

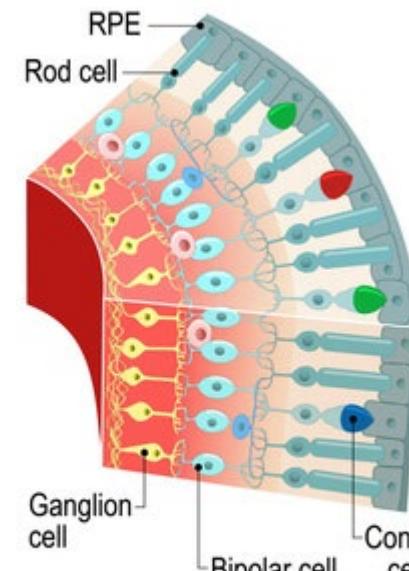
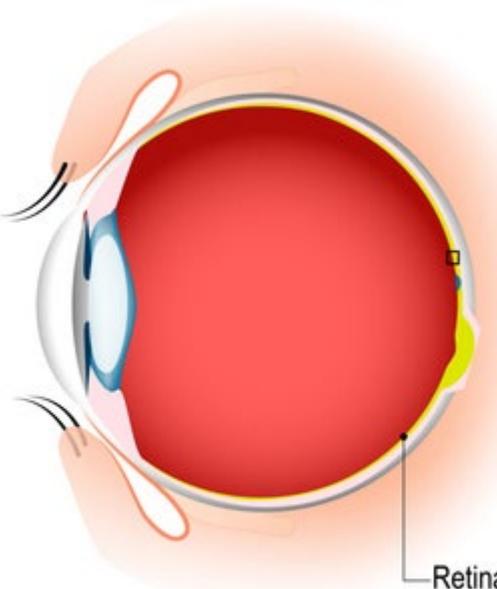
Presentation and Visualization. Perception (I)



Mireia Ribera
ribera@ub.edu
Office: 206, near T1

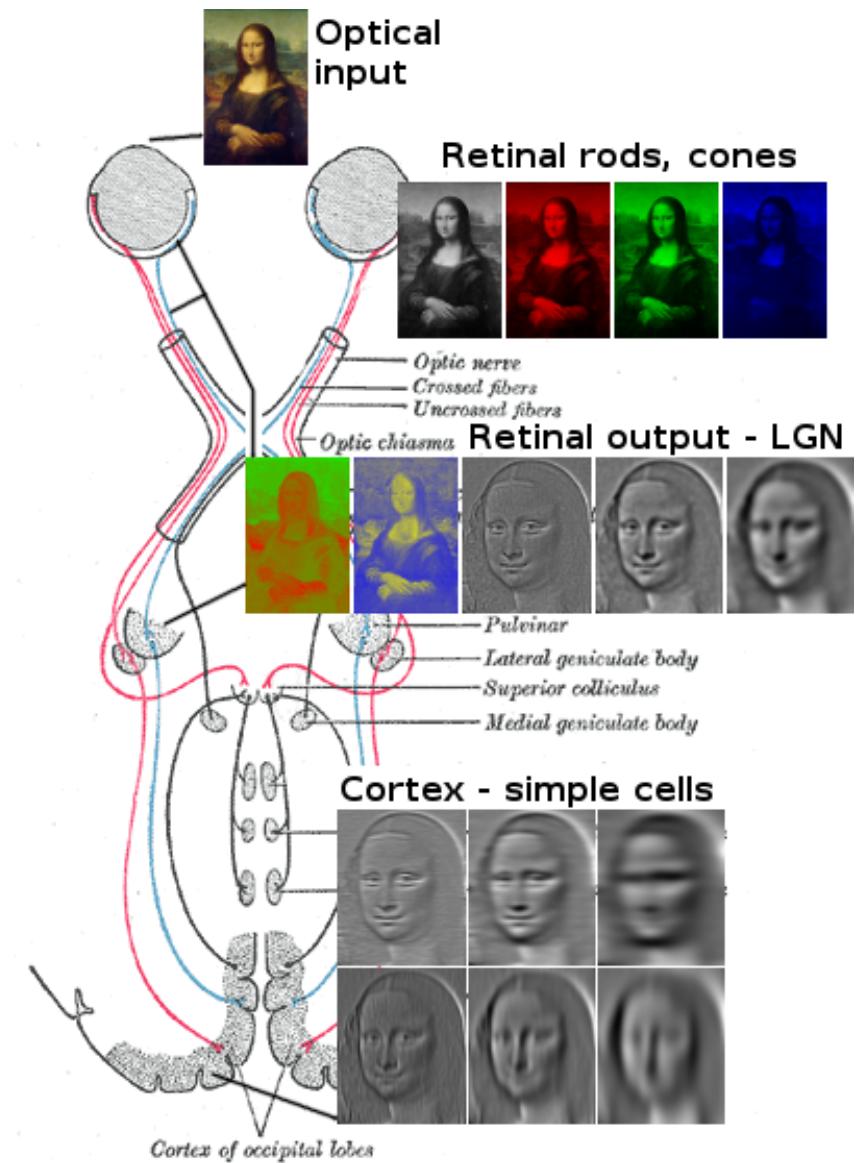
The eye and the visual process

iStock.com/metamorworks



SECTION OF RETINA

sensation {
perception {

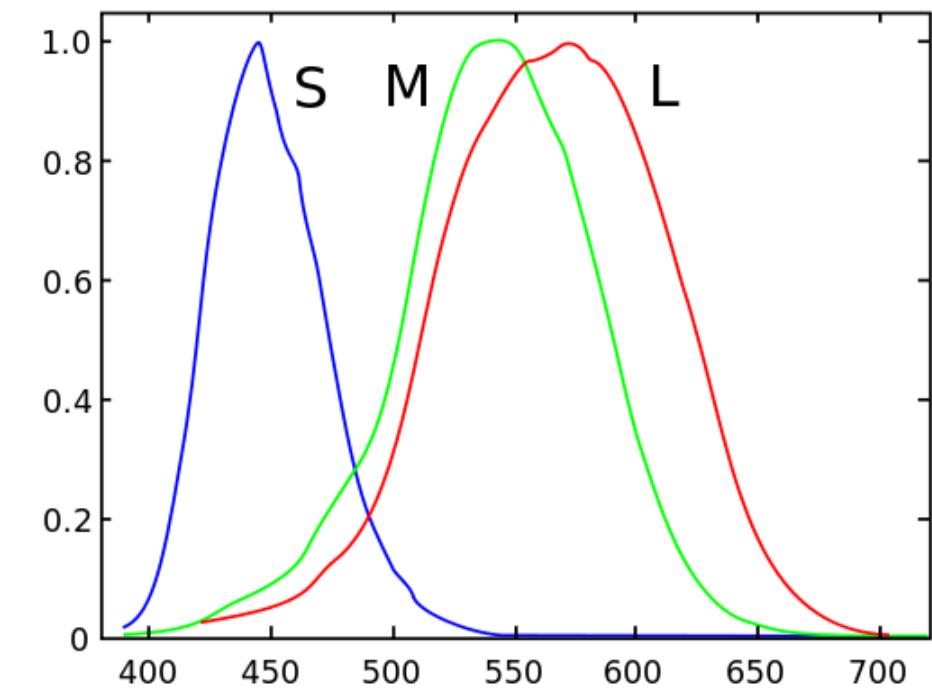
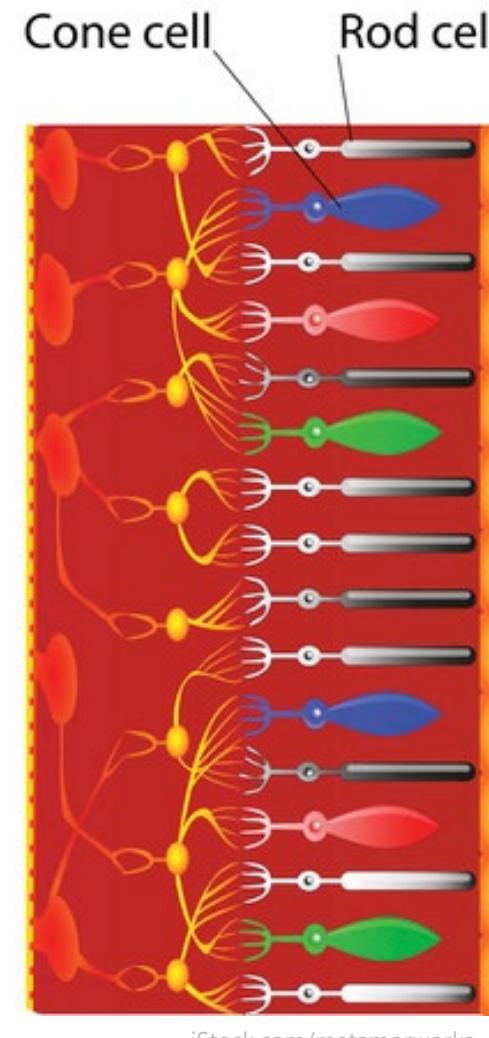


