--|---|--|
| <div><div><div>< ☼ ></div><div>C</div><div>cartoon</div></div></div> | <div><div><div>☼</div></div><div><div>Data Visualization</div><div>The visual representations of quantitative data in schematic form (either with or without axes)</div></div></div> | | | | | | | <div><div><div>☼</div></div><div><div>Strategy Visualization</div><div>The systematic use of complementary visual representations in the analysis, development, formulation, communication, and implementation of strategies in organizations.</div></div></div> | <div><div><div>☼</div></div><div><div>G</div><div>graphic facilitation</div></div></div> | | | | | | | | |
| <div><div><div>< ☼ ></div><div>Tb</div><div>table</div></div></div> | <div><div><div>< ☼ ></div><div>Ca</div><div>cascade coordinates</div></div></div> | <div><div><div>☼</div></div><div><div>Information Visualization</div><div>The use of interactive visual representations of data to simplify cognition. This means that the data is transformed into an image, it is mapped to screen space. The image can be changed by users as they proceed working with it.</div></div></div> | | | | | | | <div><div><div>☼</div></div><div><div>Metaphor Visualization</div><div>Visual Metaphors position information graphically to aid points and structure information. They also derive an insight about the represented information through the key characteristics of the metaphor that is employed.</div></div></div> | <div><div><div>< ☼ ></div><div>Me</div><div>meeting chart</div></div></div> | <div><div><div>< ☼ ></div><div>Mm</div><div>mind map</div></div></div> | <div><div><div>☼</div></div><div><div>Tm</div><div>template</div></div></div> | <div><div><div>< ☼ ></div><div>St</div><div>story template</div></div></div> | <div><div><div>< ☼ ></div><div>Tr</div><div>tree</div></div></div> | <div><div><div>☼</div></div><div><div>Ct</div><div>cartoon</div></div></div> | | |
| <div><div><div>< ☼ ></div><div>Pi</div><div>pie chart</div></div></div> | <div><div><div>< ☼ ></div><div>L</div><div>line chart</div></div></div> | <div><div><div>☼</div></div><div><div>Concept Visualization</div><div>Methods to enhance (mostly) qualitative concepts, ideas, plans, and analyses.</div></div></div> | | | | | | | <div><div><div>☼</div></div><div><div>Compound Visualization</div><div>The complementary use of different graphic representation formats in one single scheme or frame.</div></div></div> | <div><div><div>< ☼ ></div><div>Co</div><div>communication diagram</div></div></div> | <div><div><div>< ☼ ></div><div>Fp</div><div>flight plan</div></div></div> | <div><div><div>< ☼ ></div><div>Cs</div><div>concept solution</div></div></div> | <div><div><div>☼</div></div><div><div>Br</div><div>bridge</div></div></div> | <div><div><div>< ☼ ></div><div>Fu</div><div>funnel</div></div></div> | <div><div><div>☼</div></div><div><div>Ri</div><div>rich picture</div></div></div> | | |
| <div><div><div>< ☼ ></div><div>B</div><div>bar chart</div></div></div> | <div><div><div>< ☼ ></div><div>Ac</div><div>area chart</div></div></div> | <div><div><div>< ☼ ></div><div>R</div><div>radar chart wheel</div></div></div> | <div><div><div>< ☼ ></div><div>Pa</div><div>parallel coordinates</div></div></div> | <div><div><div>< ☼ ></div><div>Hy</div><div>hyperbolic tree</div></div></div> | <div><div><div>< ☼ ></div><div>Cy</div><div>cycle diagram</div></div></div> | <div><div><div>< ☼ ></div><div>T</div><div>timeline</div></div></div> | <div><div><div>< ☼ ></div><div>Ve</div><div>vein diagram</div></div></div> | <div><div><div>< ☼ ></div><div>Mi</div><div>mindmap</div></div></div> | <div><div><div>< ☼ ></div><div>Sq</div><div>square 90° opposition</div></div></div> | <div><div><div>< ☼ ></div><div>Cc</div><div>concentric circles</div></div></div> | <div><div><div>< ☼ ></div><div>Ar</div><div>argument slide</div></div></div> | <div><div><div>< ☼ ></div><div>Sw</div><div>swim lane diagram</div></div></div> | <div><div><div>< ☼ ></div><div>Gc</div><div>gantt chart</div></div></div> | <div><div><div>< ☼ ></div><div>Pm</div><div>perspective diagram</div></div></div> | <div><div><div>< ☼ ></div><div>D</div><div>dilemma diagram</div></div></div> | <div><div><div>< ☼ ></div><div>Pr</div><div>parameter ruler</div></div></div> | <div><div><div>☼</div></div><div><div>Mn</div><div>knowledge map</div></div></div> |
| <div><div><div>< ☼ ></div><div>Hi</div><div>histogram</div></div></div> | <div><div><div>< ☼ ></div><div>Sc</div><div>scatterplot</div></div></div> | <div><div><div>< ☼ ></div><div>Sa</div><div>saucer diagram</div></div></div> | <div><div><div>< ☼ ></div><div>In</div><div>information base</div></div></div> | <div><div><div>< ☼ ></div><div>E</div><div>entity relationship diagram</div></div></div> | <div><div><div>< ☼ ></div><div>Pt</div><div>petri net</div></div></div> | <div><div><div>< ☼ ></div><div>Fl</div><div>flow chart</div></div></div> | <div><div><div>< ☼ ></div><div>Cl</div><div>clustering</div></div></div> | <div><div><div>< ☼ ></div><div>Le</div><div>layer chart</div></div></div> | <div><div><div>< ☼ ></div><div>Py</div><div>pyramid technique</div></div></div> | <div><div><div>< ☼ ></div><div>Ce</div><div>cause-effect chain</div></div></div> | <div><div><div>< ☼ ></div><div>Tl</div><div>timeline map</div></div></div> | <div><div><div>< ☼ ></div><div>Dt</div><div>decision tree</div></div></div> | <div><div><div>< ☼ ></div><div>Cp</div><div>open critical path method</div></div></div> | <div><div><div>< ☼ ></div><div>Cf</div><div>concept fan</div></div></div> | <div><div><div>< ☼ ></div><div>Co</div><div>concept map</div></div></div> | <div><div><div>< ☼ ></div><div>Ic</div><div>iceberg</div></div></div> | <div><div><div>☼</div></div><div><div>Lm</div><div>learning map</div></div></div> |
| <div><div><div>< ☼ ></div><div>Tk</div><div>tick bar plot</div></div></div> | <div><div><div>< ☼ ></div><div>Sp</div><div>spectrogram</div></div></div> | <div><div><div>< ☼ ></div><div>Da</div><div>data map</div></div></div> | <div><div><div>< ☼ ></div><div>Tp</div><div>treemap</div></div></div> | <div><div><div>< ☼ ></div><div>Cn</div><div>cone tree</div></div></div> | <div><div><div>< ☼ ></div><div>Sy</div><div>system dyn./simulation</div></div></div> | <div><div><div>< ☼ ></div><div>Df</div><div>data flow diagram</div></div></div> | <div><div><div>< ☼ ></div><div>Se</div><div>semantic network</div></div></div> | <div><div><div>< ☼ ></div><div>So</div><div>soft system modeling</div></div></div> | <div><div><div>< ☼ ></div><div>Sn</div><div>strategy map</div></div></div> | <div><div><div>< ☼ ></div><div>Fo</div><div>force field diagram</div></div></div> | <div><div><div>< ☼ ></div><div>Ib</div><div>ice representation map</div></div></div> | <div><div><div>< ☼ ></div><div>Pr</div><div>process event chain</div></div></div> | <div><div><div>< ☼ ></div><div>Pe</div><div>petri chart</div></div></div> | <div><div><div>< ☼ ></div><div>Ev</div><div>evolution knowledge map</div></div></div> | <div><div><div>< ☼ ></div><div>V</div><div>ice diagram</div></div></div> | <div><div><div>< ☼ ></div><div>Hh</div><div>house of hell chart</div></div></div> | <div><div><div>☼</div></div><div><div>I</div><div>internet</div></div></div> |

