The Visualisation Design Process

CM4125 – Week 6

Based on Chapter 1-3 of Andy Kirk's "Data Visualisation" book
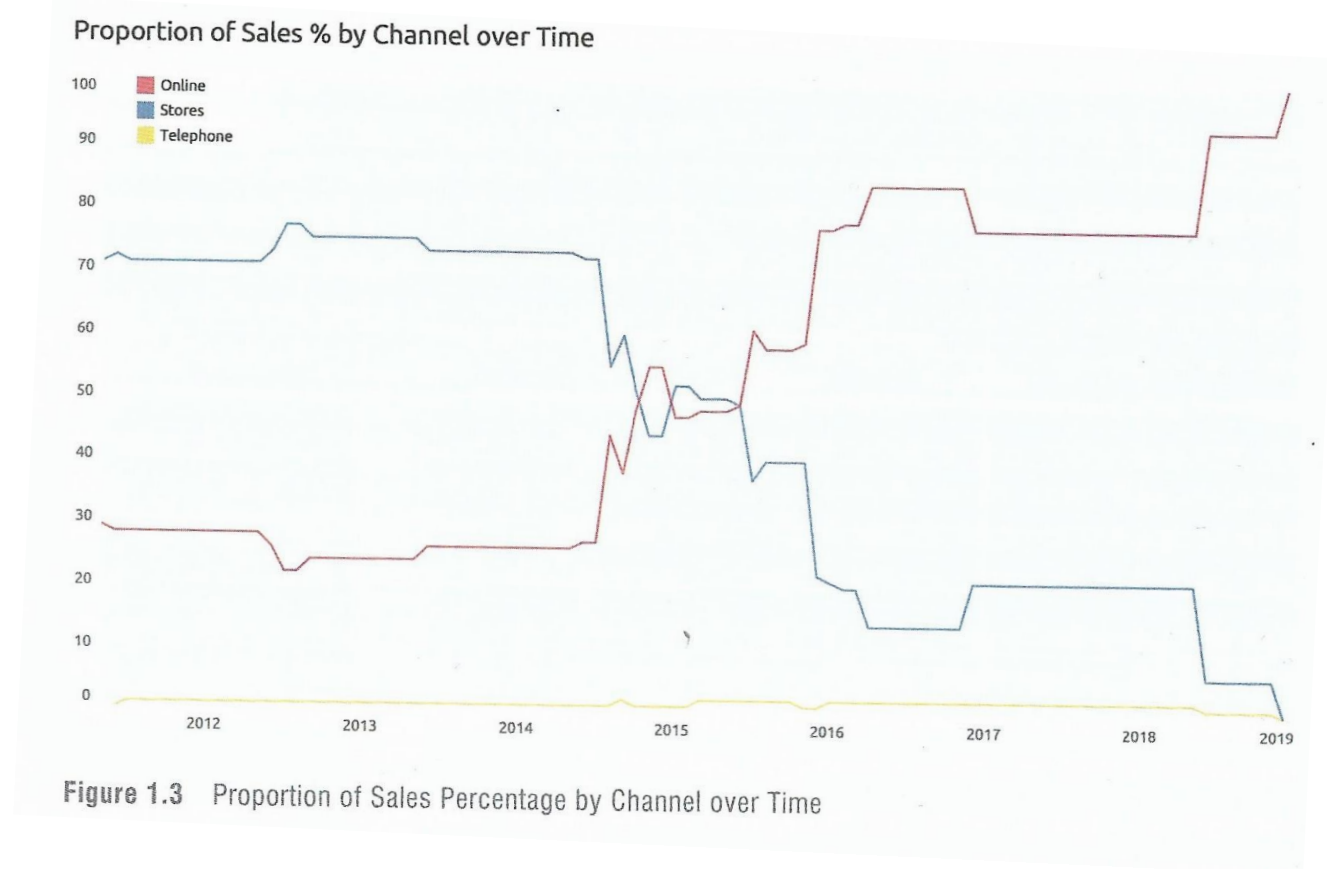
Announcements

- Lecture recordings with captions

- Courses in Datacamp

- Coursework Part 1 impressions

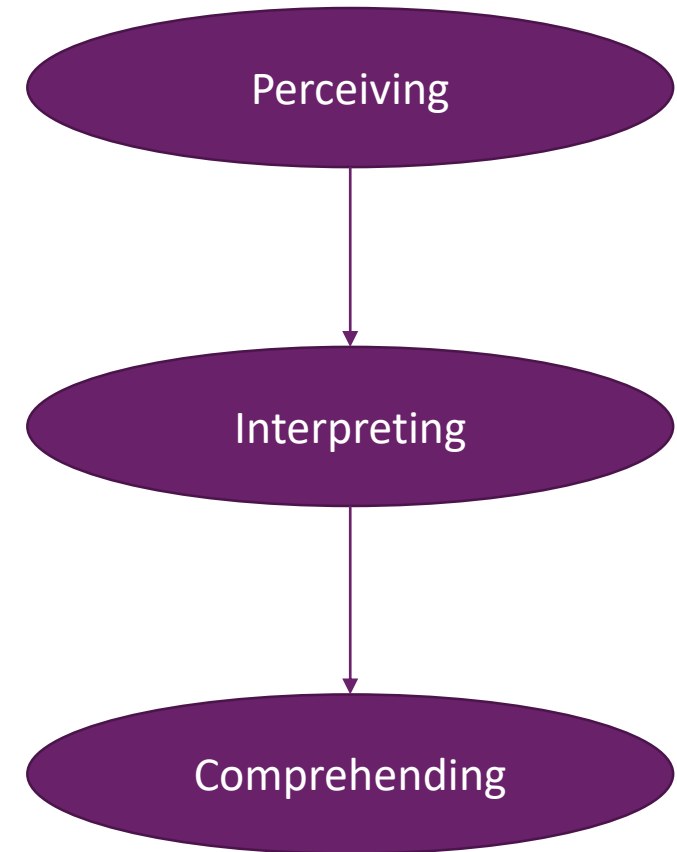- Coursework Part 2 clarification

Foundations

Basic Definitions

- Data viz is the visual representation and presentation of data to facilitate understanding

- It's building blocks are marks and attributes:
  - Marks: Points, lines or shapes used to represent the items of data
  - Attributes: Visual variations of the marks (scales, sizes, colours, etc.)

