

Data Visualisation and
Dashboarding

Infographics

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“The aim of the poet is to inform or delight, or to combine together, in what he says, both pleasure and applicability to life.

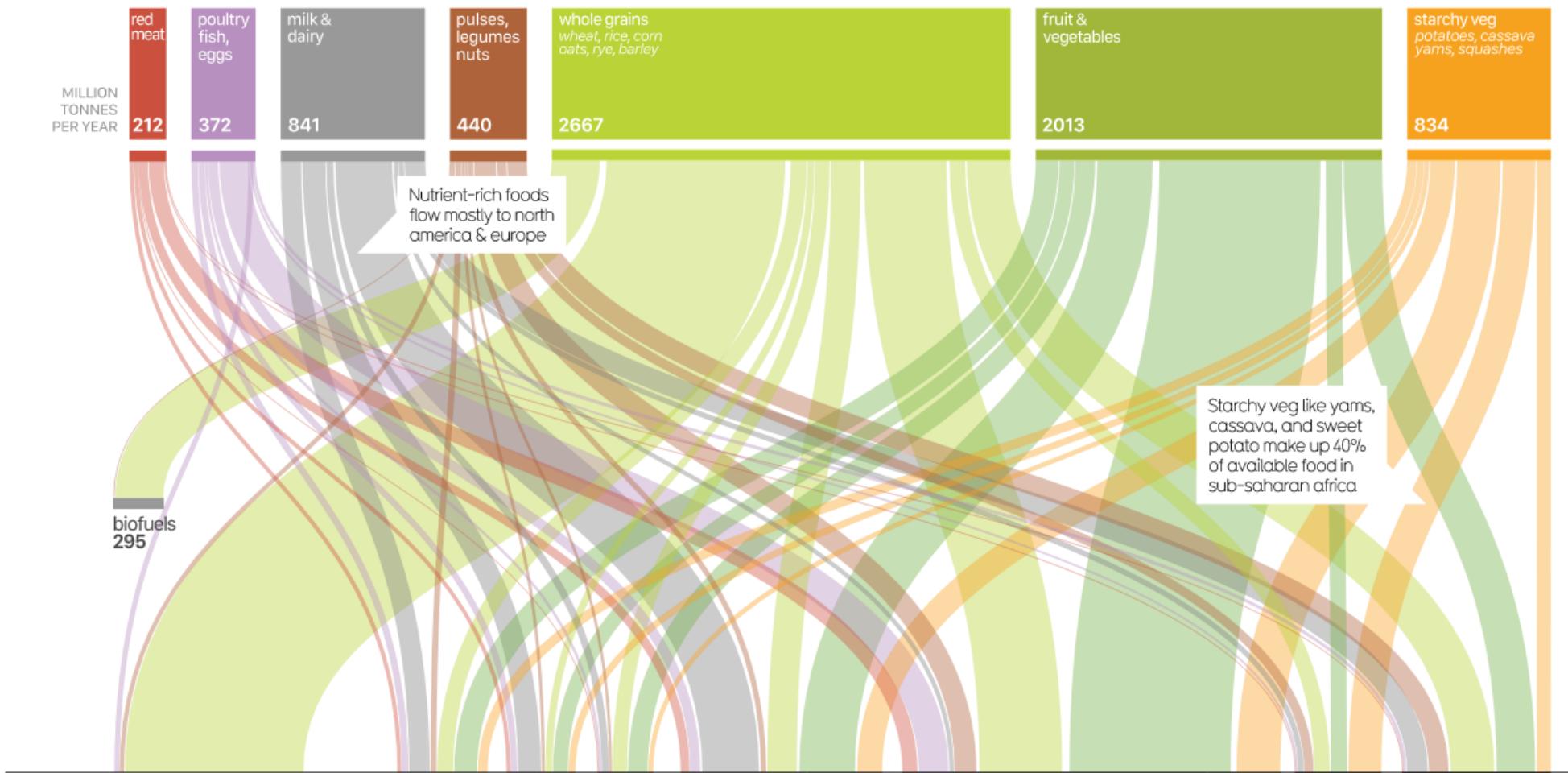
In instructing, be brief in what you say in order that your readers may grasp it quickly and retain it faithfully.

Superfluous words simply spill out when the mind is already full.”

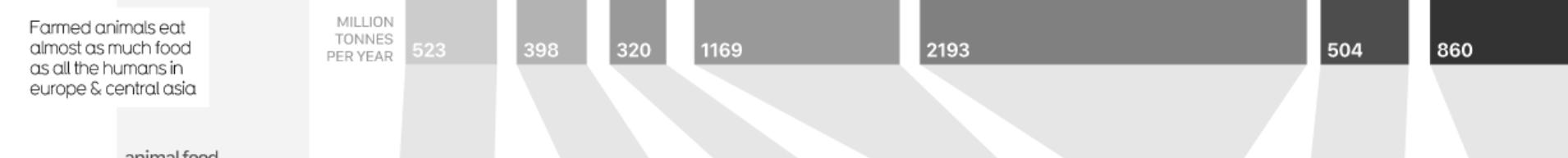
*- Horace, *Ars Poetica*, c. 19 BCE*

Where Does All The World's Food Go?

How much do we make?



Who gets the food?



Best in Show: The Ultimate Data Dog



Inexplicably Overrated



our data score

- intelligence
- costs
- longevity
- grooming
- ailments
- appetite

popularity

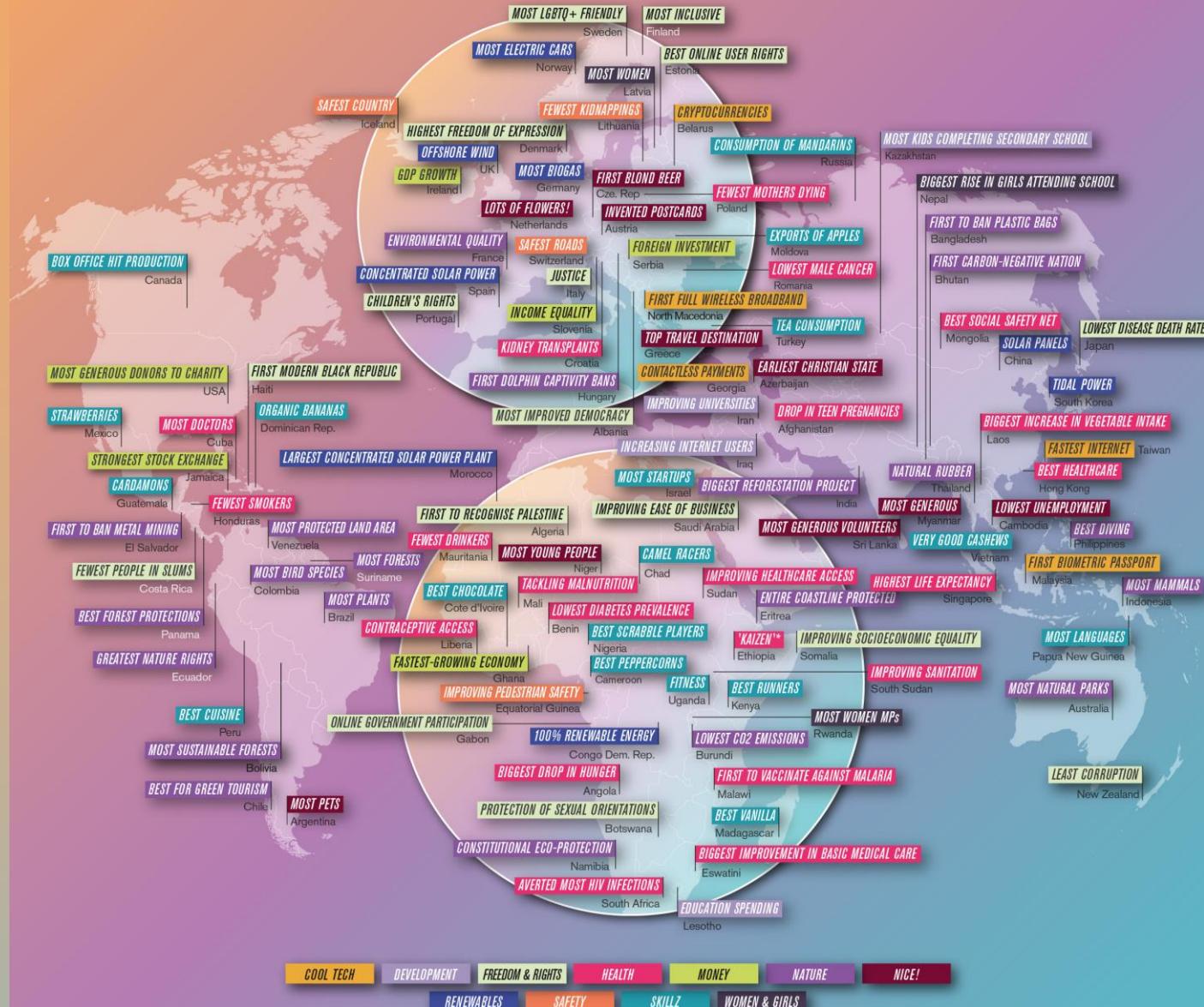


Hot Dogs!