Cones and rods

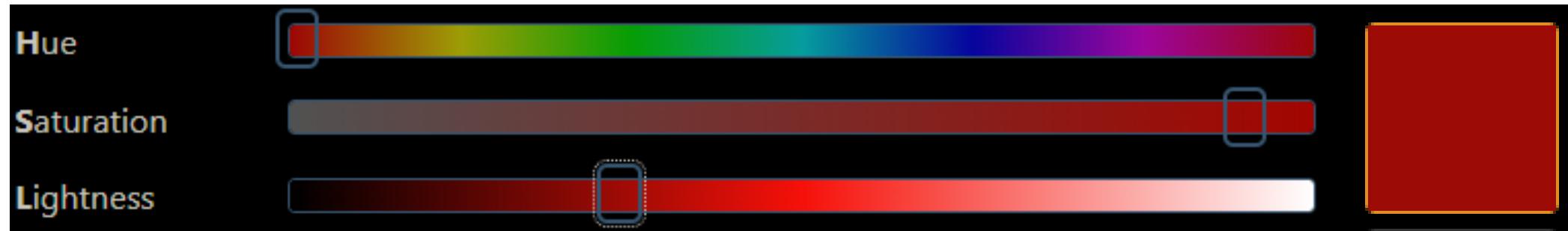
We have 120 million rods arranged throughout the retina, except the fovea (peripheral vision).

We have 6.4 million cones located in the fovea (central vision).

There are cones that detect short (blue), medium (green) or long (red) light waves.



Colour dimensions



- **Hue o Chroma**, the name of the colour
- **Saturation**, the purity of colour
- **Luminosity**, white/black level. **Most accurately perceived**

Colour blindness

Normal vision



Deutanopia (green is not perceived)



Protanopia (red is not perceived)



Tritanopia (blue is not perceived)



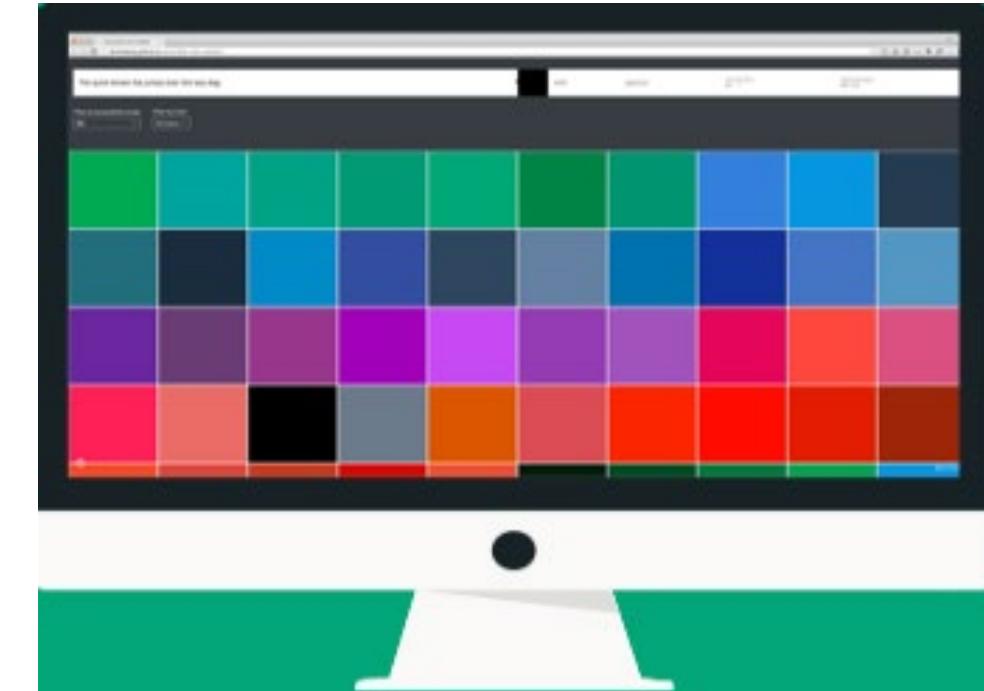
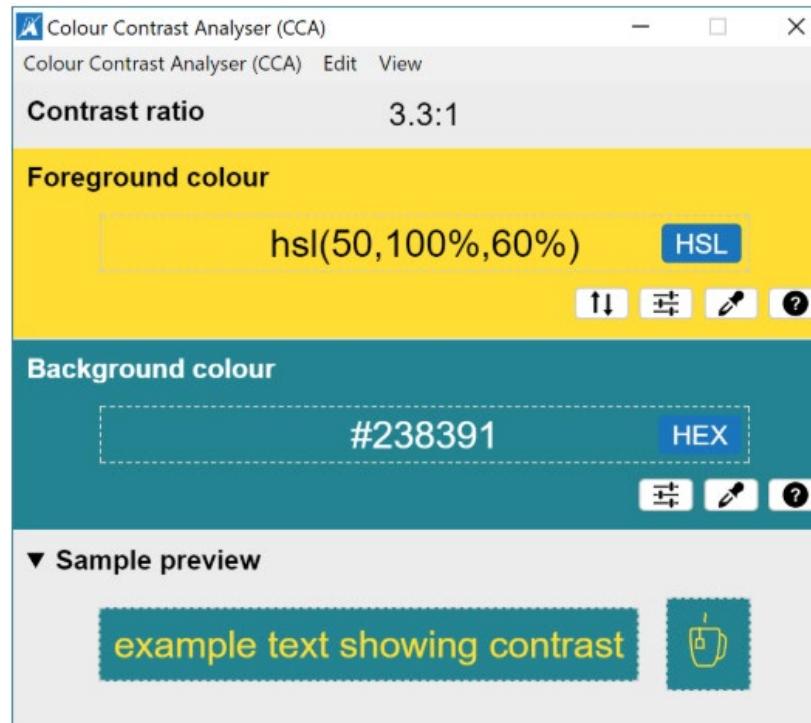
Achromatopsia (no colors perceived)



Age, Colour blindness and contrast

- Colour perception **decreases with age**
- Sight decrease affects both rods and cones
- As we have many more rods, **elders perceive much better luminance differences than hue differences.**
- It is therefore important to **keep contrast differences in every colour system.**