Proportion of Sales % by Channel over Time

- Online
- Stores
- Telephone

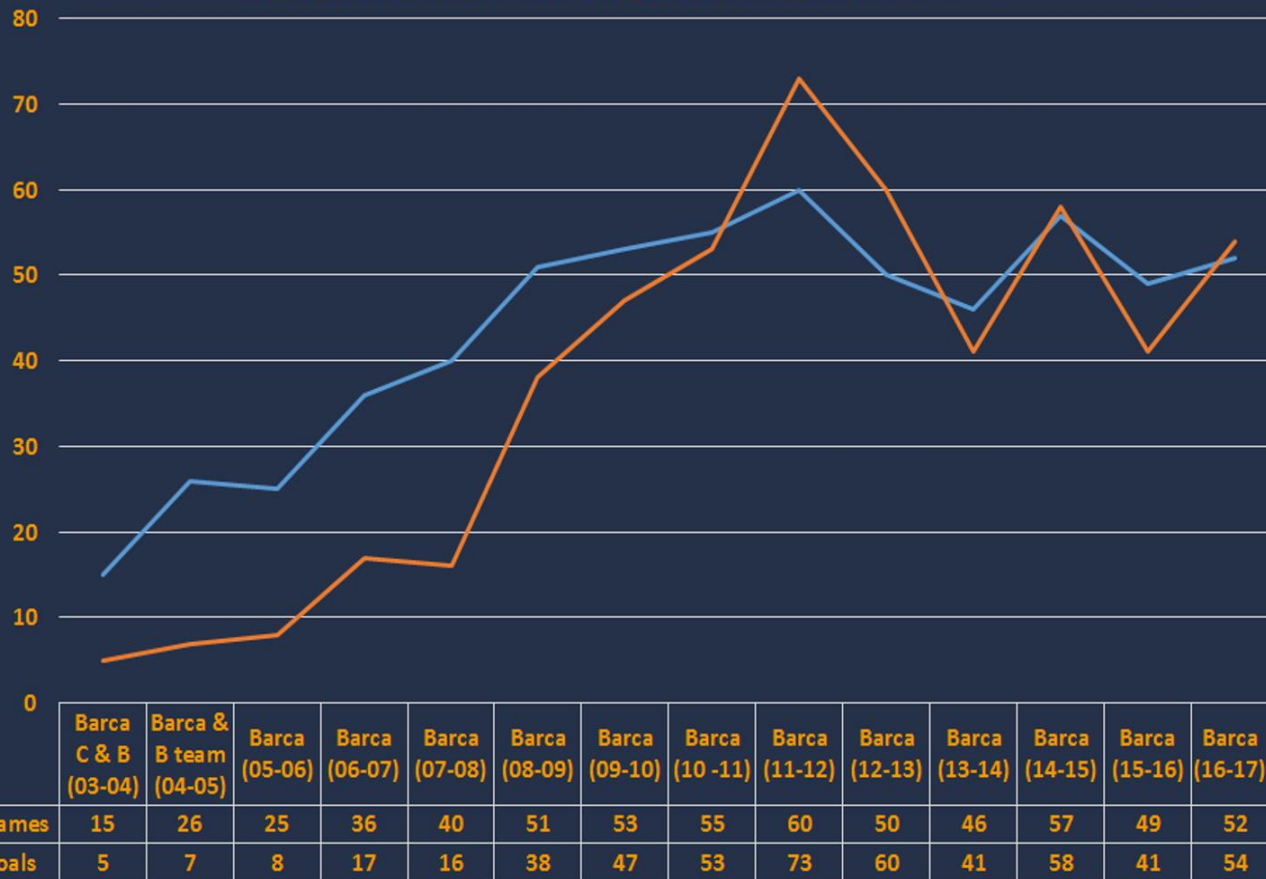Figure 1.3   Proportion of Sales Percentage by Channel over Time

Presentation

- How we choose to package the visualisation
  - Interactivity
  - Features or annotations
  - Colour usage
  - Composition of the work

- Connection between presentation and representation!

- Facilitate understanding

Perceiving

Interpreting

Comprehending

Lionel Messi At 30 - Season-By-Season Club Record

	Barca C & B (03-04)	Barca & B team (04-05)	Barca (05-06)	Barca (06-07)	Barca (07-08)	Barca (08-09)	Barca (09-10)	Barca (10-11)	Barca (11-12)	Barca (12-13)	Barca (13-14)	Barca (14-15)	Barca (15-16)	Barca (16-17)
Games	15	26	25	36	40	51	53	55	60	50	46	57	49	52
Goals	5	7	8	17	16	38	47	53	73	60	41	58	41	54

Total sightings of Winglets and Spungles

Coming back to the first example…

Forecasted % Chance of Winning Presidency (US Election, 8th November 2016)
Data from https://projects.fivethirtyeight.com/election-night-forecast-2016/
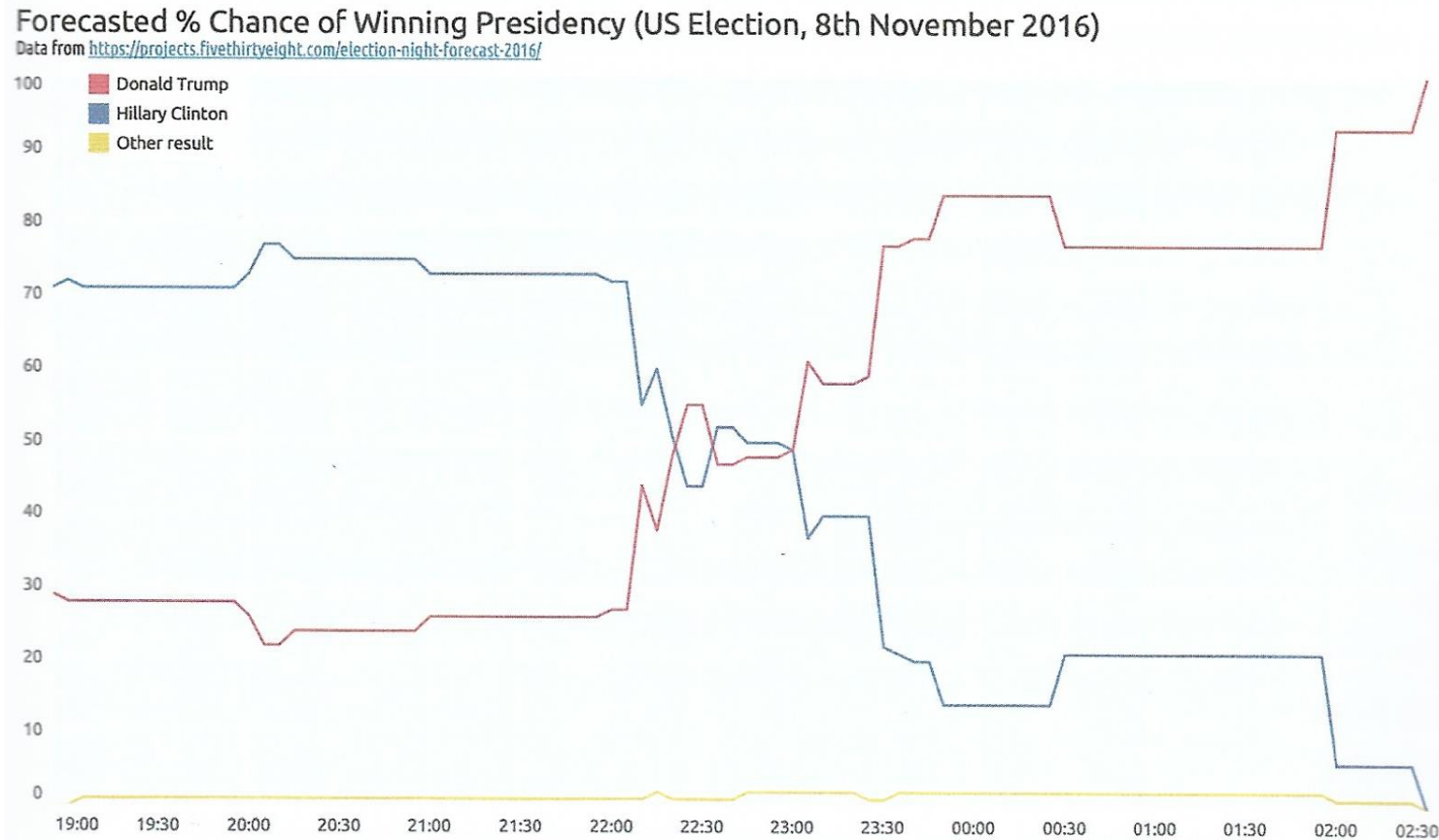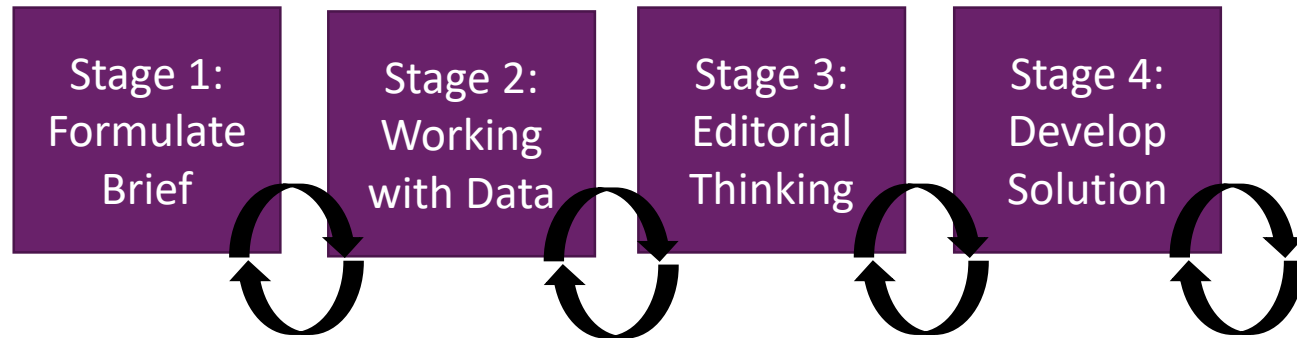
Donald Trump
Hillary Clinton
Other result

Figure 1.7 Forecasted % Chance of Winning Presidency (US Election, 8 November 2016)

The Process

The perfect vis doesn't exist!