The Rightly Ignored

Overlooked Treasures

Because Every Country Is The Most Beautiful at Something



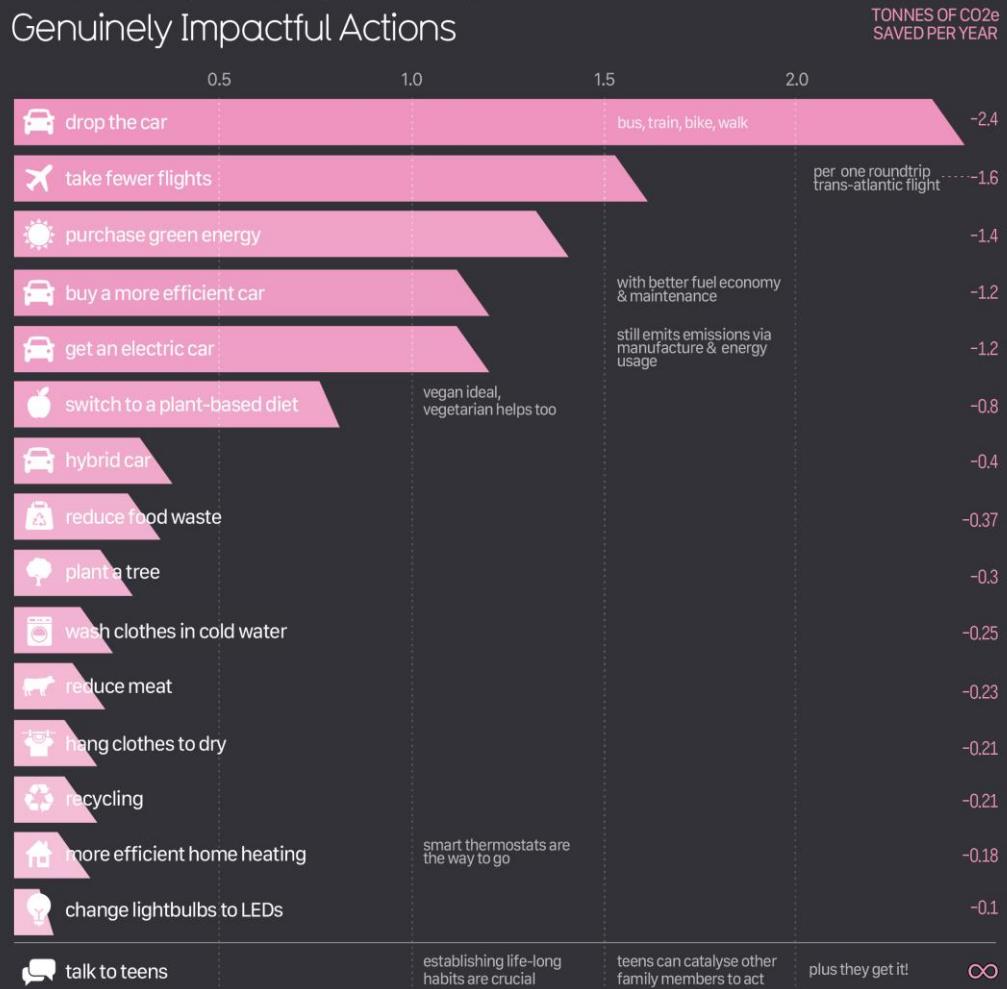
What can we do personally to reduce emissions?

We need to get [average yearly global emissions per person](#) down to 2.1 tonnes CO₂e*



* CO₂e = carbon dioxide equivalent = a unit for combining all greenhouse gas emissions in one measure

Genuinely Impactful Actions



Coronavirus Riskiest Activities

According to 500+ epidemiologists & health professionals

risk factors to consider

people how many?

space how close is the contact?

time how long the exposure?

location inside or outside?

surfaces lots of high touch?

area high number of cases?

covidicity how likely is compliance?

LOW RISK

gas/petrol station
takeout food

older kid playdates
golf

outdoor exercise
camping

friend uses your bathroom
tennis

vacation overnight (if driving)
see your doctor

consider cleaning afterwards

take care in waiting room

if both families have been taking care

vacation home with another family

walk in busy downtown
but not if you can't social distance

but avoid crowds

MEDIUM RISK

stay at a hotel
limit time in common areas like lobbies

small backyard barbecue

small dinner party (indoors)

small outdoor picnic

public pool

use a public restroom

visit a mall

get a haircut

work in a shared office

cinema/movie theatre

young kid playdates

play ground

eat at a restaurant (dine-in)

casino

exercise at a gym

ride the subway/bus

watch for shared condiments

HIGH RISK

size & physical closeness of gathering big factors

nightclub

attend a wedding or funeral

see a concert or play

hug or shake hands

indoor party

stop routinely wearing a face mask

sports stadium

go out with someone you don't know well

church

amusement park

buffet

singing is very high risk : increases airborne viral spread

INCREASING RISK →

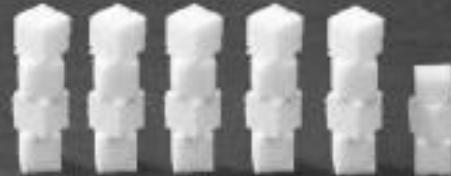
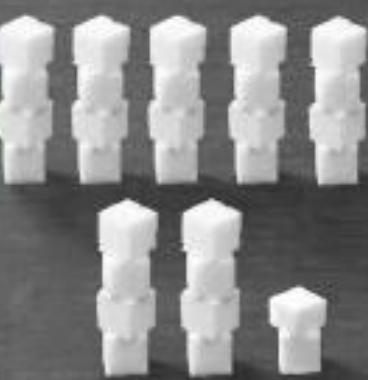
Risk reduced by [wearing a mask](#), [social distancing](#) & [washing hands](#)

informationisbeautiful

sources: New York Times, Reuters, NPR, SF Gate & others

BREAKFAST

PROTEIN-PACKED BACON AND EGGS ARE A BETTER CHOICE
THAN SUGARY SMOOTHIES AND PANCAKES.



Pancakes
with Syrup
91g CARBS

SMOOTHIE and BAGEL with Cream Cheese
119g CARBS

BACON, Eggs, and Whole-Wheat Toast
16g CARBS

Note: Values represent total carbohydrates for 16 oz. bottled strawberry-banana smoothie, plain bagel with 2 oz. reduced fat cream cheese; 2 pancakes with syrup; 2 slices of bacon, 2 eggs scrambled, 1 slice of whole wheat toast.

Infographics!

“A visual representation of information or data, e.g. as a chart or diagram” – Oxford Dictionary

“...Visually represents a core message using a combination of data copy (often minimal), graphics, and storytelling” – Fiverr.com

“An infographic is a collection of imagery, data visualizations [...], and minimal text that gives an easy-to-understand overview of a topic.[...] infographics use striking, engaging visuals to communicate information quickly and clearly” – Venngage



What makes a good infographic?

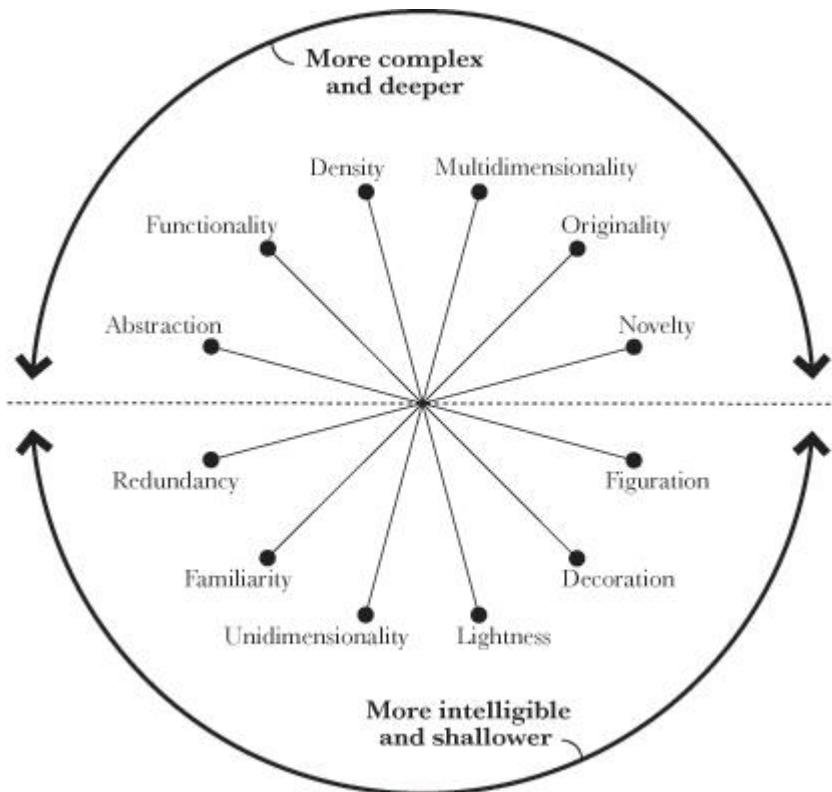
Data-ink ratio?

Chart junk?



Edward R. Tufte. Photo by Keegan Peterzell -
CC BY-SA 4.0

The visualisation wheel



Six pairs of features of an infographics

Upper hemisphere's features define graphics that are deeper and more complex, lower hemisphere more intelligible and shallower