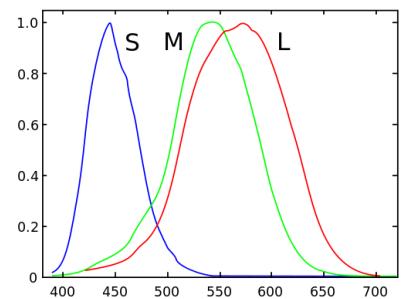
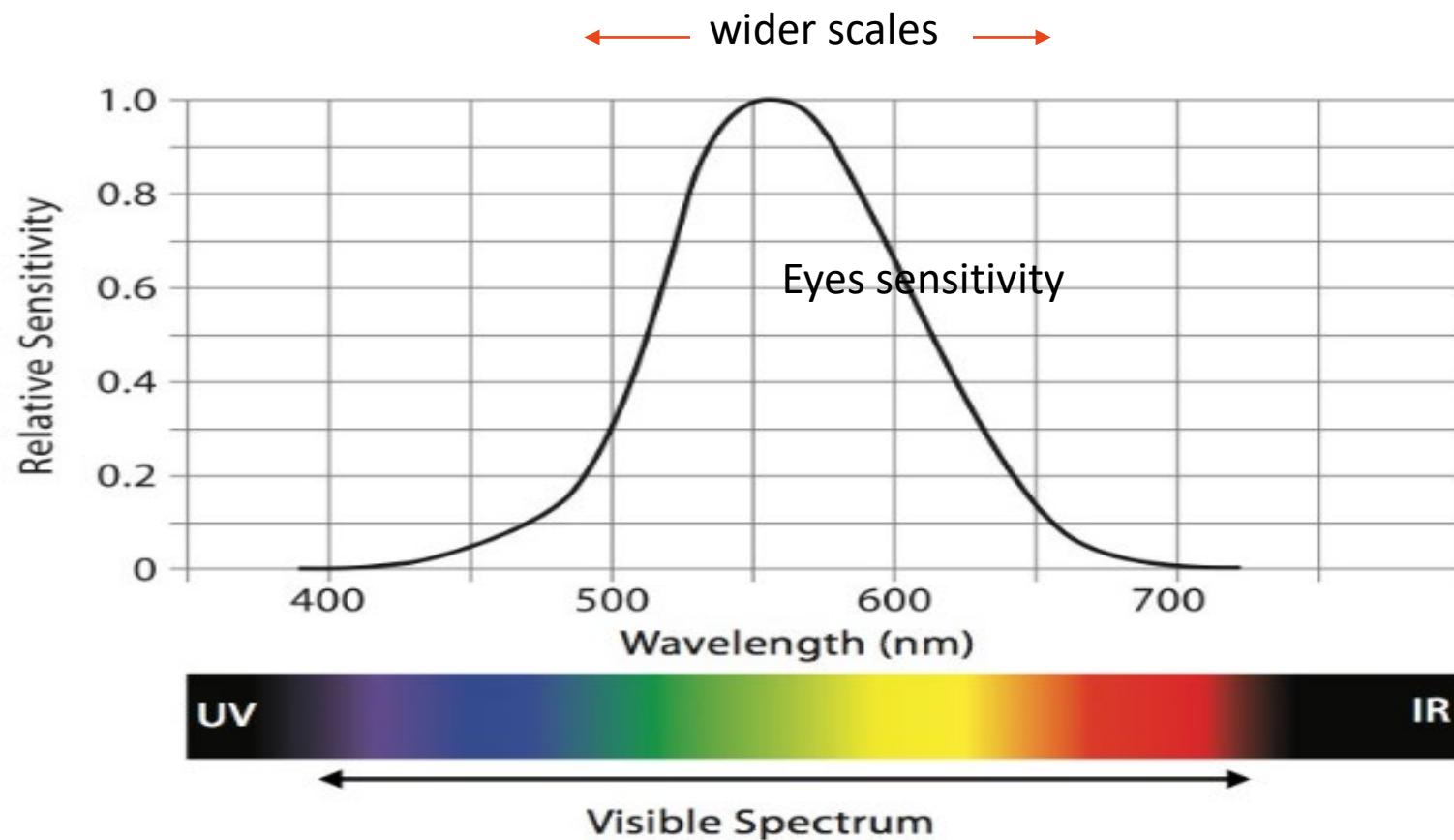
Contrast: some tools



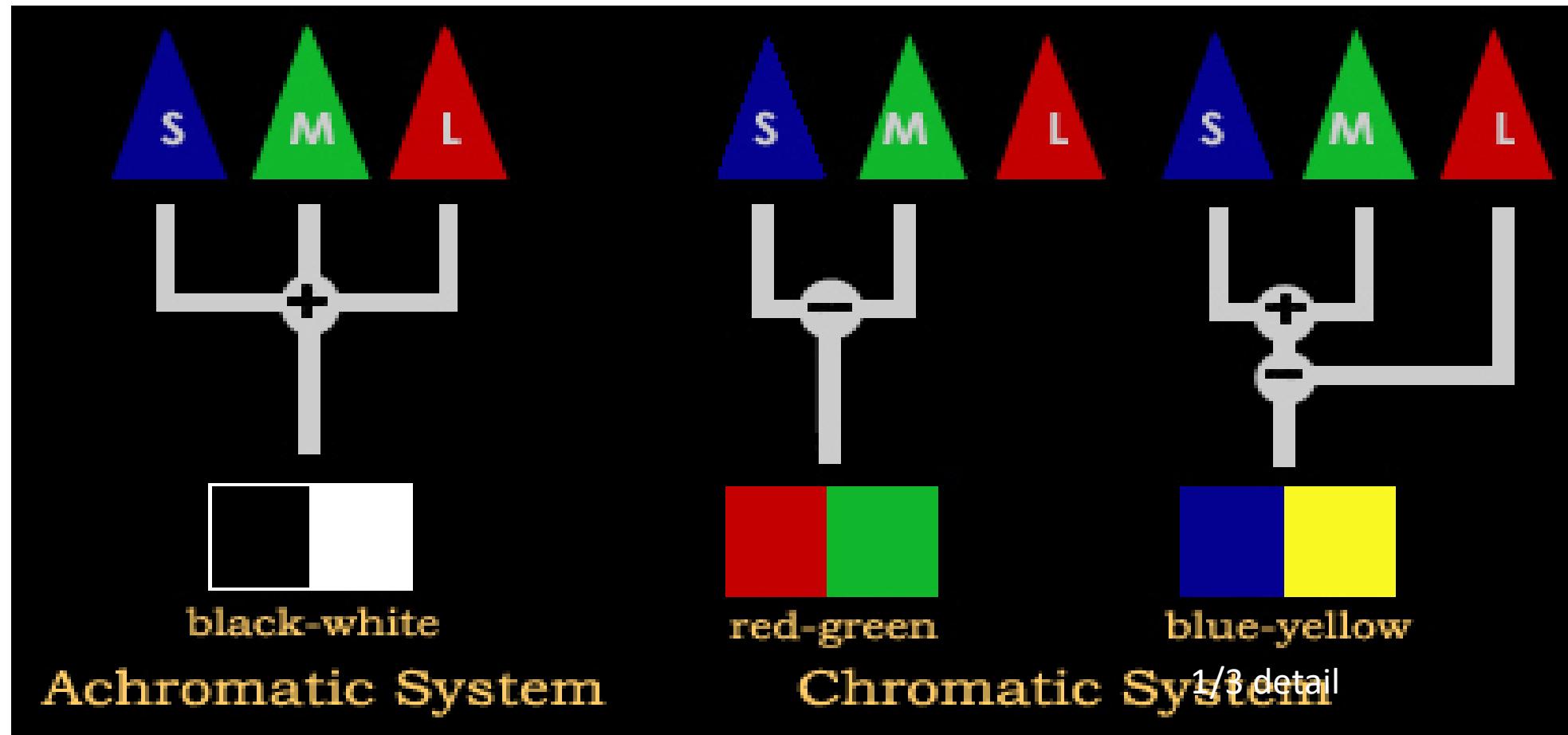
LINUX: <https://contrast-ratio.com>

Carbon IBM's Design System: Accessible colour palettes for information visualization

Eyes' sensitivity



The opponent-process theory (Edwald Hering)