- It is an iterative process
- It may never please everyone
- Effective decisions efficiently made

| Stage 1: Formulate Brief | Stage 2: Working with Data | Stage 3: Editorial Thinking | Stage 4: Develop Solution |

Some observations (the 12 steps?)

1. Reducing the randomness of your approach

2. Every project is different

3. Adaptability

4. Protect experimentation

5. The first occasion, not the last (unless you are doing your coursework at 11 pm one day before the deadline)

6. Time mgmt.

7. Mindsets

8. Documenting

9. Communication

10. Attention to detail

11. Kill your darlings

12. Learn

The 3 Principles of Design

- Good visualisation is **trustworthy**
  - **Is it reliable?**

- Good visualisation is **accessible**
  - **Is it usable?**

- Good visualisation is **elegant**
  - **Is it aesthetic?**

1. Trustworthy

- Trust ≠ truth

  - Achieving trust is an aim, presenting truth is an obligation!

  - *"Trust arrives on foot and leaves in horseback." (Dutch proverb)*

- Mostly, this can be achieved by avoiding the bullsh*t seen on Week 4

Gun deaths in Florida
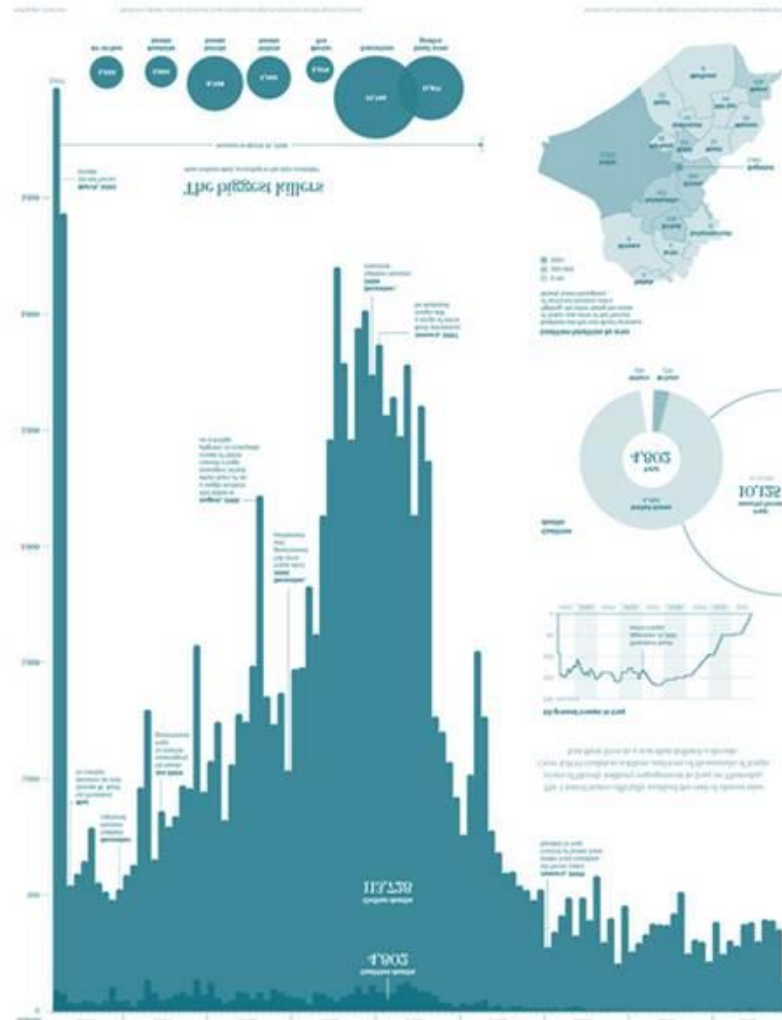
Number of murders committed using firearms

2005
Florida enacted its 'Stand Your Ground' law

873

721
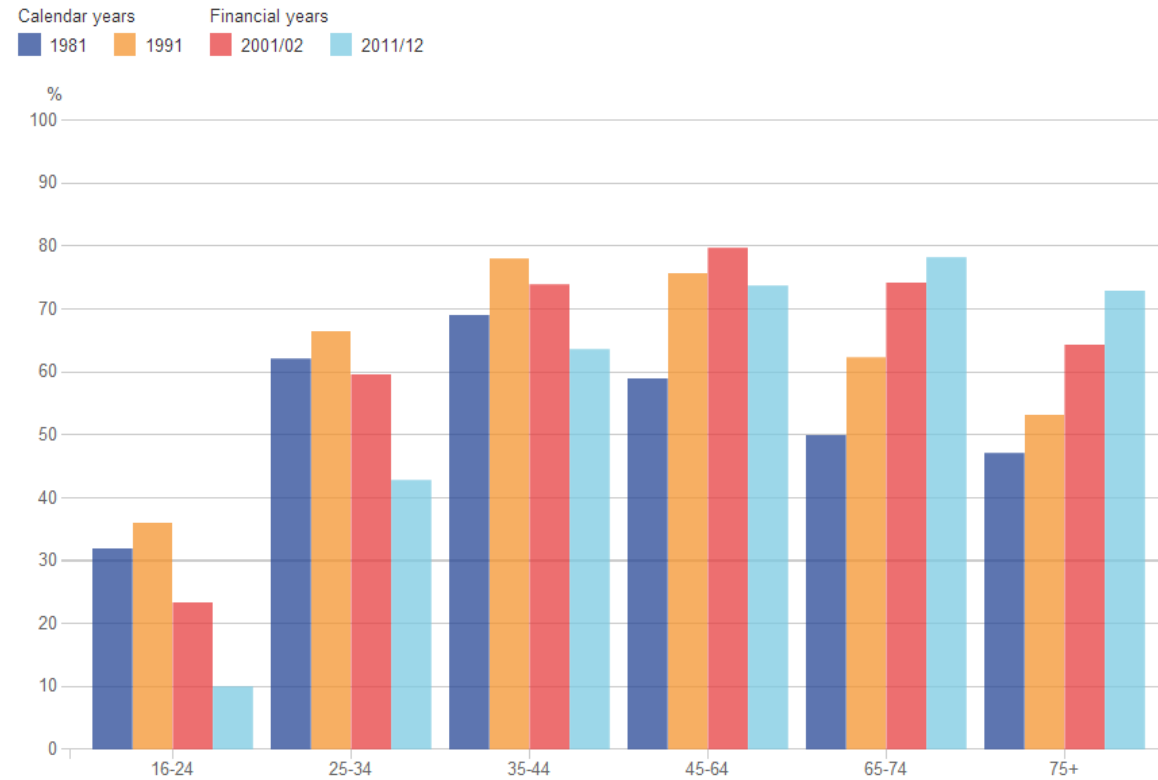
1990s   2000s   2010s
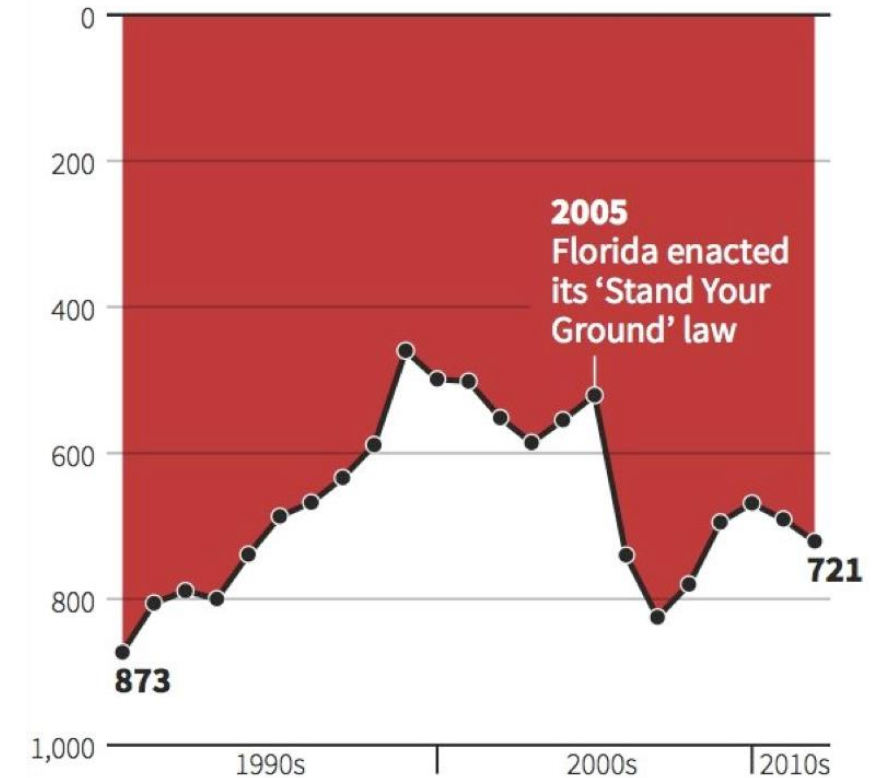
Source: Florida Department of Law Enforcement