Complexity: Required effort from readers

Depth: number of layers of information

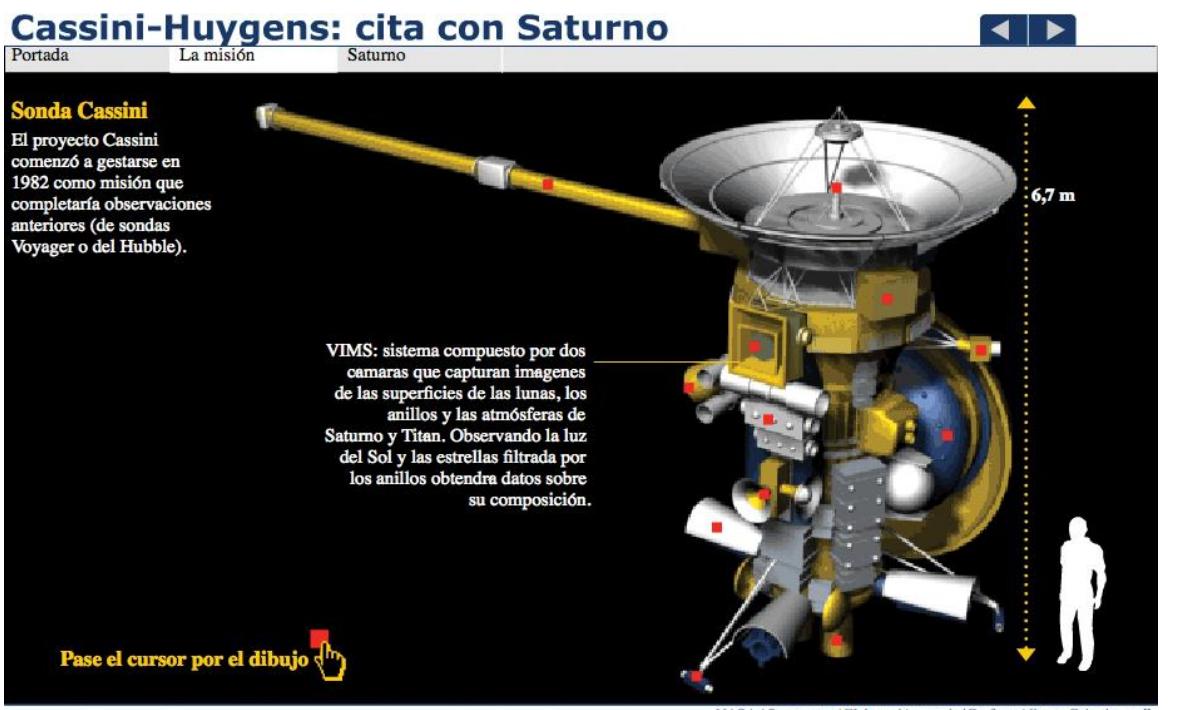
Need to balance each feature pair

Wheel is subjective and depends on audience

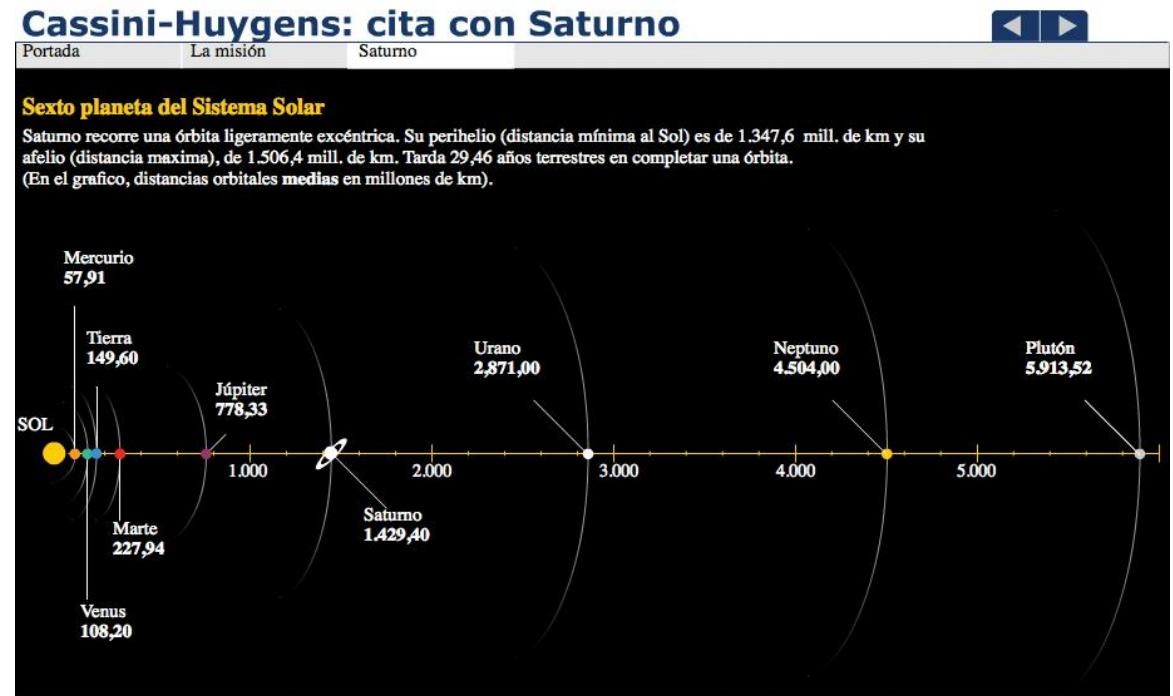
Cairo, A. (2013) The functional art an introduction to information graphics and visualization. 1st edition. Berkeley, CA: New Riders.

Abstraction – Figuration

More abstract



More figurative



Functionality – Decoration

Decorative elements don't serve any functional purpose

Decoration is not always bad, but can interfere with information

Example: Barbed wire on the right is not functional

Brazilian Population Grows More in Prisons

With 258 inmates per 100,000 people, Brazil has one of the largest prison populations.

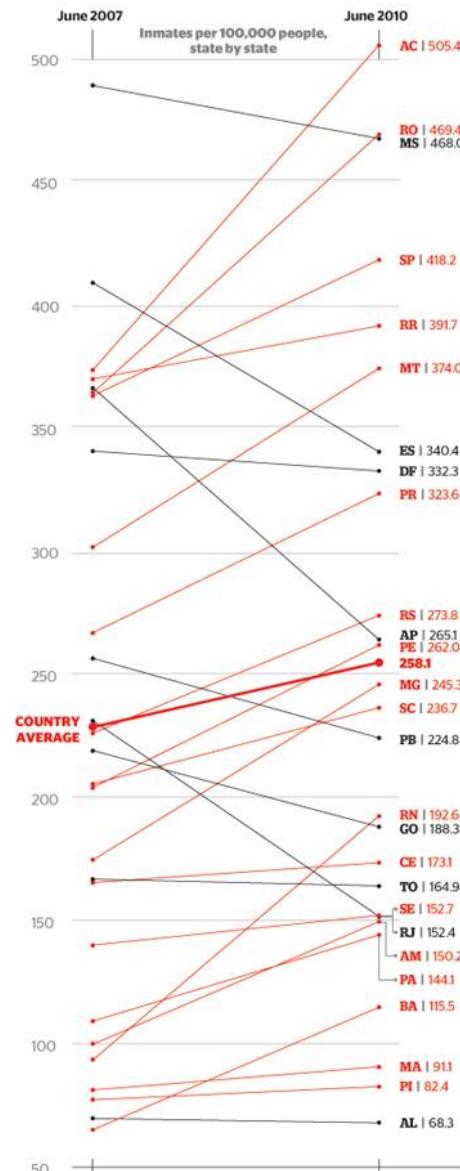
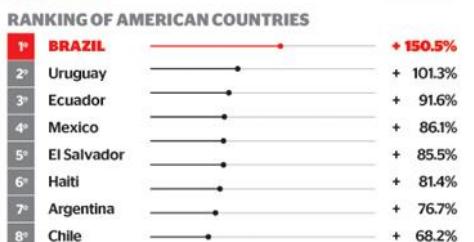
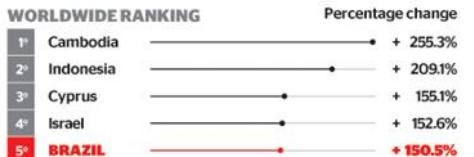
Alberto Cairo, Humberto Maia Junior

BRAZIL IS THIRD in the worldwide ranking of countries with the largest prison populations. Data released by Ministry of Justice this week reveal that Brazil had 494,237 inmates in June 2010. Only the US, with 2.3 million, and China, with 1.6 million, have larger prison systems. According to the United Nations Office on Drugs and Crime, Brazil is one of the countries where the prison population has grown most rapidly in the world. Between 2007 and 2010, it increased by 13.3% (see chart on the right), while the overall population growth was 0.98% in the same period. Even considering the new prisons that are being built, Brazil has reached a deficit of 200,000 jail spaces.

Sources: Ministério da Justiça, IBGE, United Nations Office on Drugs and Crime



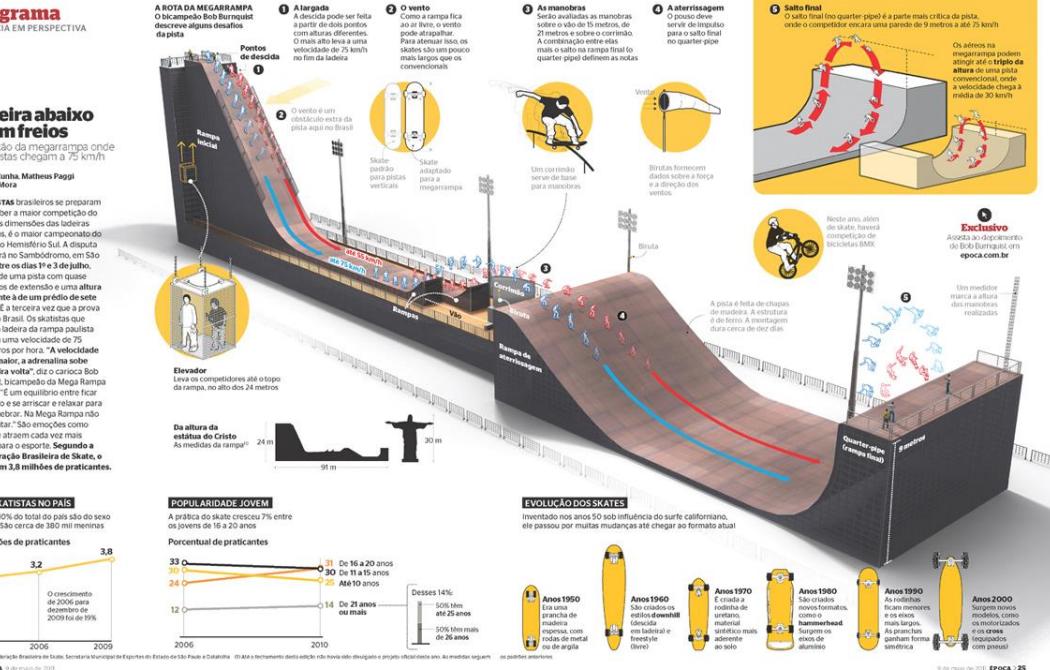
1 Between 1997 and 2007, Brazil experienced the fifth largest increase in prison population in the world.



Density – Lightness

How much information in what space?

Infographic on top is much more dense than infographic on bottom



Um macaquinho esperto

Biólogos descobrem na Paraíba macacos que fazem espertos para fisgar insetos. Só os chimpanzés - e humanos - sabem usar ferramentas desse modo

Peter Moon

En 1500, a Mata Atlântica cobria todo o litoral nordestino. Hoje é só a Zona da Mata, que sobrenome é. É um mure de canavais que se estende por 1.000 quilômetros, dessas ilhas fici em Barra de Maramanga, no litoral da Paraíba. Lá vive um bando de macacos-pregos-galegos (*Cebus flavius*; uma fêmea, um filhote e quatro machos). Eles vivem em florestas secas e ricas em frutas silvestres. Comem frutas e insetos. Três machos gostam de comer insetos. Para satisfazer seu apetite, usam uma técnica sofisticada. Elas escolhem um grampo metálico, arrancam-o da madeira, usam-o para pescar insetos na mata e, quando chegam ao topo, usam a mão direita para pegar o esperto e o empurrar, girando como uma chave de fenda. Em menos de um mi-

nuto o esperto entra 10 centímetros. É retirado o chão de cupins. Só se sabe por que giram o esperto. Ele quebra se for simplesmente empurrado. Mas é exatamente isso que os chimpanzés experimentaram. As biólogas Camila Biome e Montique Bastos avistaram esse comportamento em 140 horas de observação, de maio a setembro de 2009. O bando vive numa ilha de mata de 300 hectares, cercada pelos canaviais de três sítios. O estudo se restringiu aos 98 hectares de mata que permaneceram.

O macaco-prego-galego é o único descoberto em 1648 pelo naturalista alemão Georg Marcgrave. Desde então, não foi mais visto. Foi redescoberto em 1970, vivendo em grupos esparsos do Rio Grande do Norte a Alagoas. A espécie está entre os primatas mais ameaçados. Quais técnicas os outros bandos remanescentes podem ter desenvolvido? Teremos tempo de estudá-las? ■

Como é a técnica de fisgar insetos

Três machos de um bando de macacos-pregos-galegos usam ferramentas de cavar cupins. Eles usam espertos de madeira para pescar os insetos no cupinzeiro.