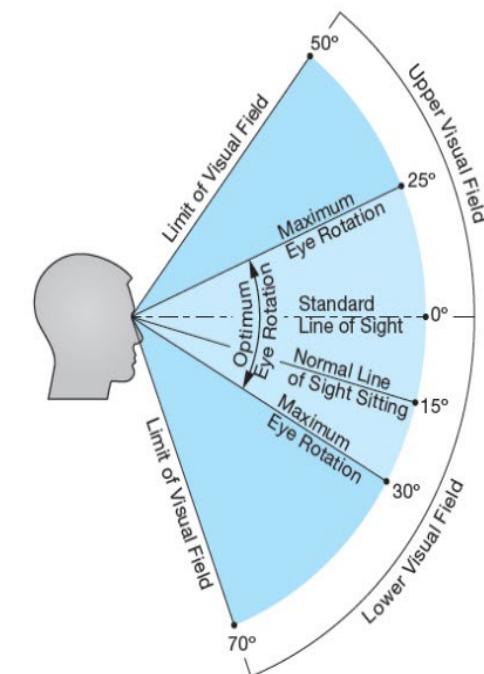
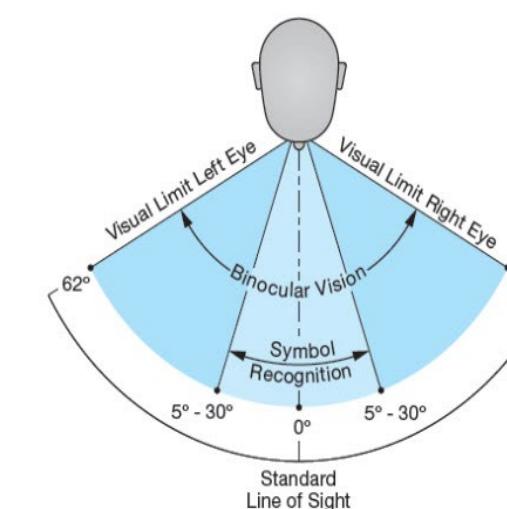
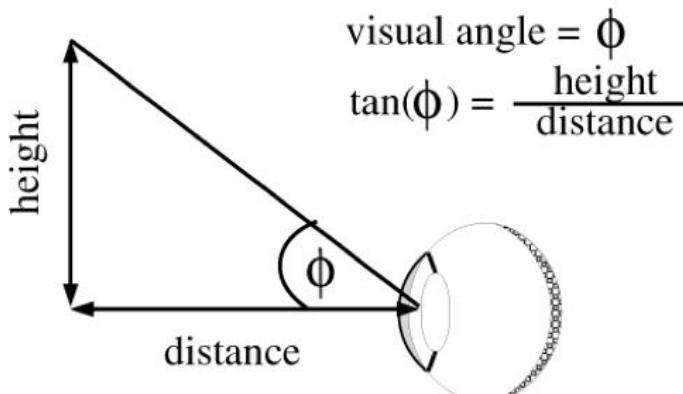


Class activity

- The Hue-test challenge <http://www.xrite.com/hue-test/>
- Simulating colour vision [Silktide disability simulator](#)

Visual angle and Useful field of view

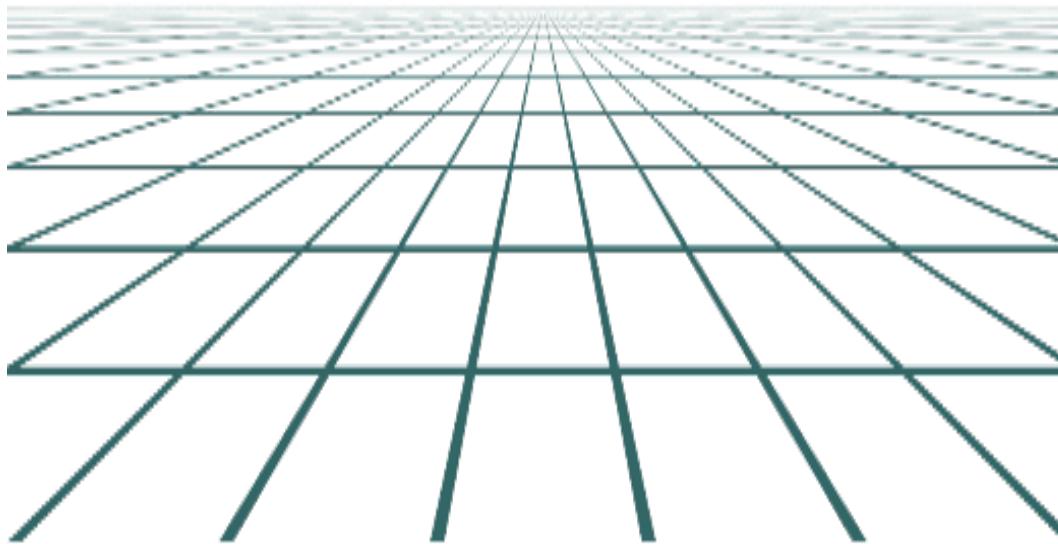
Visual angle



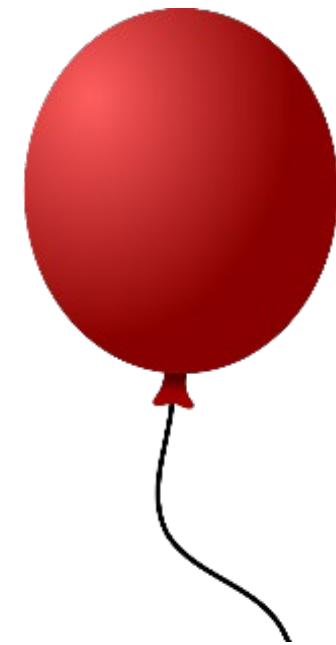
Source: <http://www.cns.nyu.edu/~david/courses/perception/lecturenotes/eye/eye.html>

From eyes or from mind?