C. Chan 16/02/2014

REUTERS

Percentage of each age group that are home owners[5], England, 1981 to 2012

Source: English Housing Survey (EHS) 2012 to 2013, Table FC2101, DCLG ; EHS 2001/02, Table S106, DCLG

2. Accessible

- Relevance
  - You may not have the answer, but you may be able to guide the audience into it
- Suitability
  - Minimum friction (with the audience)
- Understanding of the subject
  - Complicated
  - Complex
  - Simple
- SIMPLIFY when the audience doesn't have the knowledge or capacity to handle a complicated subject!
- CLARIFY when the audience doesn't have the knowledge, but have the capacity to handle a complicated subject!

3. Elegant

- Is the design appealing?
  - *"Do not make something unless it is both necessary and useful; but if it is both, do not hesitate to make it beautiful!" (Frank Chimero, author)*

- Eliminate the arbitrary ≠ Make it minimalistic

- Decoration should be additive, not negative!

Smooth Sales
The online men's razor and blade market in the U.S. is growing, threatening traditional retail sales.
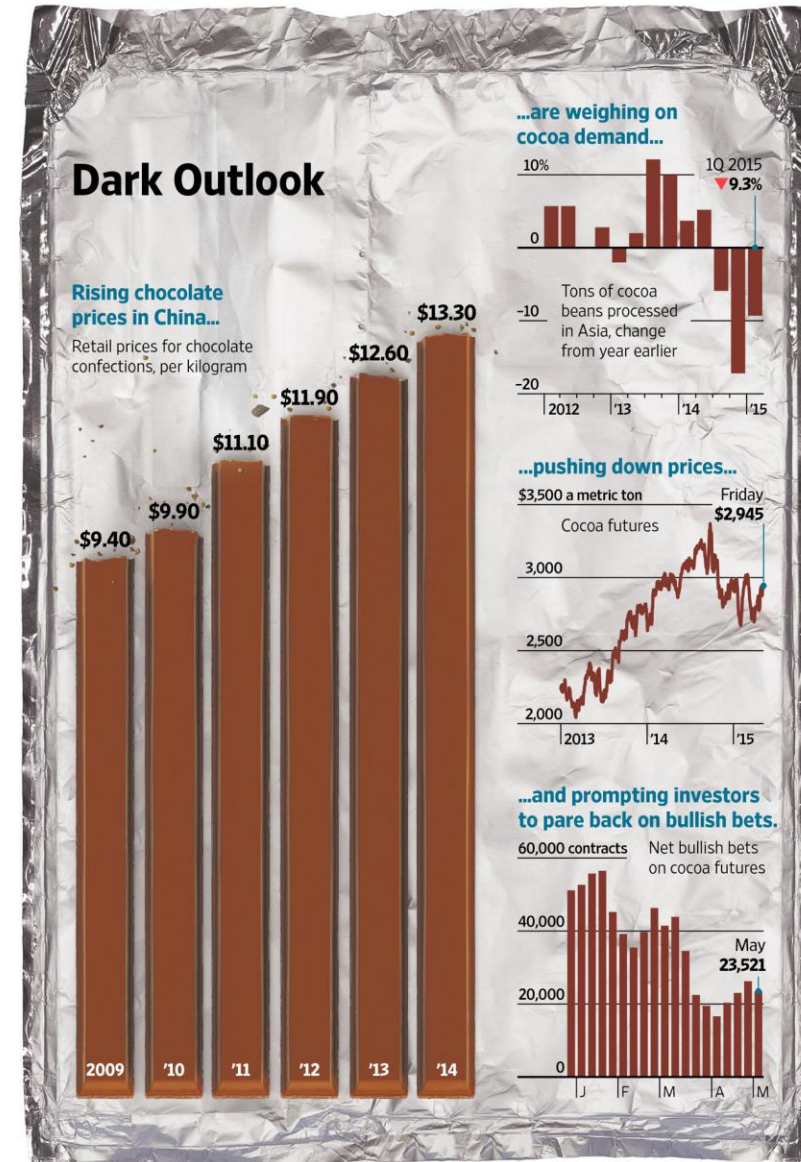
$111M — 2013
$189M — 2014
$141M — 2015, through May

Source: Slice Intelligence
Photo: F. Martin Ramin/The Wall Street Journal; styling by Anne Cardenas
THE WALL STREET JOURNAL.

- Innovative
- Long-lasting
- Environmentally friendly!

Dark Outlook

Rising chocolate prices in China...
Retail prices for chocolate confections, per kilogram

$9.40 — 2009
$9.90 — '10
$11.10 — '11
$11.90 — '12
$12.60 — '13
$13.30 — '14

...are weighing on cocoa demand...
Tons of cocoa beans processed in Asia, change from year earlier
1Q 2015 ▼9.3%

...pushing down prices...
Cocoa futures
Friday $2,945

...and prompting investors to pare back on bullish bets.
Net bullish bets on cocoa futures
May 23,521

Sources: Euromonitor (retail prices); Cocoa Association of Asia (beans processed); FactSet (futures); U.S. Commodity Futures Trading Commission (bets)
THE WALL STREET JOURNAL.

The Hidden Thinking

Step 1: Formulating your brief

What is the motivation curiosity?

- Some origin interest held by someone about a subject

- You don't (only) create a viz because you happen to have data, but also because there is a desire for you to understand something!

An example of a pet project

- Do you have pet/passion projects?

- About what do you want to **facilitate understanding?**

Identifying Project Circumstances

- Frictions and freedoms that are imposed on you or determined by you

- Think about…
  - **Stakeholders**
  - **Audience**
  - **Visualisers**
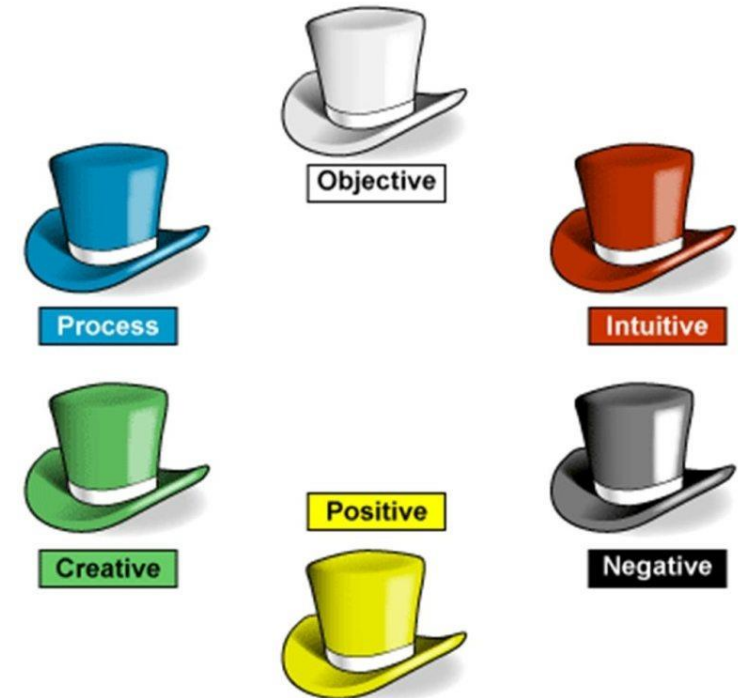
The seven visualiser thinking hats