1 O macaco dilata o cupinzeiro para soltar os cupins dentro



2 O esperto é um galho seco e resistente para usar como esperto



3 Com a mão direita, empurra o esperto, girando-o de forma a não quebrá-lo



4 Quando o buraco atinge cerca de 10 cm, o esperto é retirado, também girando



5 O macaco come o esperto, removendo o esperto no furto e repete a operação

Multidimensionality – Unidimensionality

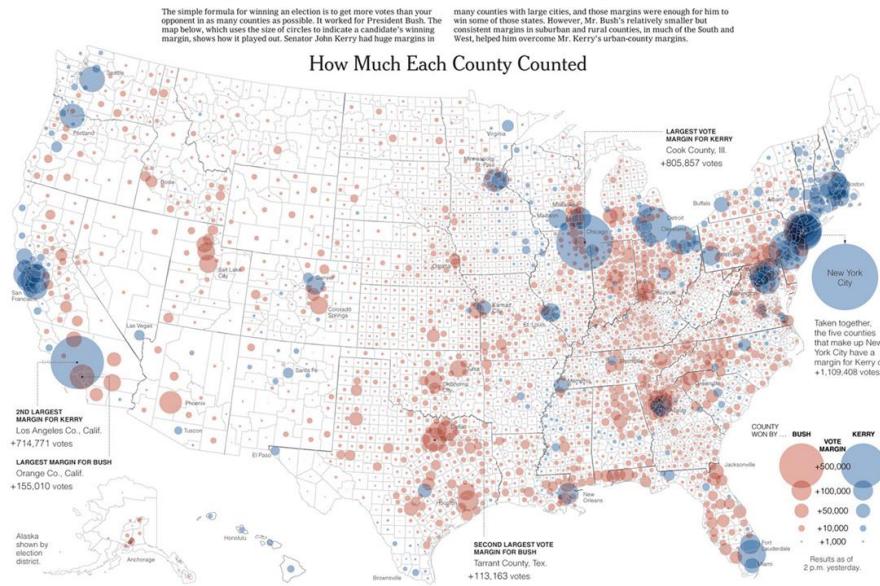
Number of layers of depth

Different forms to encode data

Example on the right is highly multidimensional

- County vote as proportional symbol map
- Electoral vote by state as choropleth and cartogram
- Popular vote by county and population density

Red and Blue, the Divided Electorate, in All Its Shades

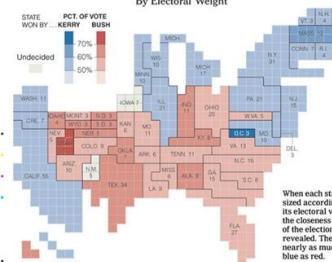


Two Views of the Electoral Vote

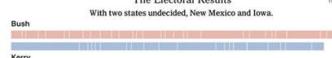
By Geography
Using the typical map of the United States, vast swaths are painted red.



By Electoral Weight

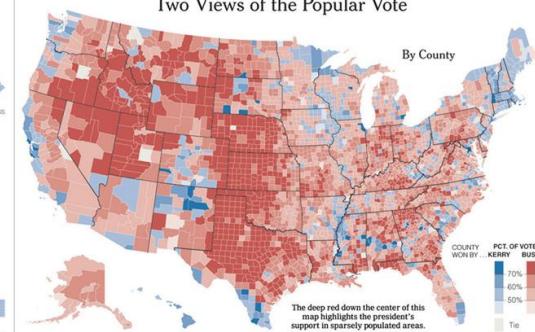


The Electoral Results

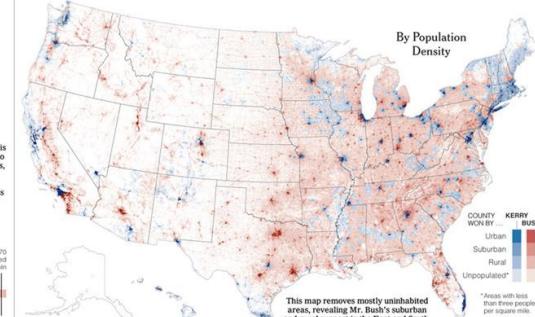


Two Views of the Popular Vote

By County



By Population Density

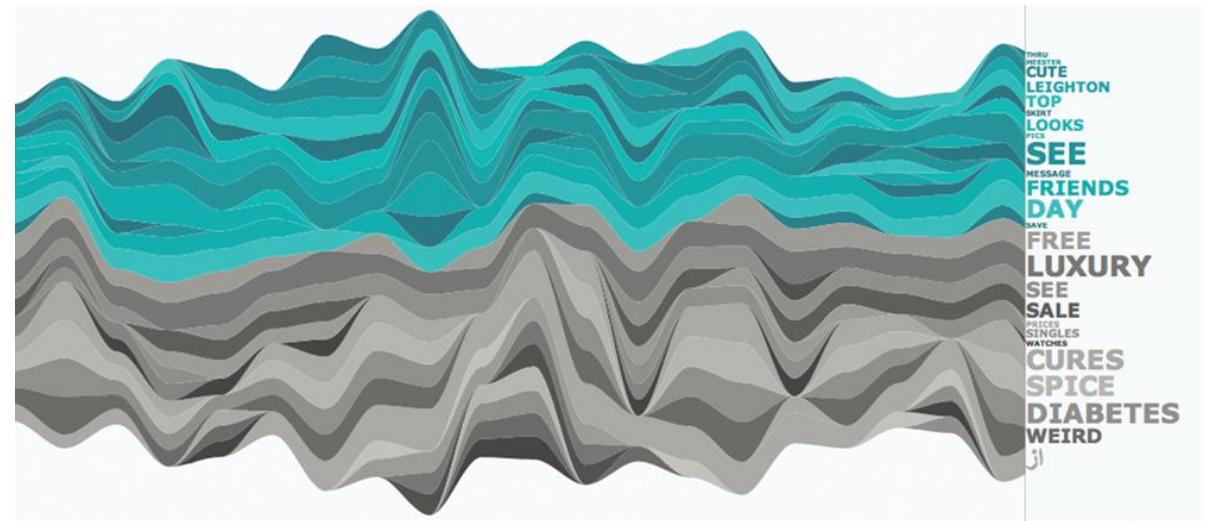


Originality – Familiarity

Common charts (line, bar) are as readable as text

Other charts require more thought to understand,
but might be more exciting

Example: Stream graph on the right



Novelty – Redundancy

Explain many different things once (novelty), or

Explain the same things several times, by different means (redundancy)

Example: Copy (text) repeats information encoded in image.



Brazilian Population Grows More in Prisons

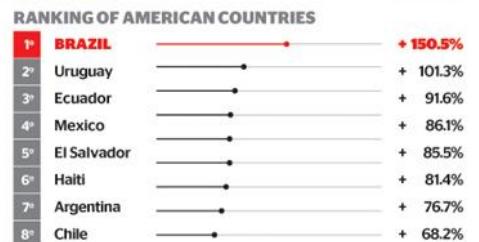
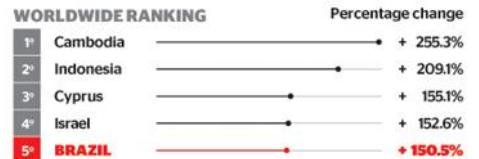
With 258 inmates per 100,000 people, Brazil has one of the largest prison populations.

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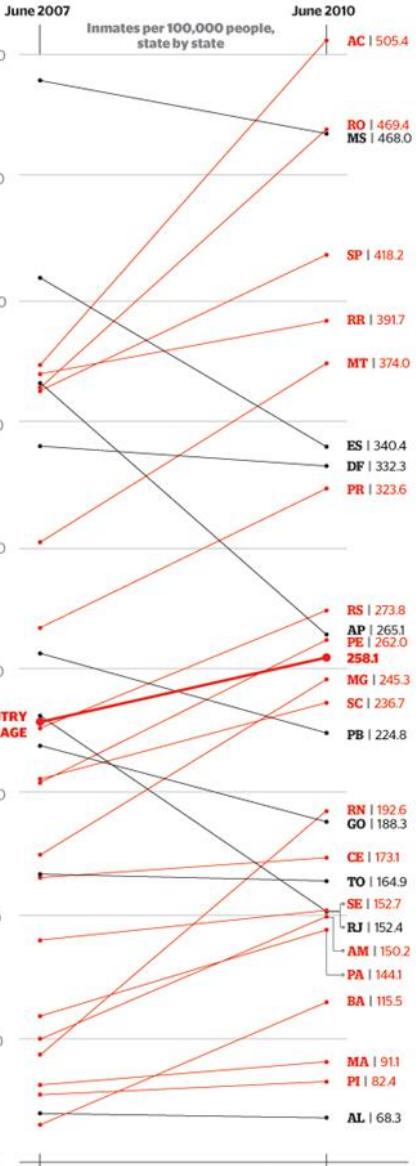
Sources: Ministério da Justiça, IBGE, United Nations Office on Drugs and Crime

1 Between 1997 and 2007, Brazil experienced the fifth largest increase in prison population in the world.



2 The trend continued since 2007...
The rate of inmates per 100,000 people has gone
in just eight of the states plus the Federal District.