iStock.com/ ImpakPro

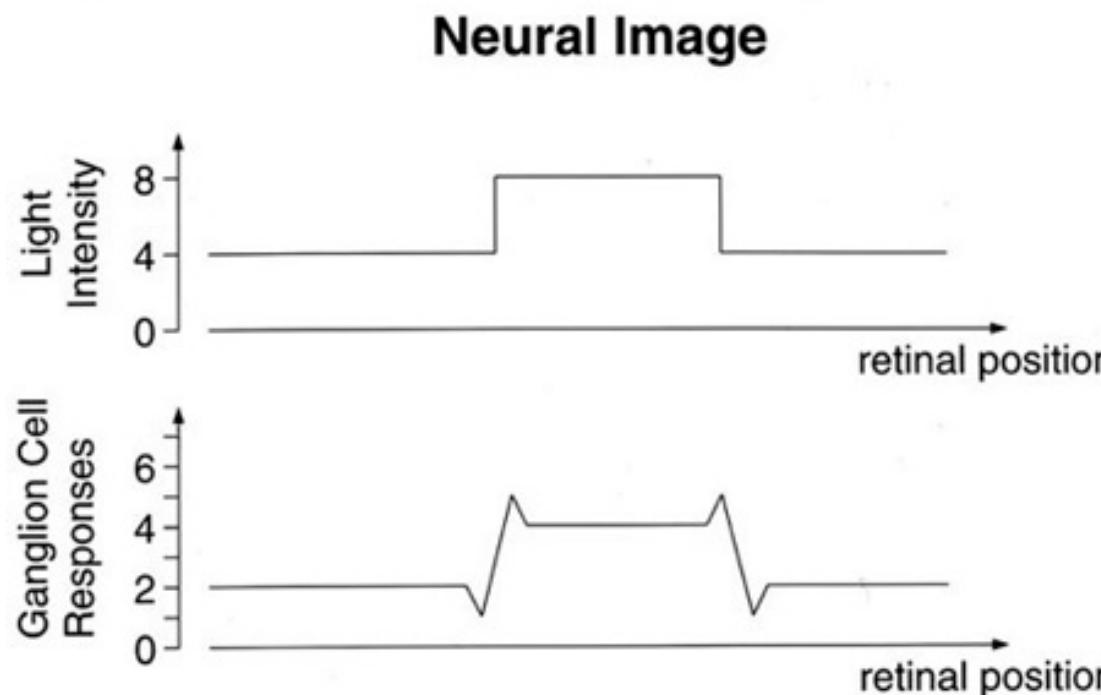


THE CHAT

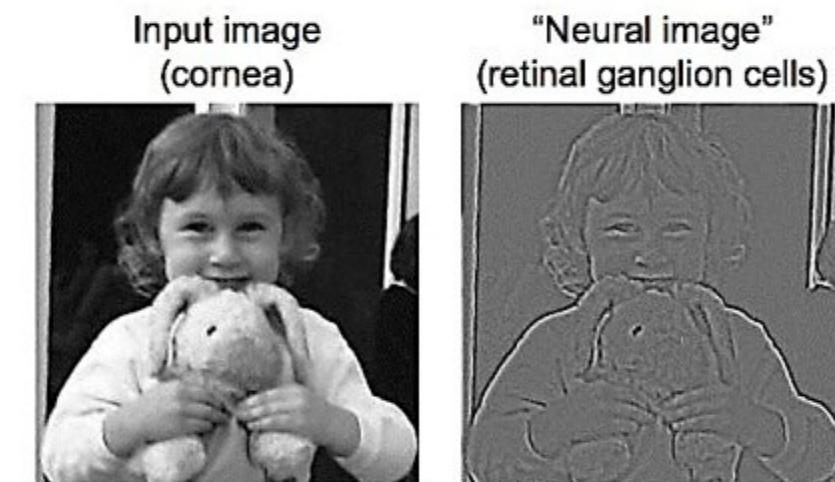


iStock.com/Sigit Mulyo Utomo Anastasija_M

Economy of effort



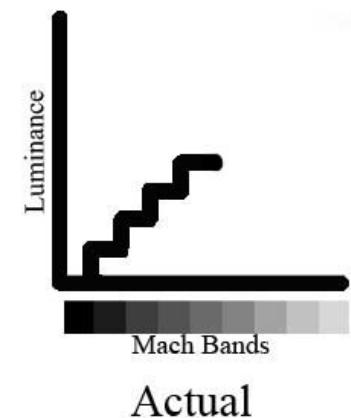
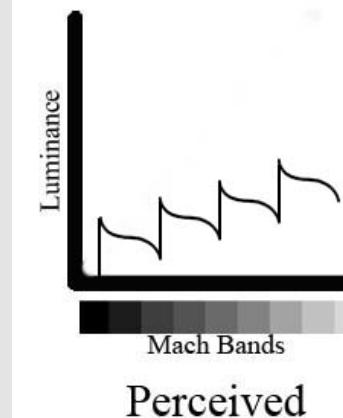
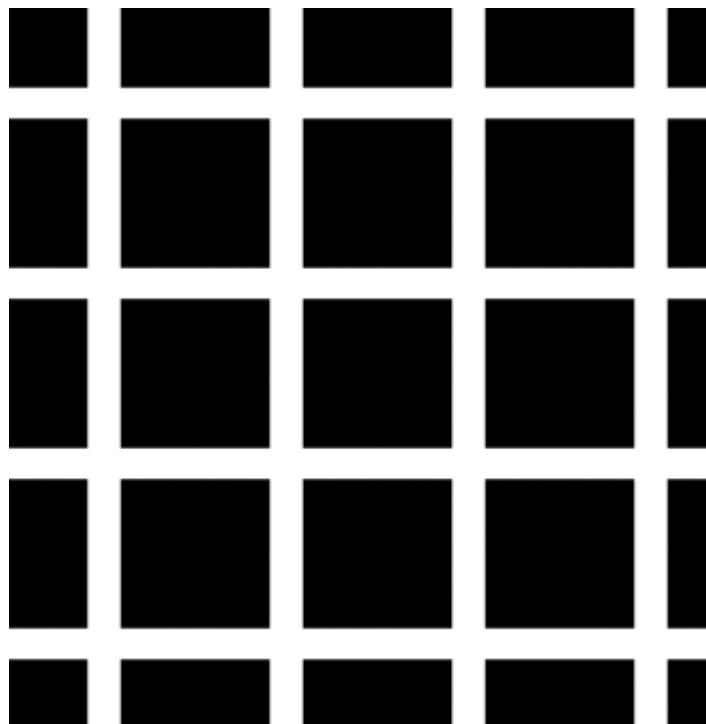
Retinal ganglion cells respond to edges



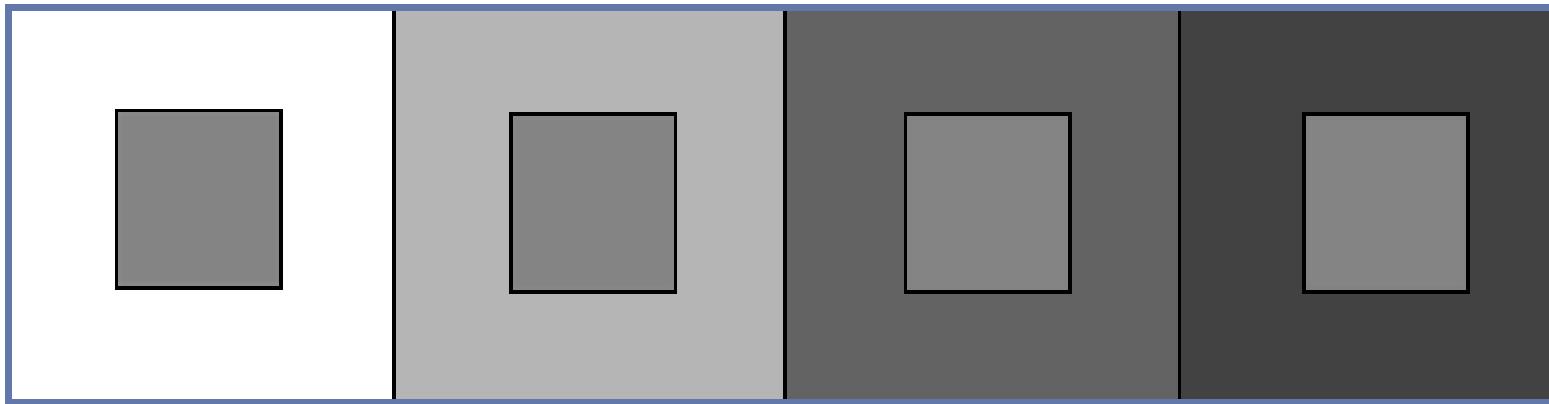
Center-surround receptive fields: emphasize edges.