DIRECTOR | The coordinator, overseeing the project
Initiates and leads on gathering and understanding requirements
Identifies and establishes the project's key circumstances
Defines the purpose of the project based on desired outcome
Manages progress through the process and keeps it cohesive
The primary decision maker, often needing to compromise
Pays strong attention to detail
Gets things done: checks, tests, finishes tasks

COMMUNICATOR | The broker between all people
Helps to define the perspective of the audience
A good listener with the humility to defer to domain experts
Has a 'thick skin': needs patience, empathy and diplomacy
A confident communicator with laypeople and non-specialists
Possesses strong copy-editing abilities
Manages expectations and presents possibilities
Launches and promotes the final solution

JOURNALIST | The reporter, pursuing the scent of enquiry
Driven by a desire to help others understand
Defines the origin curiosity of the project
Has an instinct to research, learn and discover
Possesses or is able to acquire salient domain knowledge
Understands the essence of the subject's data
Has empathy for the interests and needs of an audience
Defines the editorial angle, framing and focus

DATA ANALYST | The wrangler, handling the data work
Has strong data and statistical literacy
Possesses technical skills to acquire data from multiple sources
Examines the physical properties of the data
Undertakes initial descriptive analysis
Transforms and prepares the data for its purpose
Undertakes exploratory data analysis
Has database and data modelling experience

DESIGNER | The conceiver, providing creative direction
Establishes the initial creative pathway through defining purpose
Harnesses initial mental visualisations: ideas and inspiration
Has strong creative, graphic and illustration skills
Understands the principles of user interface design
Is fluent with the full array of possible design options
Unifies the decision making across the design anatomy
Has a relentless creative drive to keep innovating

SCIENTIST | The thinker, providing scientific rigour
Brings a strong research mindset to the process
Understands the science of visual perception
Understands visualisation, statistical and data ethics
Understands the influence of human factors
Verifies/validates the integrity of all data and design decisions
Demonstrates a systems thinking approach to problem solving
Undertakes reflective evaluation and critique

TECHNOLOGIST | The developer, constructing the solution
Possesses a repertoire of software and programming capabilities
Has an appetite to acquire new technical solutions
Possesses strong mathematical knowledge
Can automate otherwise manually intensive processes
Has the discipline to avoid feature creep
Works on the prototyping and development of the solution
Undertakes pre and post-launch testing, evaluation and support

Figure 3.3   The Attributes that Comprise the 'Seven Hats of Visualisation Design'

https://www.visualisingdata.com/2012/06/article-the-8-hats-of-data-visualisation-design/

Constrains

Deliverables

- Timescales

- Pressures

- Design

- Technological

- Setting

- Medium

- Quantity

- Frequency

Defining your project's vision

- Mission ≠ Vision

- Two significant design characteristics
  - Tone: **Read or Feel**
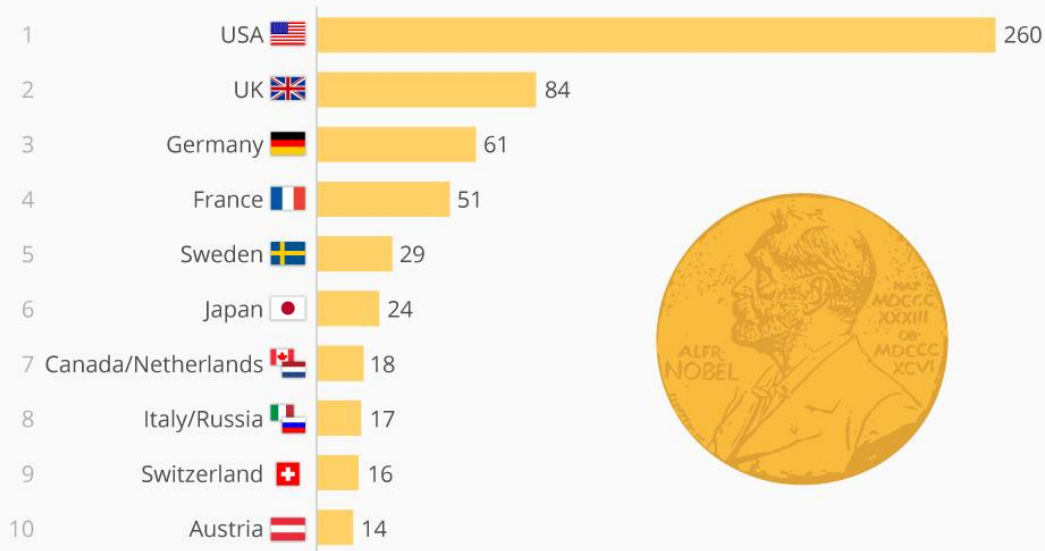 - Experience: **Explain, Exhibit or Explore**

Reading Tone

- Optimise the precision and efficiency to perceive the represented data

- Pragmatic, analytical, conservative, utilitarian, boring(?)

- Bar charts are the reading tone choice by excellence!
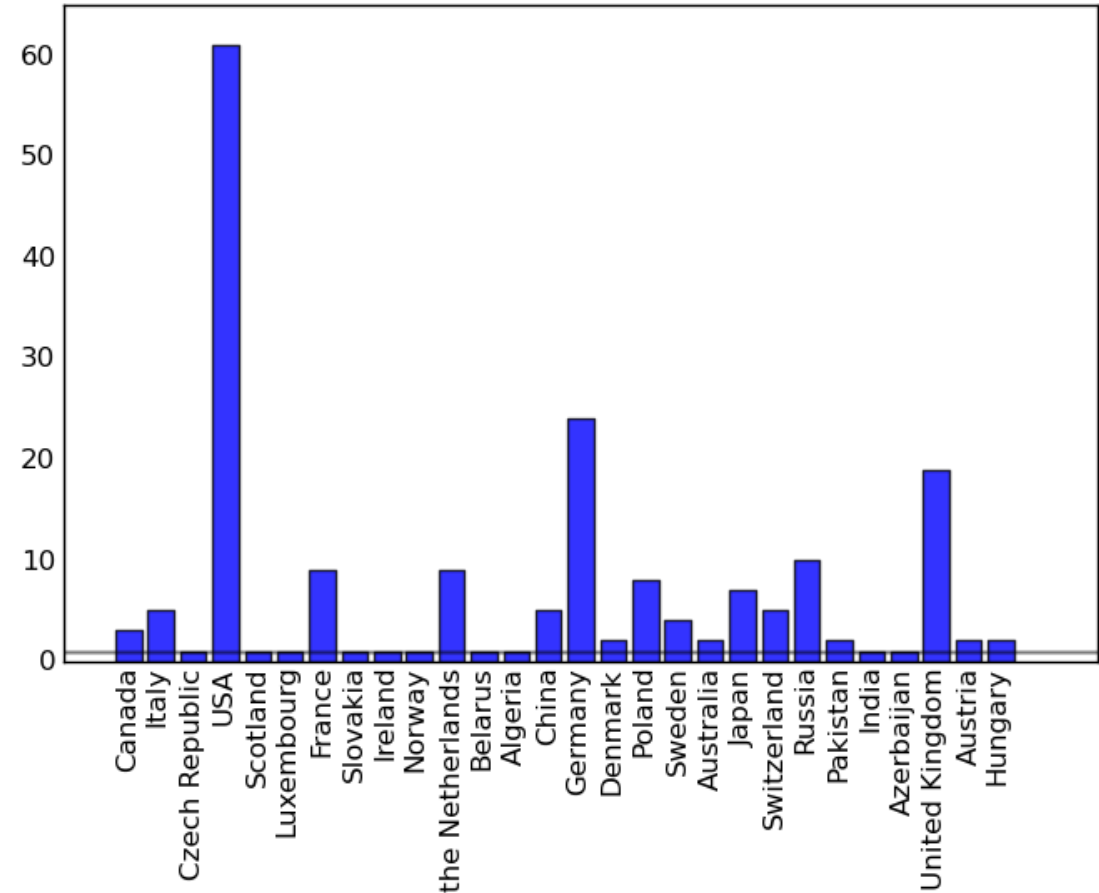
Moving slightly to the "feel" area