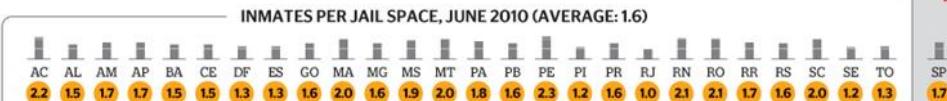
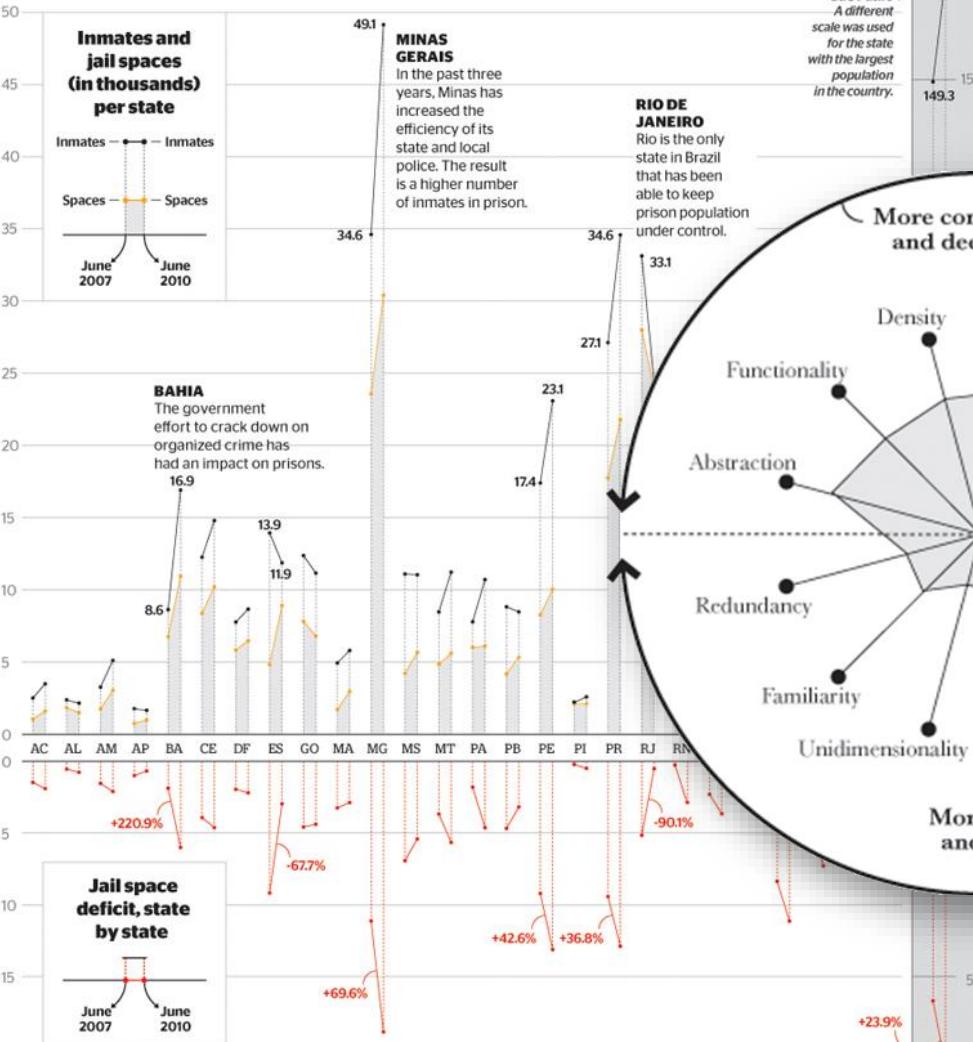
The rate of inmates per 100,000 people has gone down in just eight of the states plus the Federal District.



3 ...but government has not been able to create jail spaces at the same pace

Brazil's jails are packed full. A comparison between the variation of inmates and the number of jail spaces, neither the federal government nor the states have been able to avoid overcrowding. The only exception

Brazil's jails are packed full. A comparison between the variation of inmates and the number of jail spaces reveals that neither the federal government nor the states have been able to avoid overcrowding. The only exception is Rio de Janeiro.

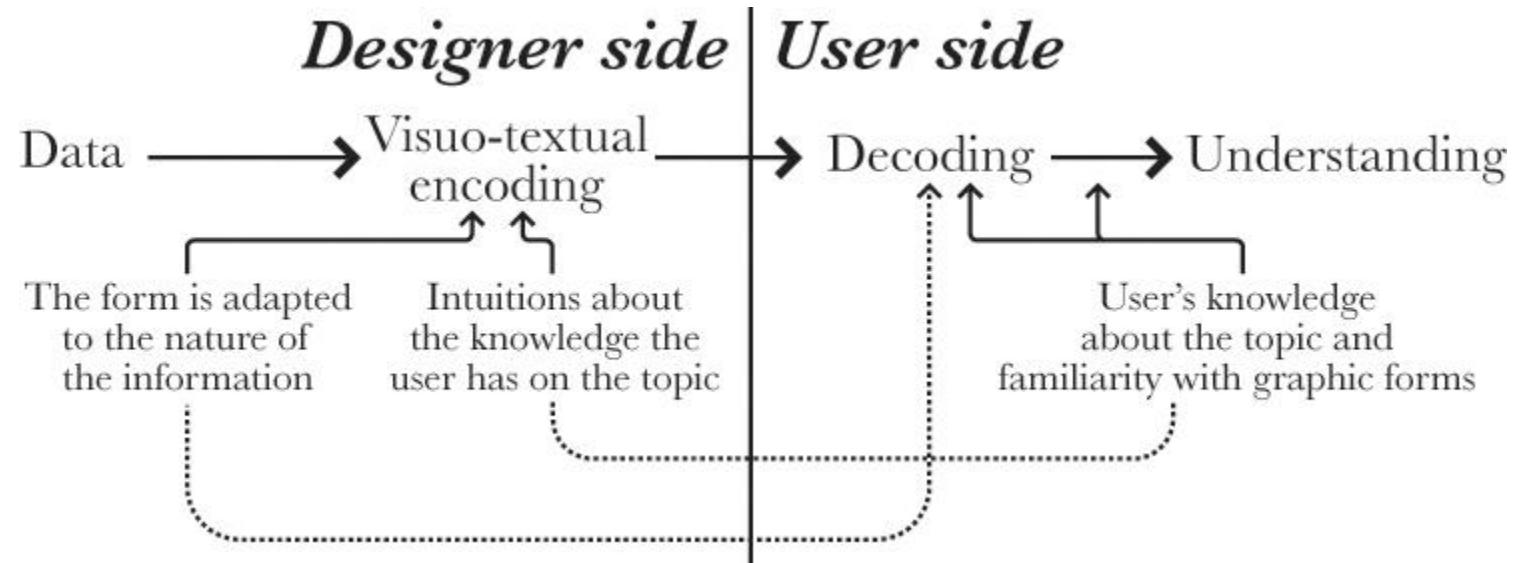


The visualisation wheel

The wheel allows you to quantify the complexity and depth of your graphic

Aids revising the graphic: Should it be more complex, or shallower?

Know your audience!

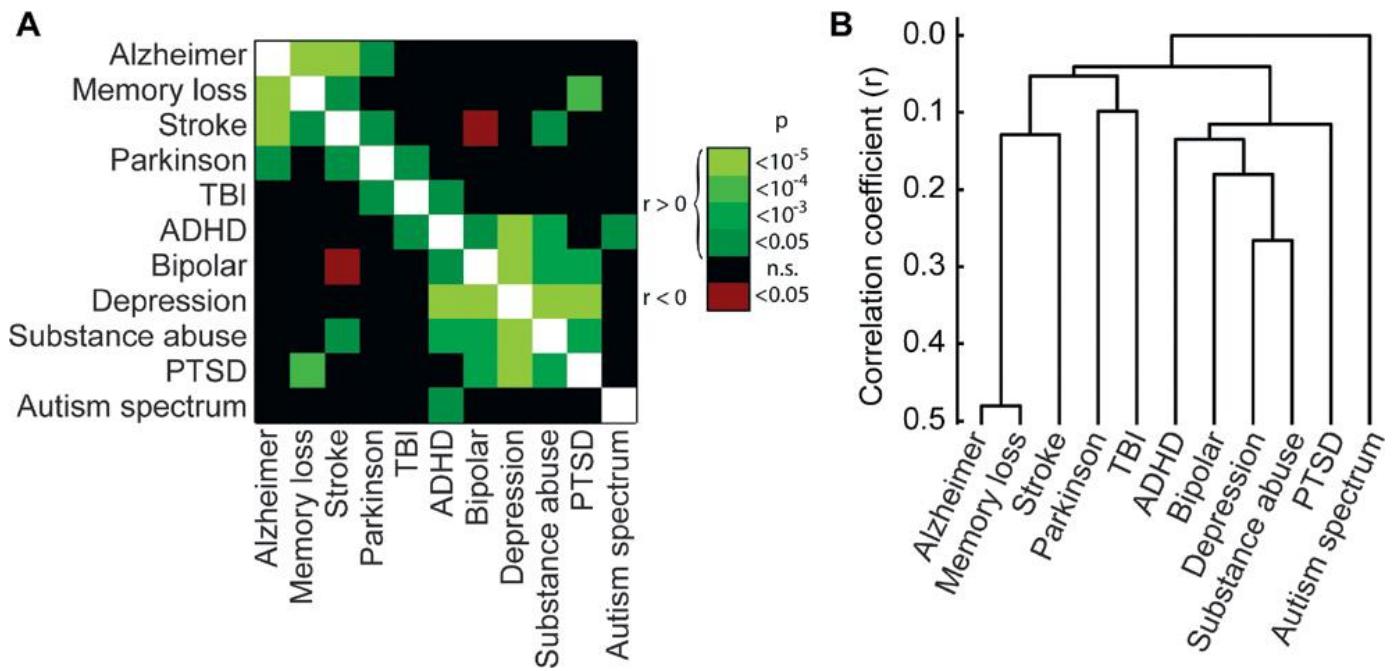


How complex is too complex?

What does this graphic mean?

Is it a good chart?

Scientific publications are often aimed at
a small group of experts who are familiar
with complex charts



B.C. Campbell and S.S. Wang, "Familial Linkage between Neuropsychiatric Disorders and Intellectual Interests," *PLoS ONE* 7(1): e30405.

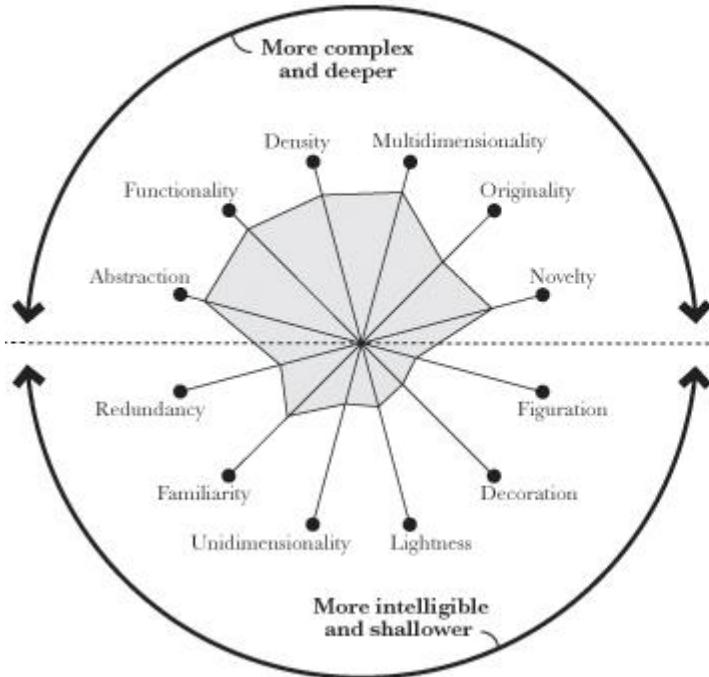
Balance the wheel!