Cy Process Visualization

Hy Structure Visualization

- ☼ Overview
- ☼ Detail
- ☼ Detail AND Overview
- < ☼ > Divergent thinking
- > ☼ < Convergent thinking

Note: Depending on your location and connection speed it can take some time to load a pop-up picture.

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version 1.5

| | | | | | | | | | | | | | |
|--|---|---|--|---|---|---|--|---|---|--|---|---|--|
| < ☼ > Su supply demand curve | < ☼ > Pc performance charting | < ☼ > St strategy map | < ☼ > Oc organization chart | < ☼ > Ho house of quality | < ☼ > Fd feedback diagram | ☼ Ft failure tree | < ☼ > Mq matrix question | < ☼ > Ld life-cycle diagram | < ☼ > Po porter's five forces | < ☼ > S cycle | < ☼ > Sm stakeholder map | ☼ Is issues diagram | ☼ Tc technology roadmap |
| ☼ Ed edge-weight box | < ☼ > Pf portfolio diagram | ☼ Sg strategy game board | < ☼ > Mz marketing's organograph | < ☼ > Z zeuthen's morphological box | < ☼ > Ad affinity diagram | ☼ De decision discovery diagram | < ☼ > Bm big matrix | < ☼ > Stc strategy canvas | < ☼ > Vc value chain | < ☼ > Hy hyper-cycle | < ☼ > Sr stakeholder rating map | < ☼ > Ta taxi | < ☼ > Sd spray diagram |

It's so bad!

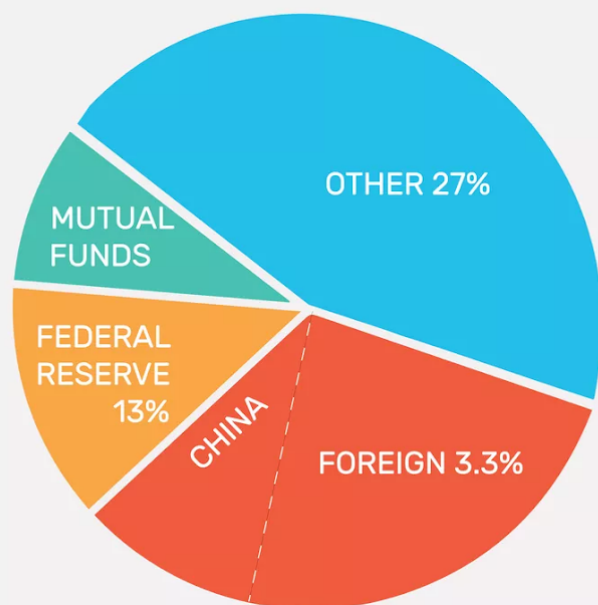
Maybe we do [this](#) instead...

Or [this](#)?

Or anything else!

Another atrocity

US National Debt Holdings in Trillions



OTHER 27%

STATE AND LOCAL GOVERNMENT
PENSION FUNDS
5%

OFFICE OF PERSONNEL
MANAGEMENT RETIREMENT
5%

BANKS
4%

MILITARY RETIREMENT
4%

STATE AND LOCAL GOVERNMENT
PENSION FUNDS
5%

CASH ON HAND TO FUND
FEDERAL GOVERNMENT
OPERATIONS 3%

SOCIAL SECURITY
15%

INSURANCE COMPANIES
2%

ALL OTHER
RETIREMENT FUNDS
2%

MEDICARE
2%

PRIVATE PENSION
FUNDS
3%

PRIVATE PENSION
FUNDS
3%

US SAVINGS
BONDS
1%

A template process

1. Write down your goal and intent for the visual
2. Gather the data that will help you achieve that goal
3. Decide how to tell your intended story with the data
4. Apply a visual representation of your data

Visual Options in Power BI

Let's walk through this process to address the following question:

- How have global civil liberties changed over time?

Visual Options in Power BI

We will explore the following charts:

1. Bar Chart
2. Histogram
3. Line Charts (revisited)

And the following techniques:

- Grouping
- Aggregating
- Trend Lines

(We are saving maps for their own lesson!)

Lab Time!

Get ready for student-led lessons beginning next week!