Fuente: Heeger, 2006

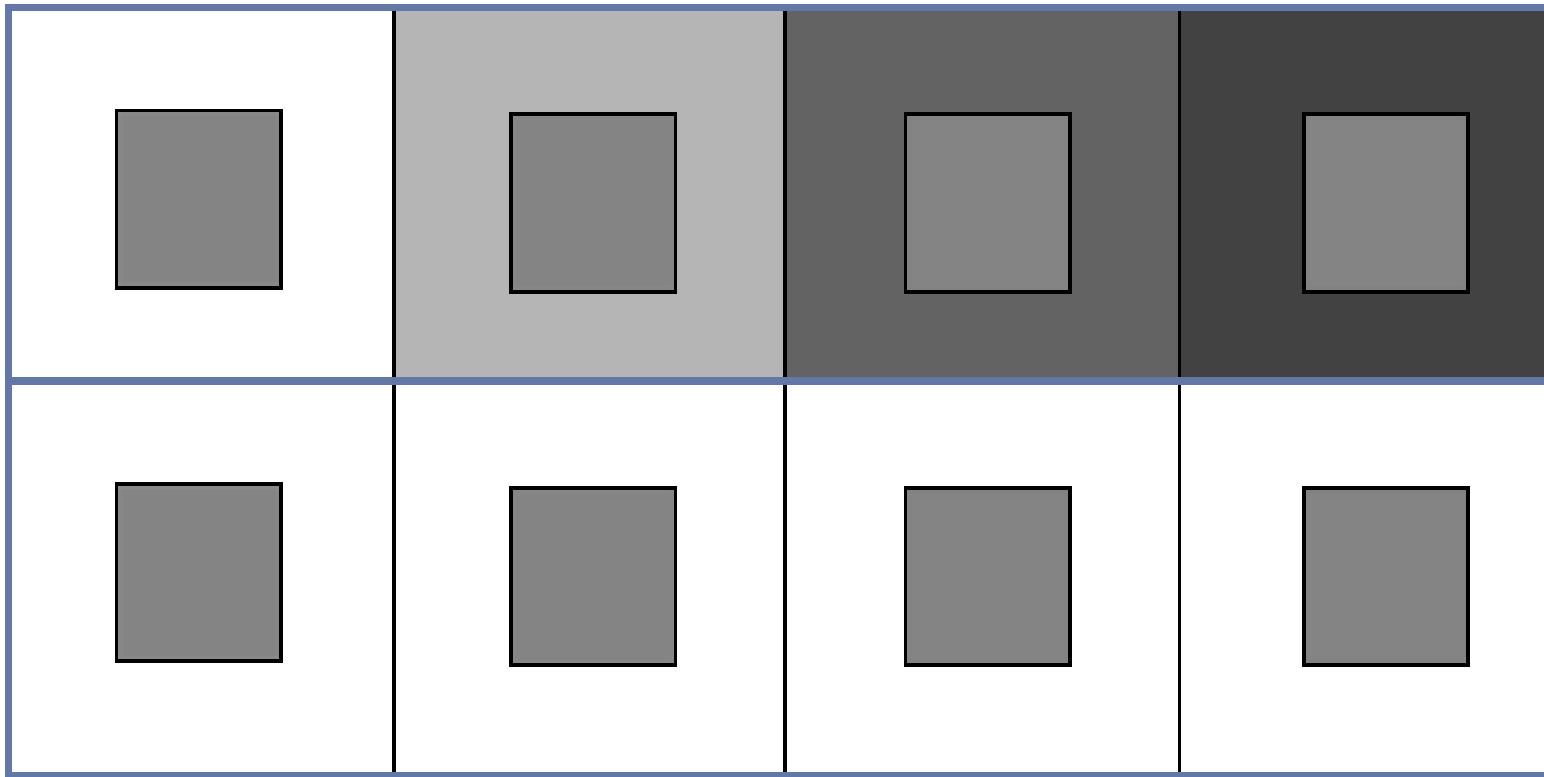
Biased signals sent to neurons



Perception is relative



Perception is relative (II)



How many 5 are there?

385720939823728196837293827

382912358383492730122894839

909020102032893759273091428

938309762965817431869241024

How many 5 are there? (II)

385720939823728196837293827

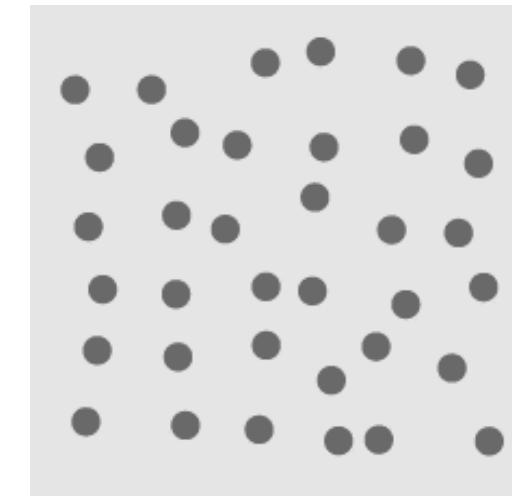
382912358383492730122894839

909020102032893759273091428

938309762965817431869241024

Preattentive properties

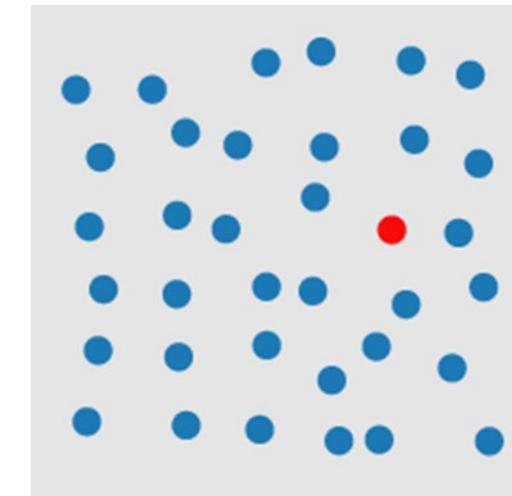
- Certain visual properties are detected immediately by low-level visual system
 - Immediately is <200-250 ms
- They “pop-out” without requiring serial search
- Not affected by distractors



Source: Healey, 2012

Preattentive properties

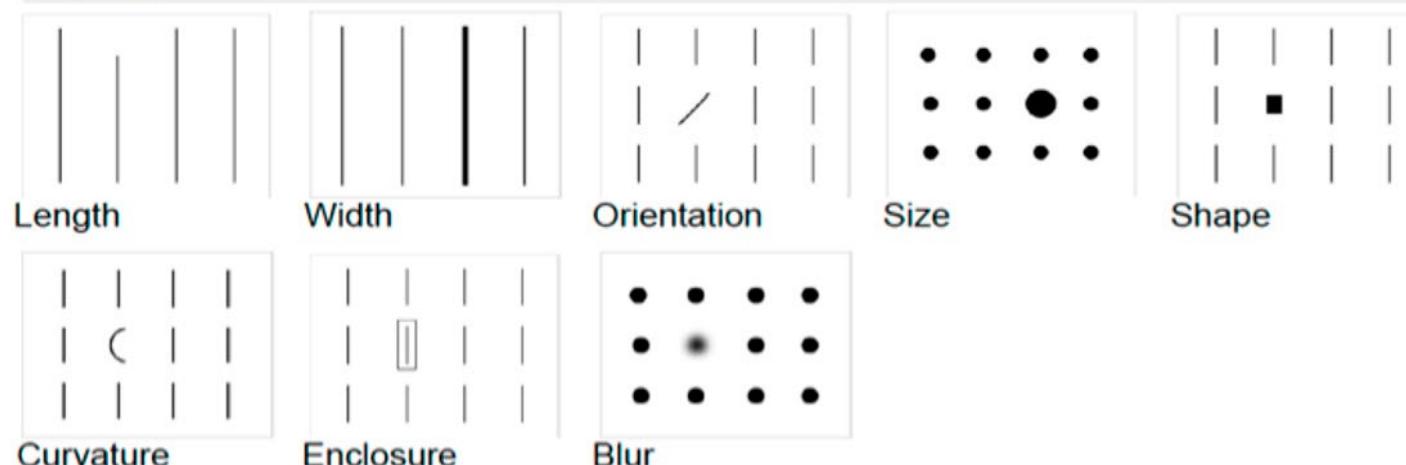
- Certain visual properties are detected immediately by low-level visual system
 - Immediately is <200-250 ms
- They “pop-out” without requiring serial search
- Not affected by distractors