Design for your audience

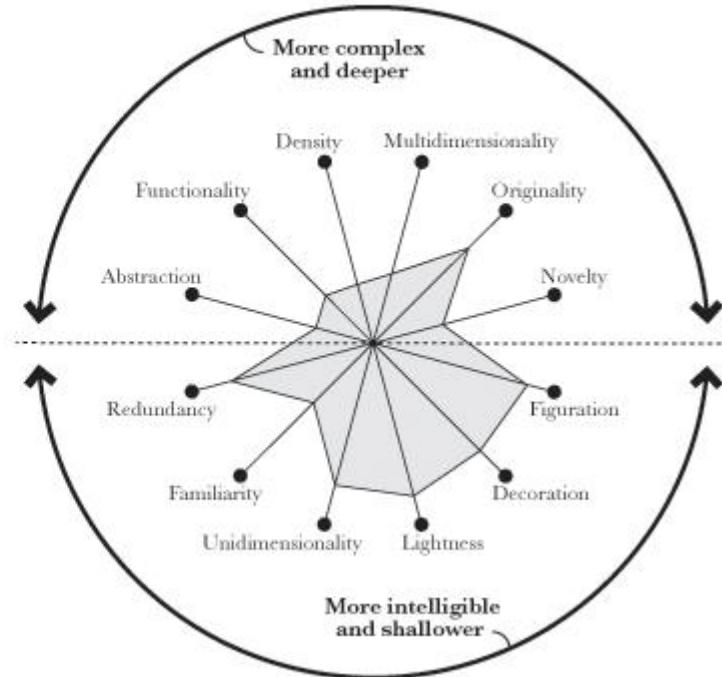
Trust your readers' intelligence,
don't patronise!