USA leads the way in the Nobel Prize
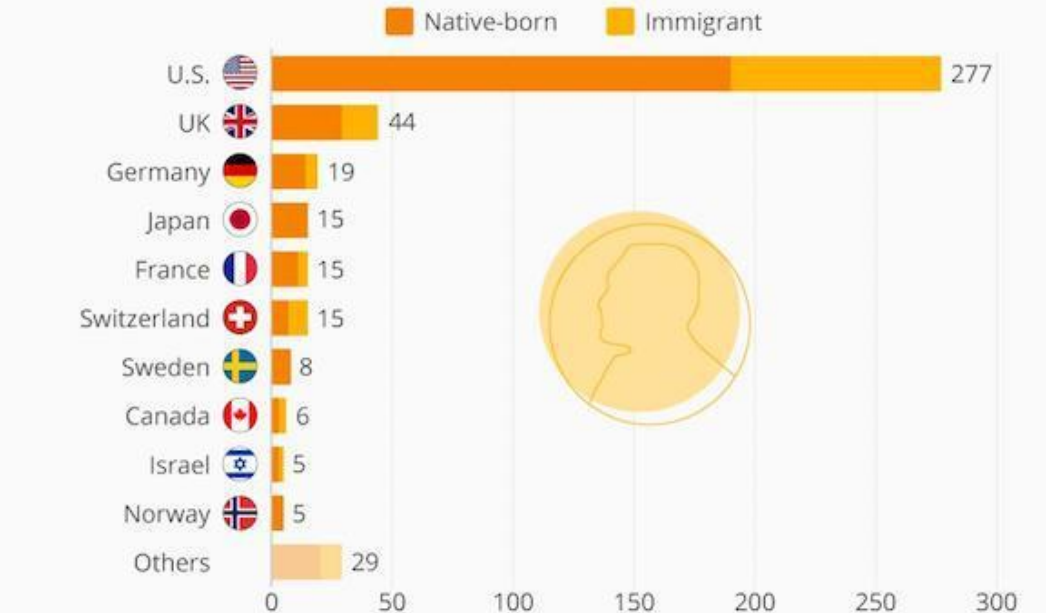The Top 10 Nobel Prize Winners by Country of Birth

	Country	Value
1	USA 🇺🇸	260
2	UK 🇬🇧	84
3	Germany 🇩🇪	61
4	France 🇫🇷	51
5	Sweden 🇸🇪	29
6	Japan 🇯🇵	24
7	Canada/Netherlands 🇨🇦🇳🇱	18
8	Italy/Russia 🇮🇹🇷🇺	17
9	Switzerland 🇨🇭	16
10	Austria 🇦🇹	14

@StatistaCharts   Source: Nobel Foundation

statista

Immigrants' Share of Nobel Prizes in the Sciences
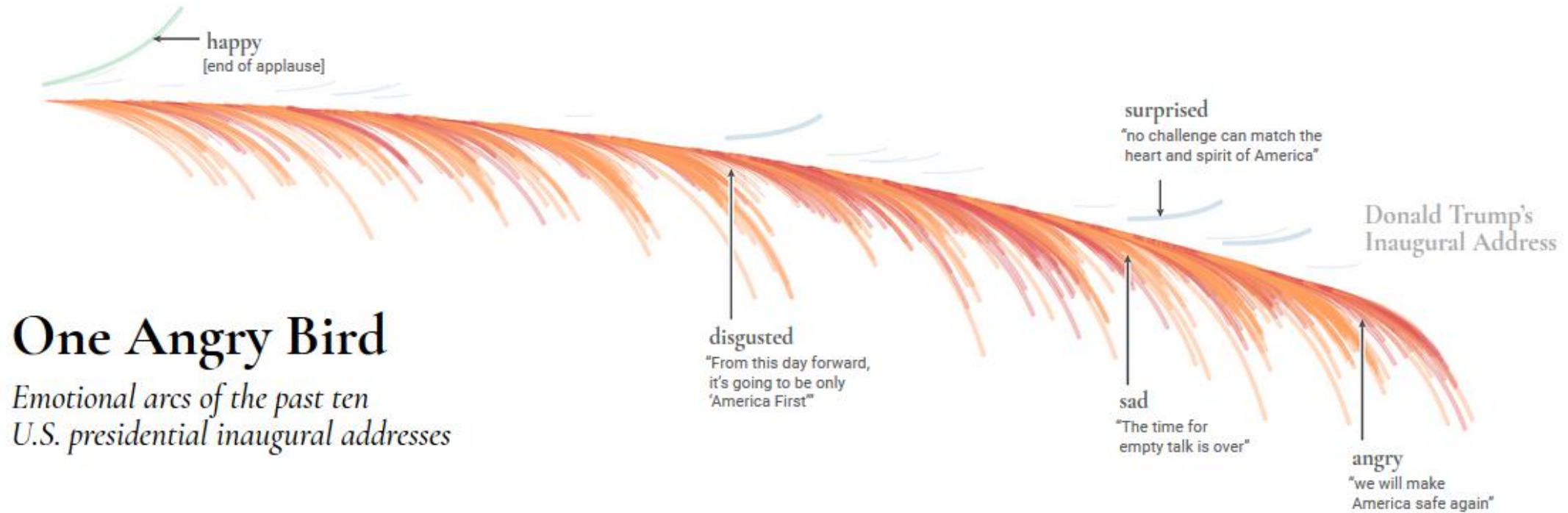Number of Nobel laureates (physics, chemistry, medicine, economy) per country 1969-2019*

■ Native-born   ■ Immigrant

Country	Value
U.S. 🇺🇸	277
UK 🇬🇧	44
Germany 🇩🇪	19
Japan 🇯🇵	15
France 🇫🇷	15
Switzerland 🇨🇭	15
Sweden 🇸🇪	8
Canada 🇨🇦	6
Israel 🇮🇱	5
Norway 🇳🇴	5
Others	29

@StatistaCharts   * Immigration status determinded by place of birth and affiliation at at time of win
Source: Nobel Prize Foundation