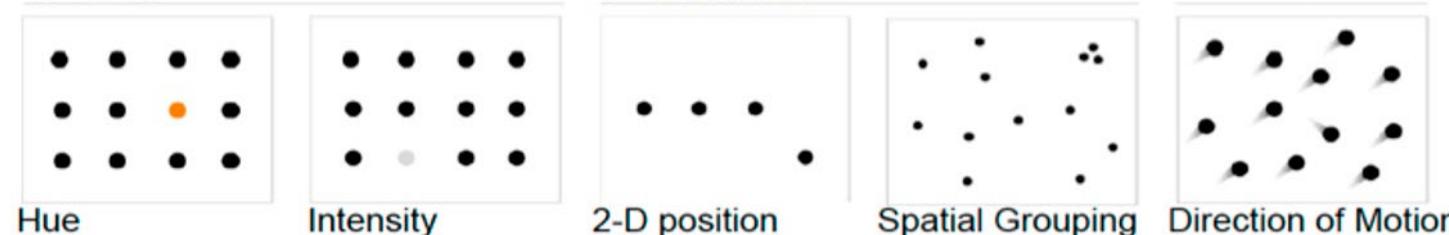
Source: Healey, 2012

Preattentive properties. Types

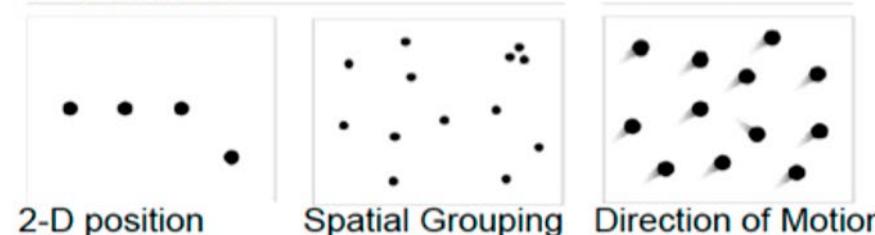
Form



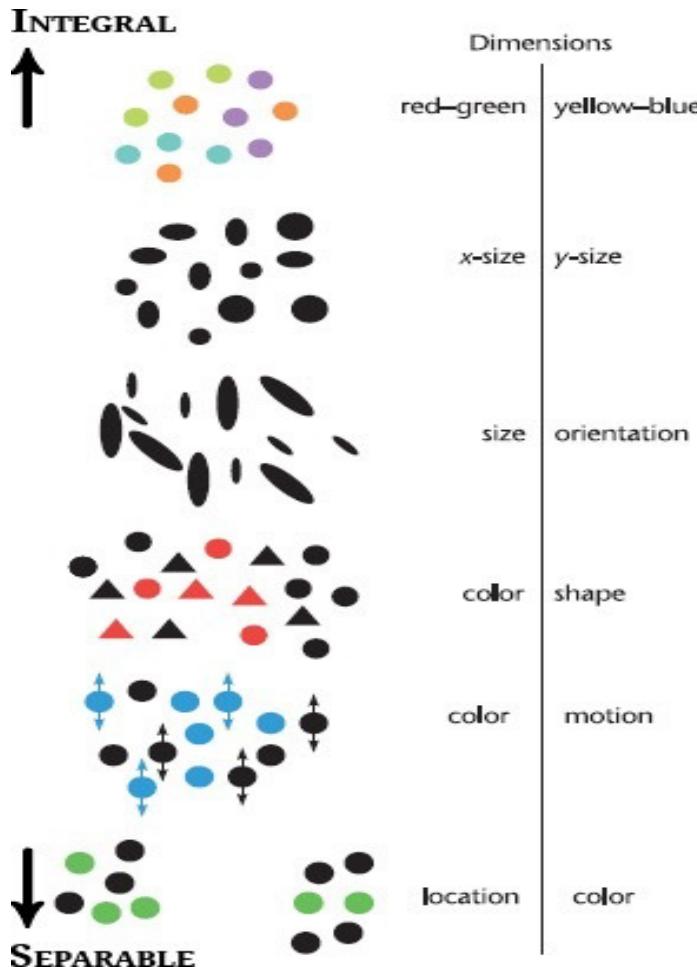
Color



Position

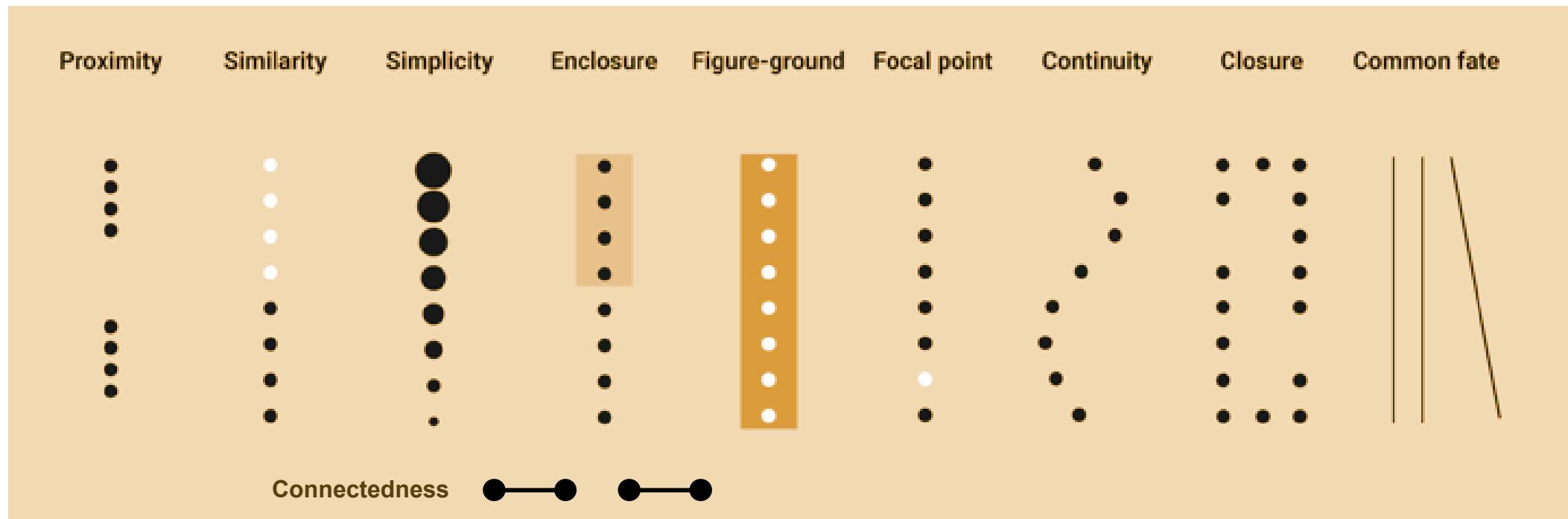


Combination of dimensions: integral and separable



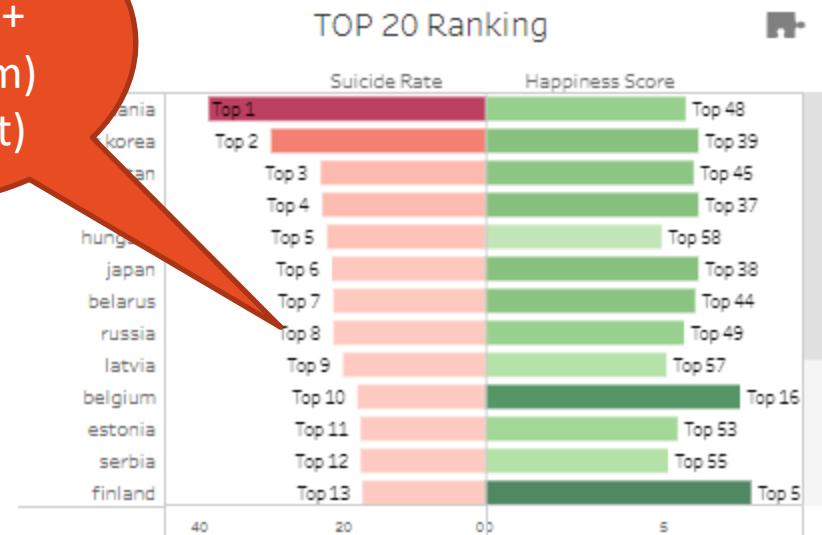
- **Integral** dimensions are seen together
- **Separable** dimensions are seen separately

Gestalt laws

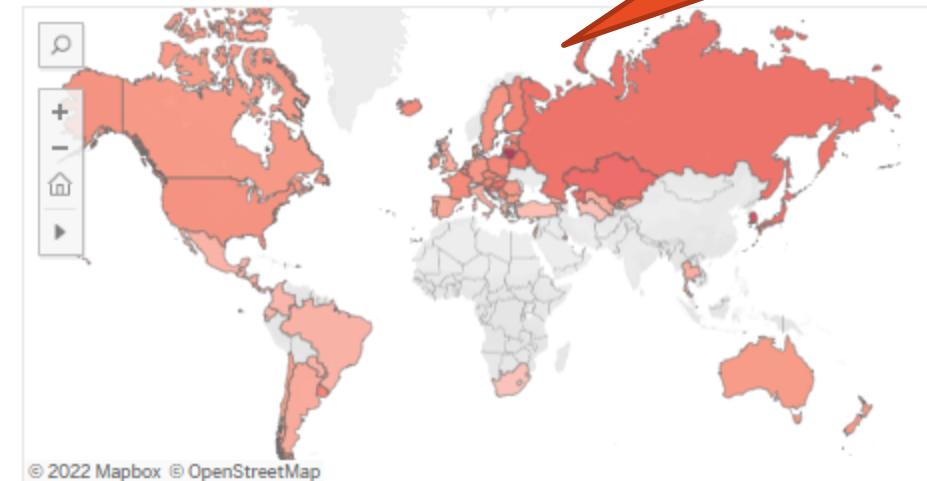


Source: van Dijk, 2022

Color (Hue + Intensity) + length(Form)
(redundant)