Clarify information, rather than
simplify it

The wheel preferred by
scientists and engineers

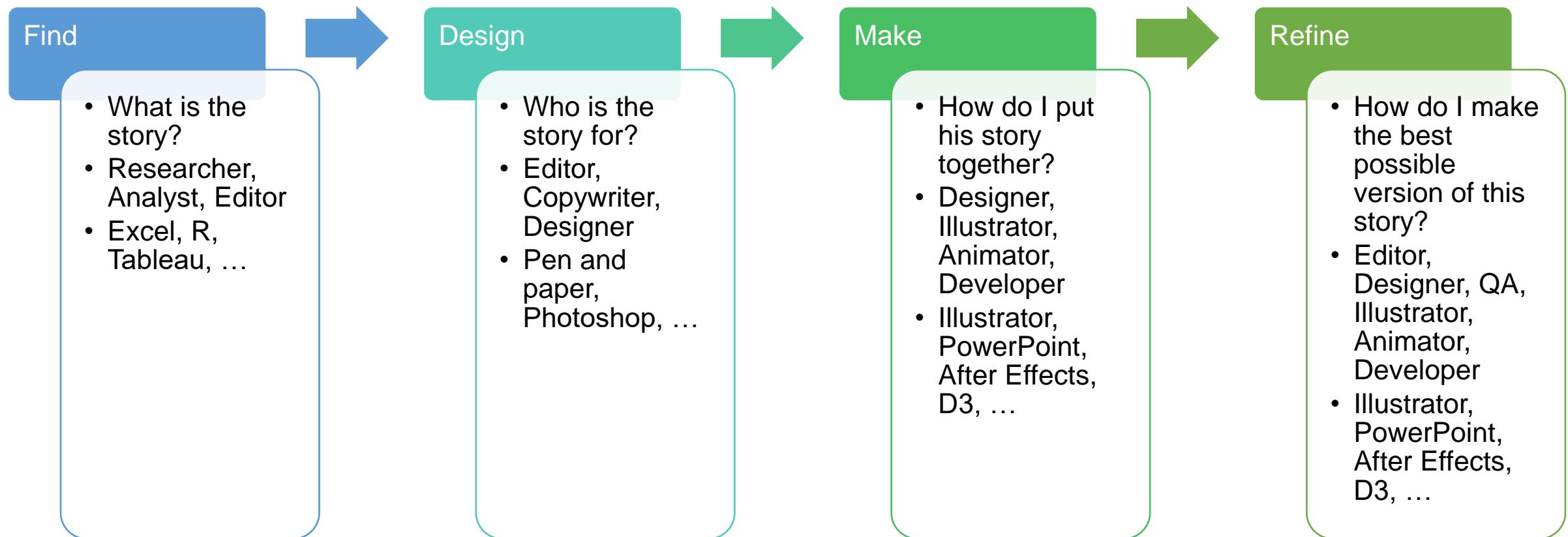


The wheel favored by artists,
graphic designers, and journalists

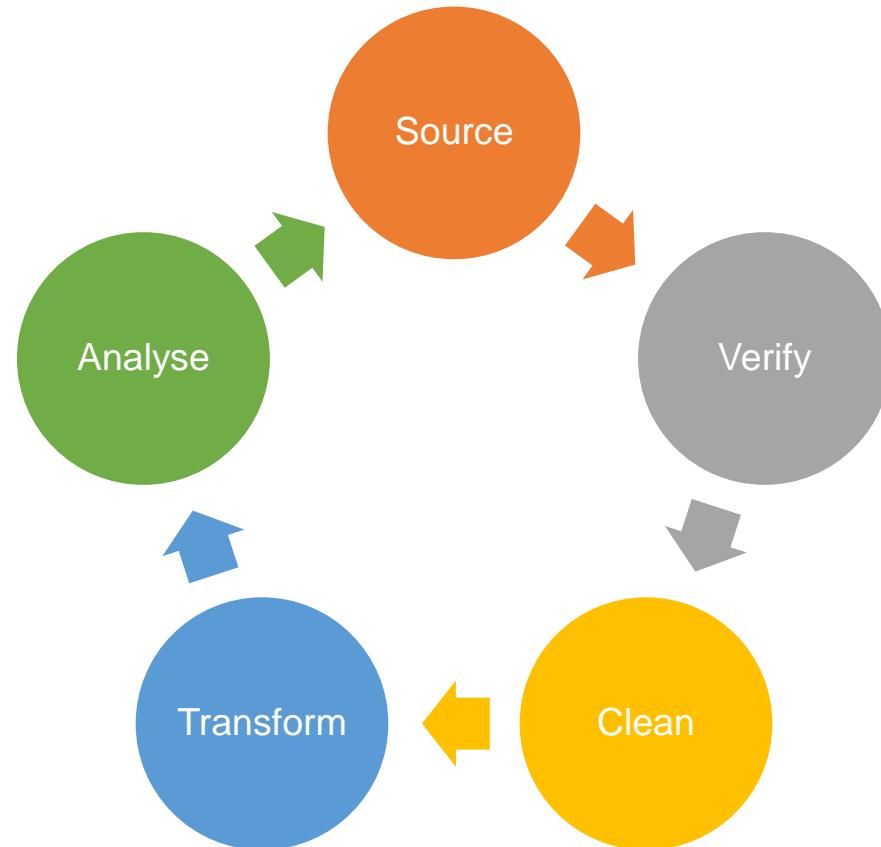


How to design an infographic

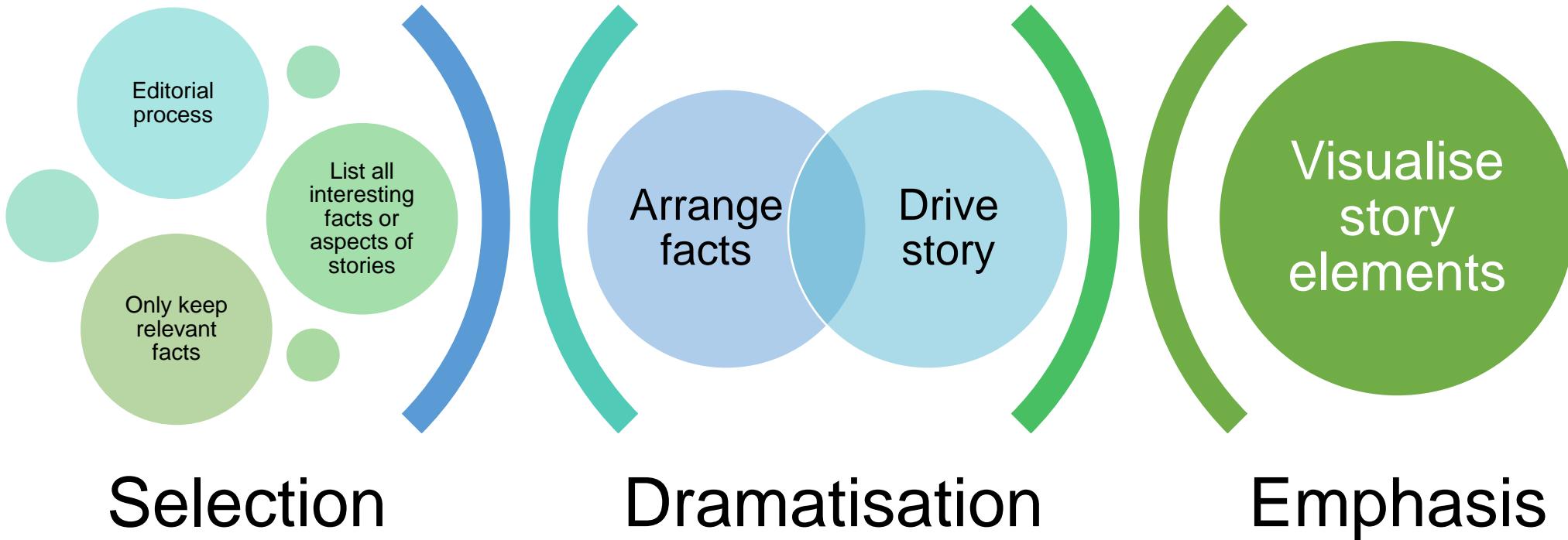
Infographics design process



Find



Design: The three stages of wireframing

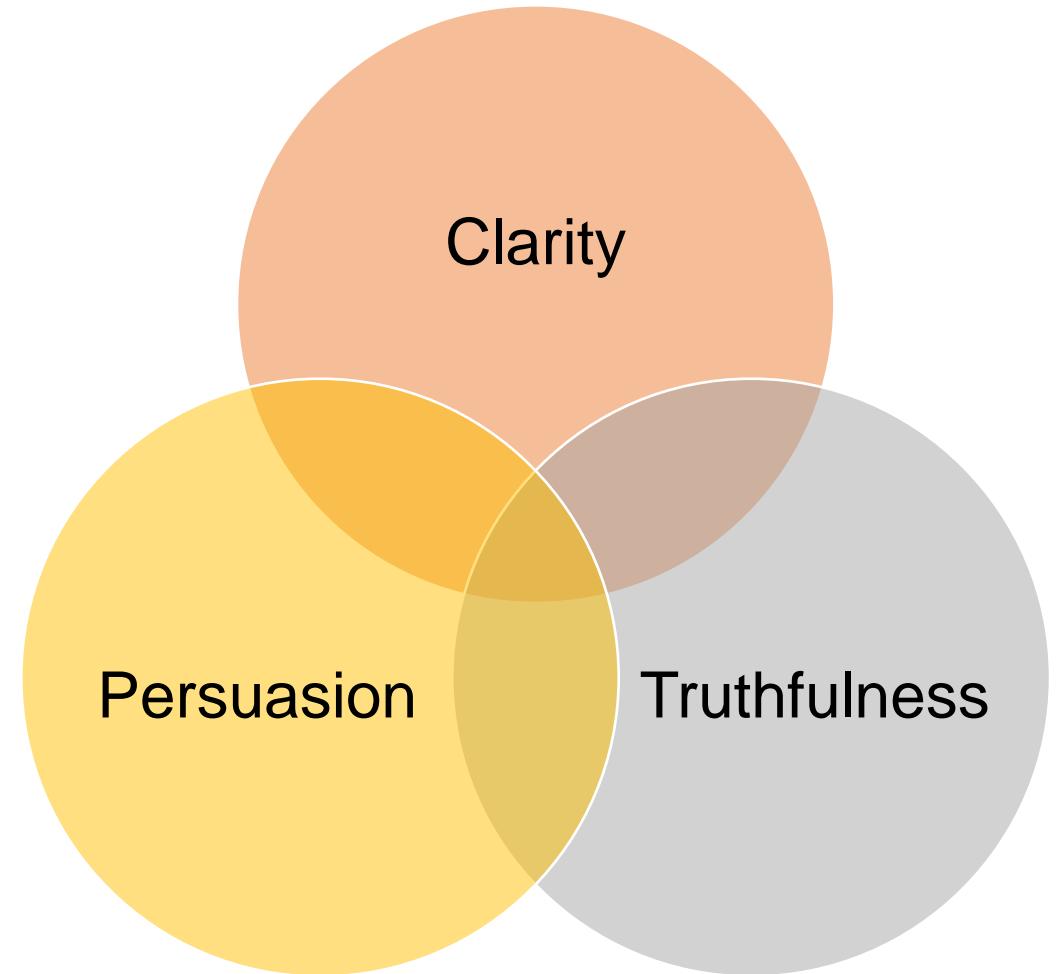


Make

Create data visualisations

Write texts

Combine elements and layout



Refine

Test infographic before release

Functional testing for more complex, interactive infographics

Focus group to test understanding

Accessibility testing

Animated infographics

Animation – motion charts

Let's have a look at an example:

[Hans Rosling's 200 Countries, 200 Years, 4 Minutes - The Joy of Stats - BBC Four – YouTube](#)

How does animation help the viewer?

How can animation damage data visualisation?

Animation – what does it give us?

Animation aids contextual understanding

Offers non-linear exploration as well as linear story-telling
visualisations

However – Too ‘busy’ animations blinds viewers

Smooth, well-timed animation is essential

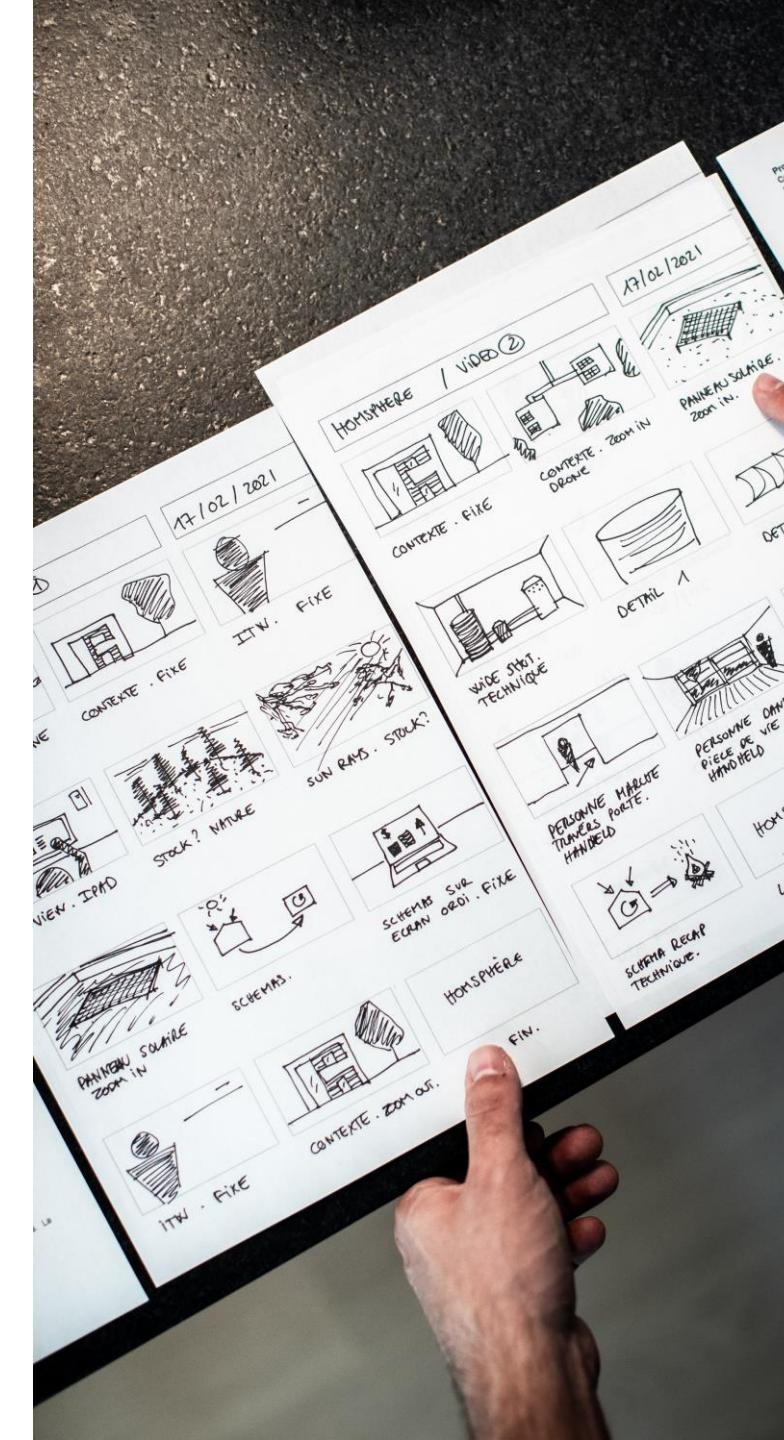
Designing animated infographics

Select data

Sketch each scene in a storyboard

Plan gaps between scenes

Plan transitions



Sound

Music

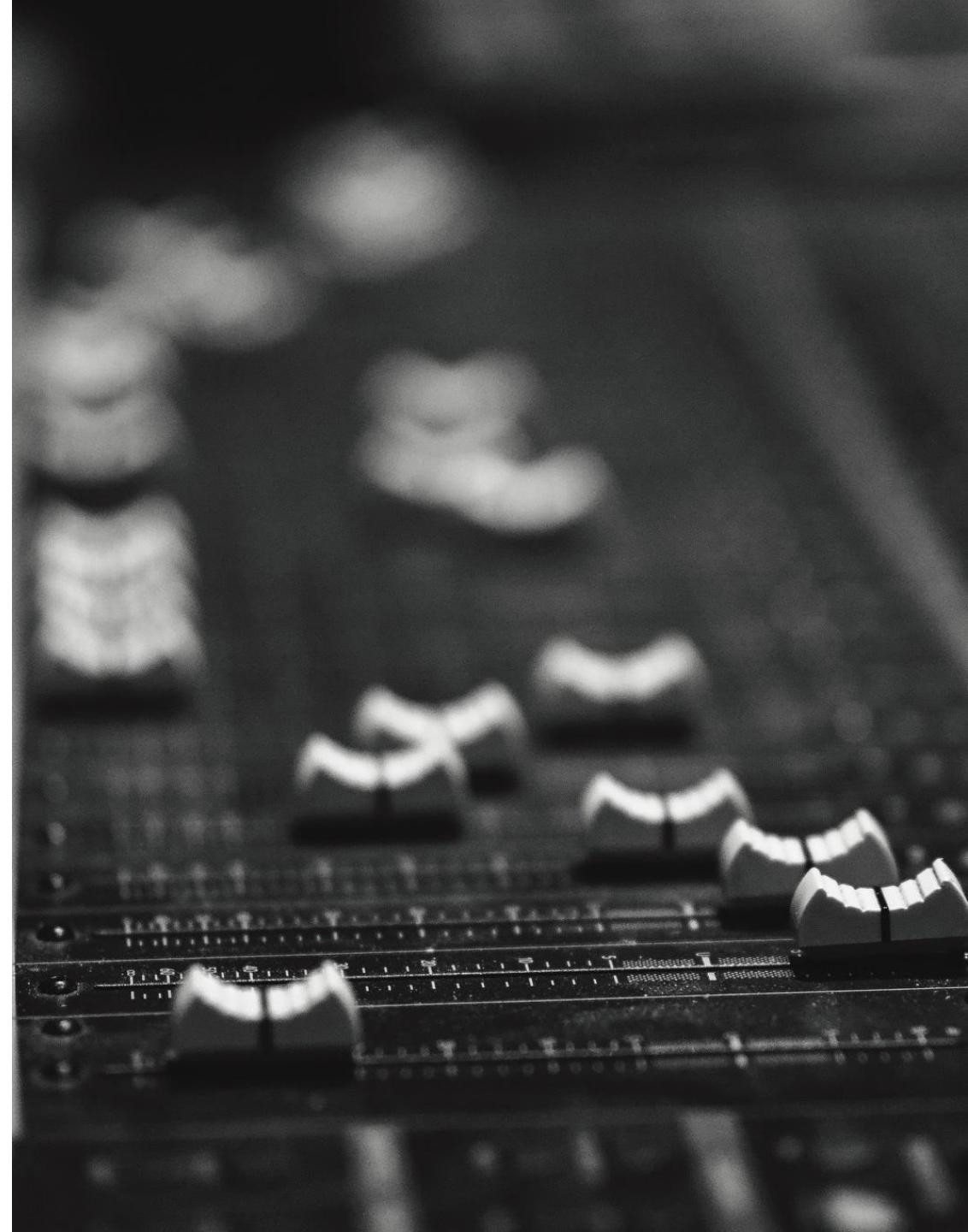
- Sets pace, mood and tone
- Costly – licenses and time
- What does it add?

Voiceover

- Additional information
- Needs to be timed to animation
- Keep in mind accessibility

Sound effects

- To be used sparingly
- Usually with a specific meaning



Interactivity

Designing for interaction

Visual Information-seeking Mantra:

'Overview first, zoom and filter, then details on demand'

'The Eyes Have It: A Task by Data Type Taxonomy for Information

Visualizations' Ben Schneiderman,

IEEE Symposium on Visual Languages, 1996.