statista

Feeling Tone
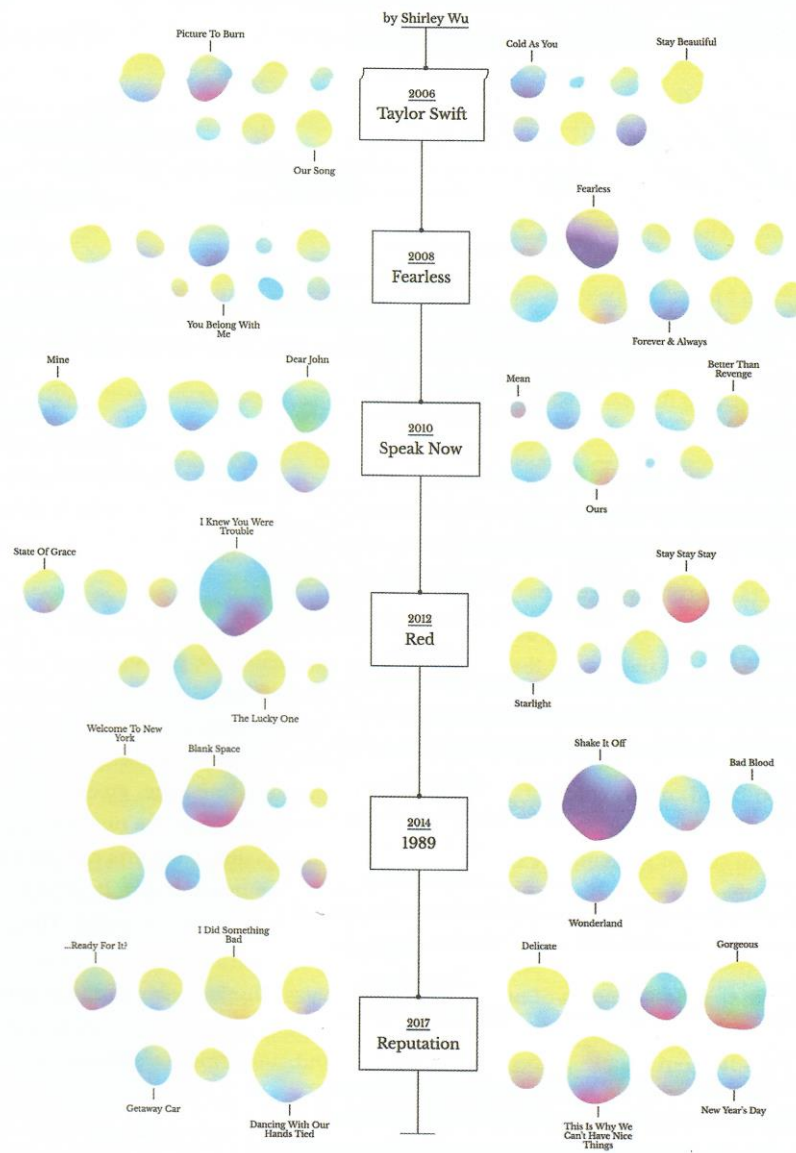
- Emotive, figurative, seductive, big-picture, fun and dramatic

- Need more in-depth analysis

- But that doesn't mean that you can have a glance!

One Angry Bird

Emotional arcs of the past ten U.S. presidential inaugural addresses

https://emotions.periscopic.com/inauguration/

Figure 3.8 Taylor Swift is Mostly Happy, Quite Often Sad, Sometimes Mad, and Occasionally Really Scared, by Shirley Wu

https://sxywu.com/

BUYING POWER

Here are 120 million Monopoly pieces, roughly one for every household in the United States.

Just 158 families have provided nearly half of the early money for efforts to capture the White House.

https://www.nytimes.com/interactive/2015/10/11/us/politics/2016-presidential-election-super-pac-donors.html

Experience

- Different methods of enabling interpretation

  - Explanatory

  - Exploratory

  - Exhibitory

Explanatory

Black Students Are Underrepresented On Campus
Black enrollment at public research universities vs. black college-age state population, 2013
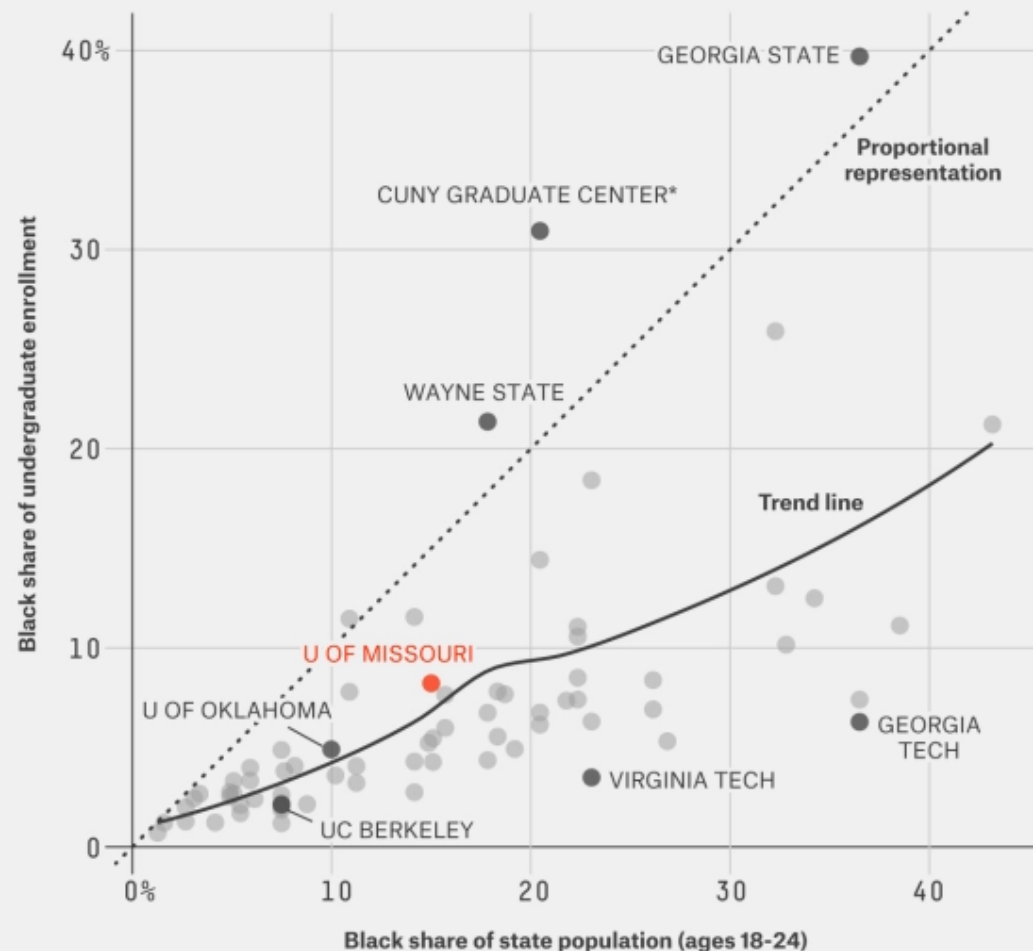
*The CUNY Graduate Center primarily grants doctorates but has a small undergraduate population.