Interaction styles

Instruction (linear)

Conversation (rare but usually linear)

Manipulation (non-linear)

Exploration (mostly non-linear)

'Interaction Design: Beyond Human-Computer interaction' Rogers, Sharp & Preece(2011)

Navigating interactive graphics

Scroll & pan

Zoom

Open and close

Sort and rearrange

Search and filter

‘Designing Interfaces’ J. Tidwell (2005)

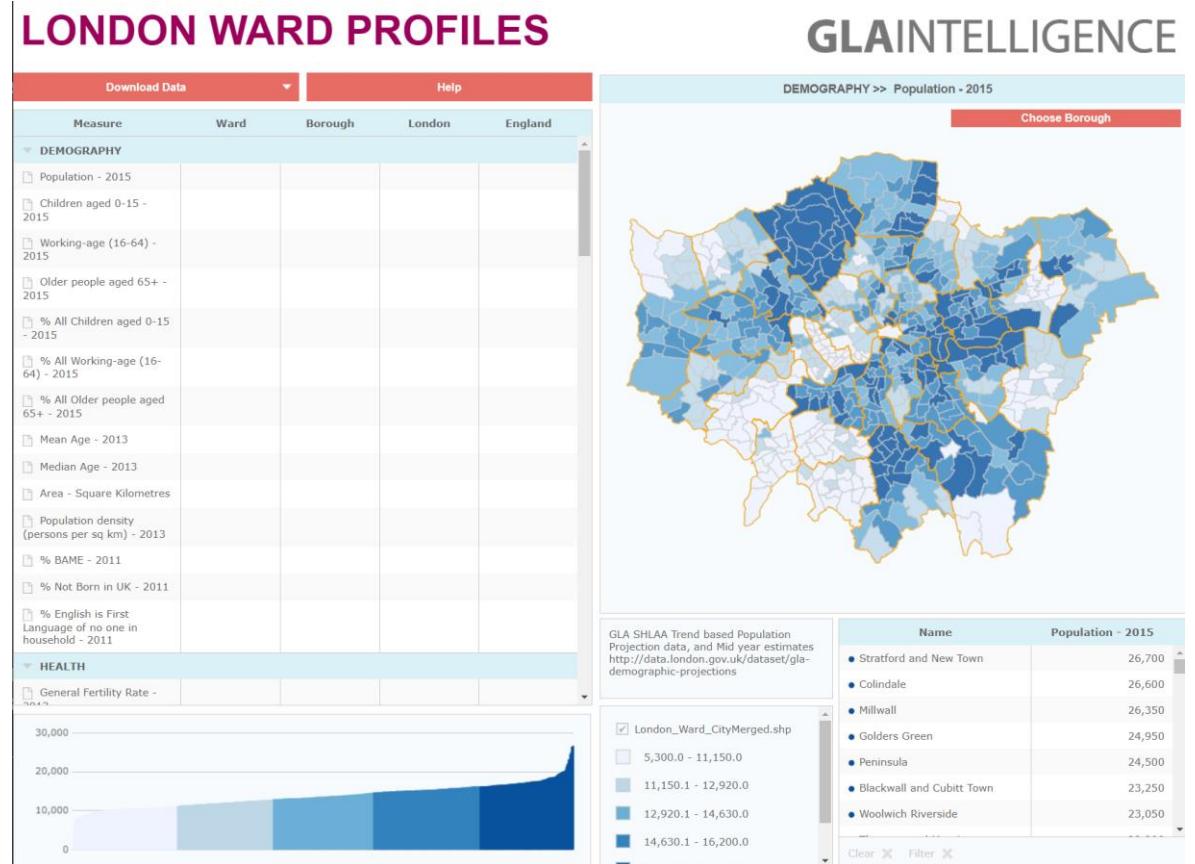
Lets have a look at an example

InstantAtlas™ Report (londondatastore-upload.s3.amazonaws.com)

What interaction style is this?

Which navigation options have they used?

How have they prioritized the dashboard space?



London Census Tool - Notes

The Census tool prioritises the map in the dashboard –it is predominantly an exploratory, non-linear experience.

There is a lot of detailed navigation options –which take a while to explore and understand.

It shows nearly all the key interactive navigation methods –leading to criticism that it is too ‘busy’ with interactive detail.

However, it conforms to Schneiderman’s Visual Information-seeking Mantra of ‘Overview first, zoom and filter, then details on demand’ –so it meets the key criteria for interactive design.

Designing interactive infographics

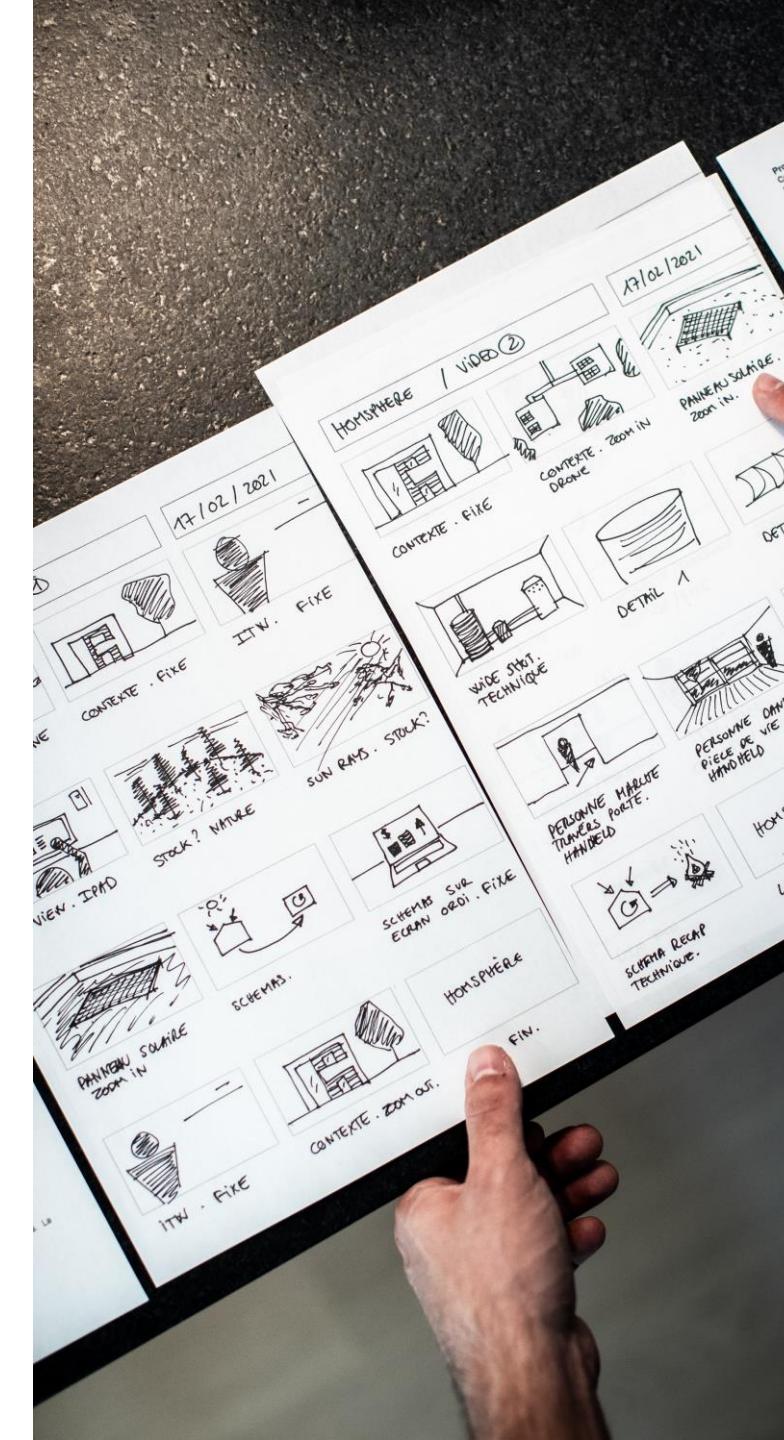
Interactive infographics are similar to animated infographics

Select data

Create storyboard

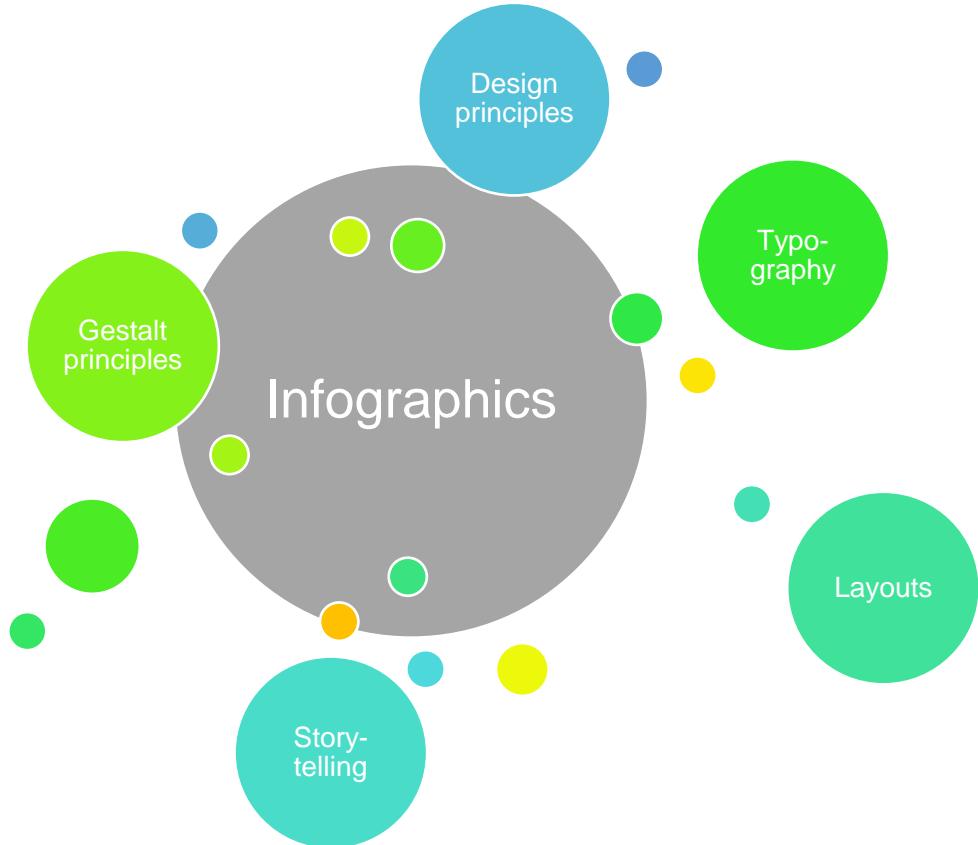
Gaps in the story

Plan transitions



Relation to other topics

Don't forget what we learned so far!



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