FIVETHIRTYEIGHT   SOURCE: U.S. DEPARTMENT OF EDUCATION

Exploratory

- Focused on helping the viewers discover and form their own interpretations
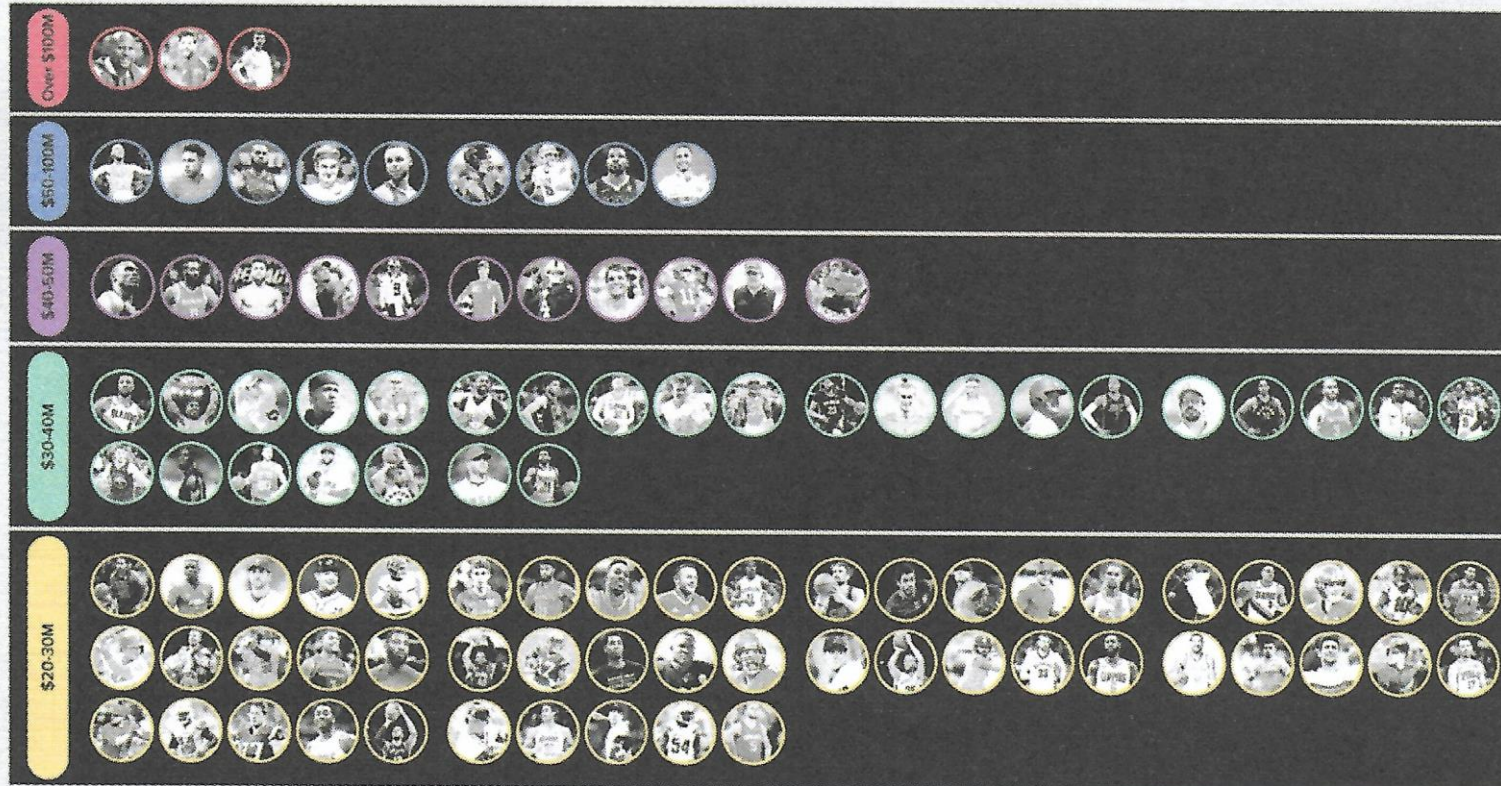
- Simple interpretation and manipulation of data
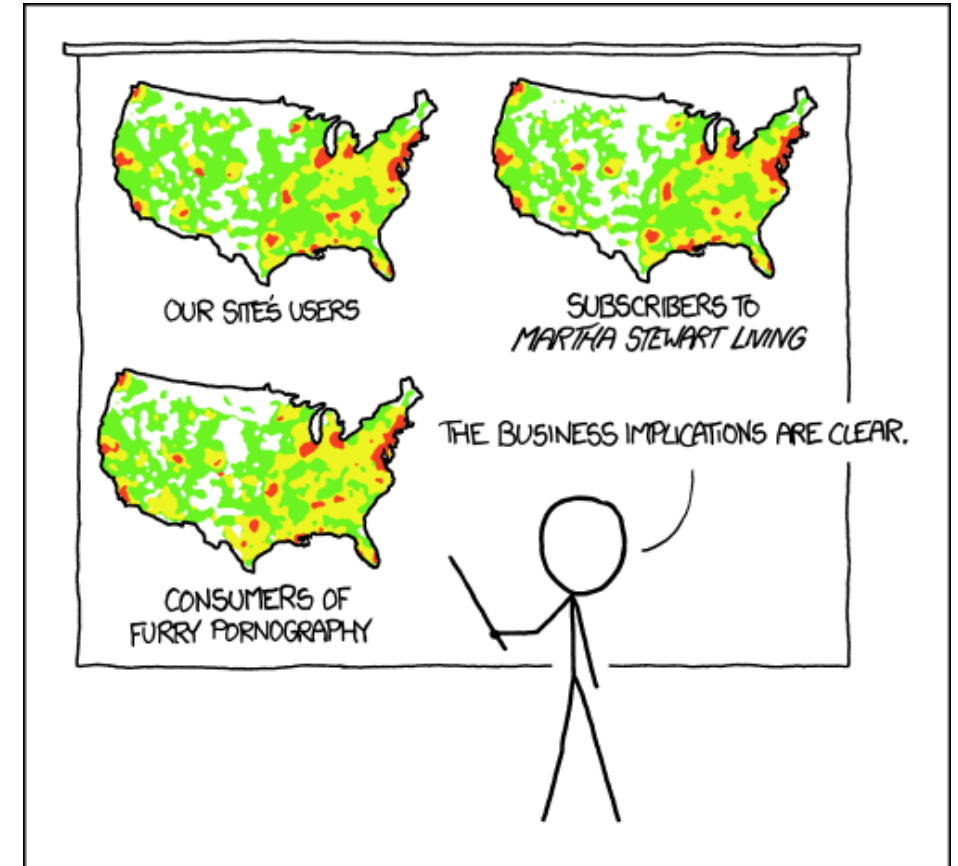
- https://luiscarli.com/2012/09/01/wood-changes/

https://xkcd.com/1138/
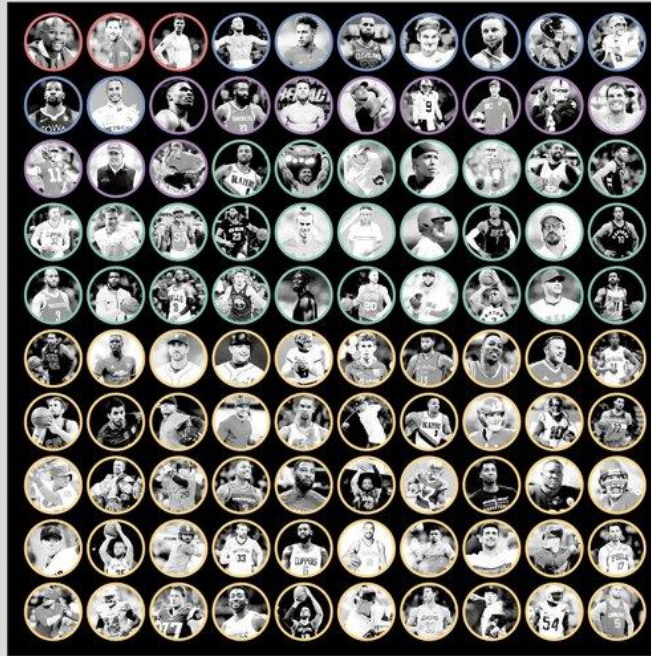
Exhibitory

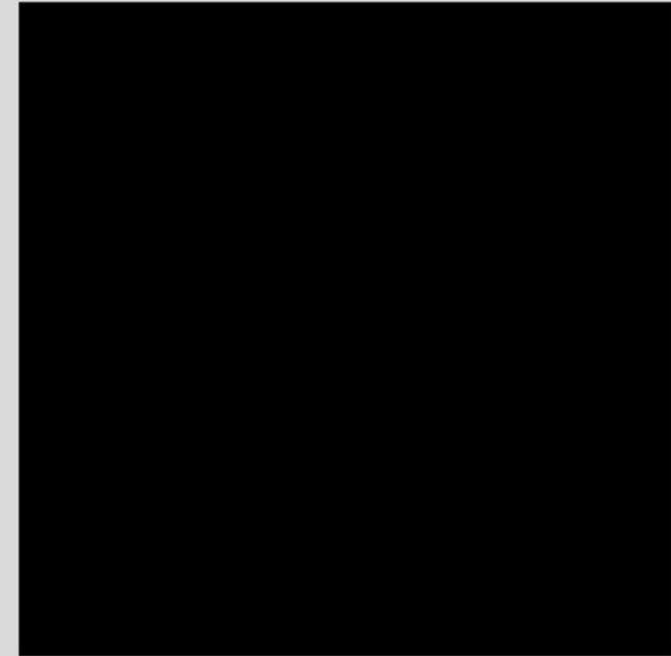Forbes: The World's 100 Highest-Paid Athletes

Exhibitory

Forbes: The World's 100 Highest-Paid Athletes

Male | Female

Pay groups: Over $100M | $50-100M | $40-50M | $30-40M | $20-30M

Data and images from https://www.forbes.com/athletes/list/

Another example:

https://informationisbeautiful.net/visualizations/the-billion-dollar-o-gram-2009/

Conclusions

Lab time