Suicide Rate over the World



Color (Saturation + Luminosity) = Intensity

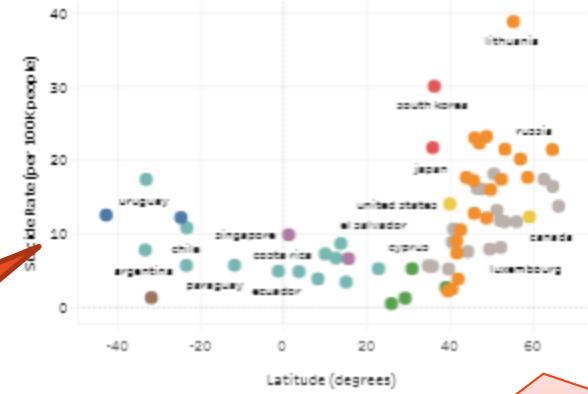
Color + length (Form)
(separable)



Suicide Rate vs GDP per Capita



Suicide Rate vs Latitude

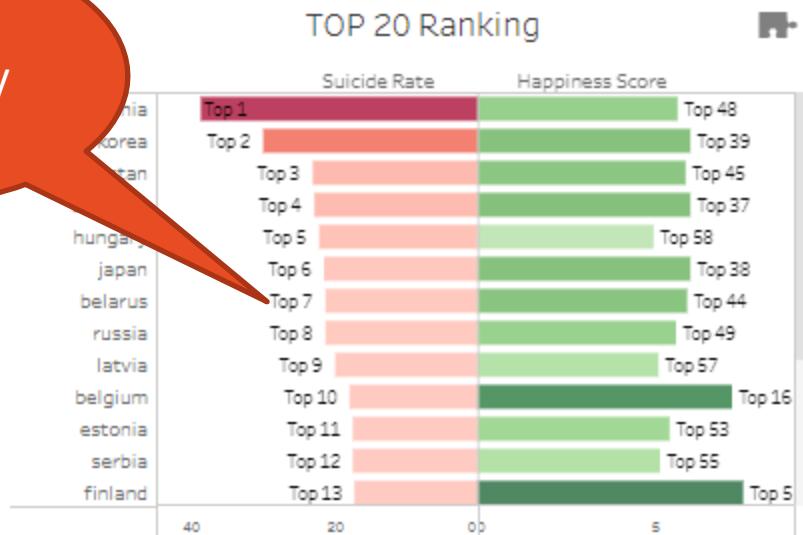


Color + Position
(separable)

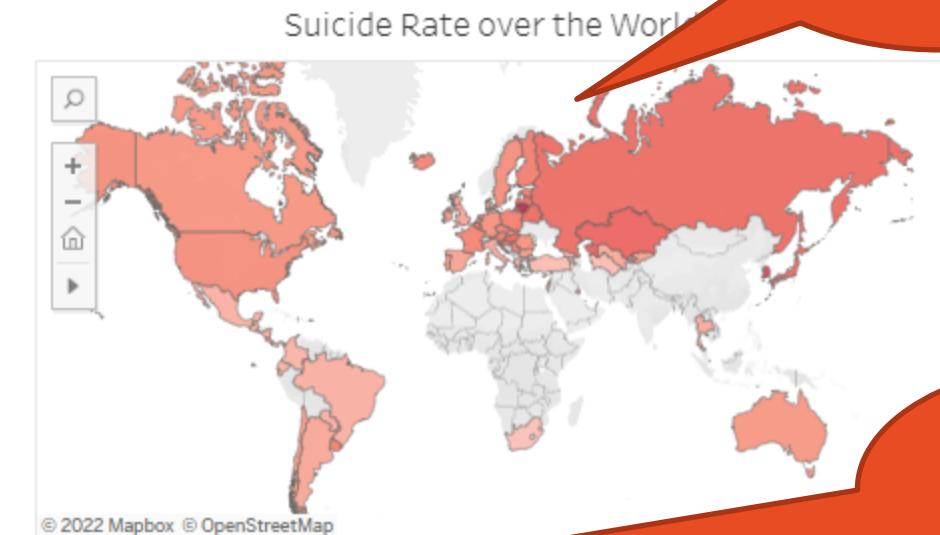
What do women...? What age ...?

How is Central and Eastern Europe GDP and suicide rate?

Symmetry



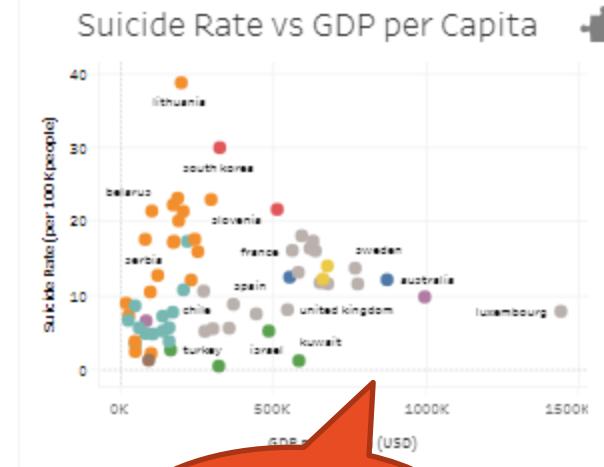
Similarity



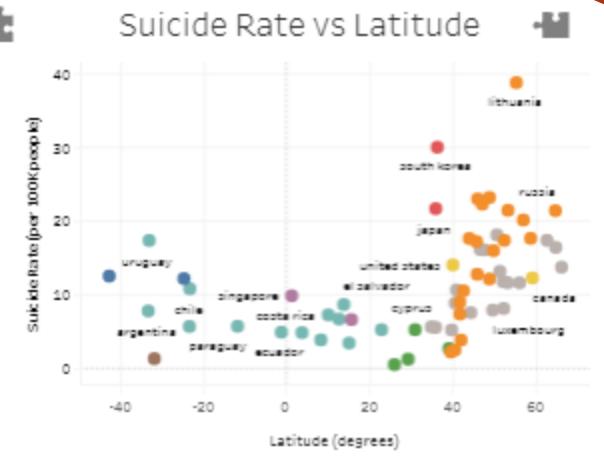
Closure



Similarity



Proximity



Combining preattentive properties + gestalt to represent quantity

- size:
 - *length or height,*
 - *area (radius),*
 - never *volume*
- lightness, darker = bigger
- hue saturation, saturated = bigger
- vertical position, higher = bigger

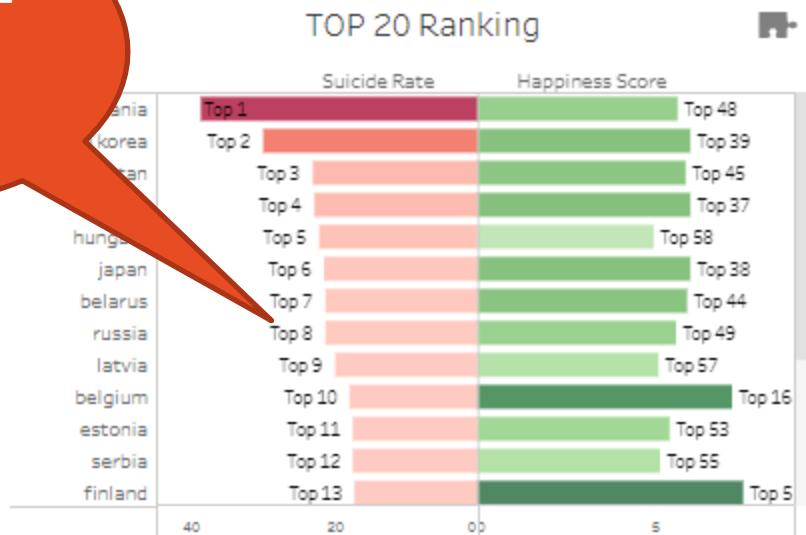
Combining preattentive properties + gestalt to represent INTENSITY

- Darker or more saturated,
- Bigger,
- Thicker

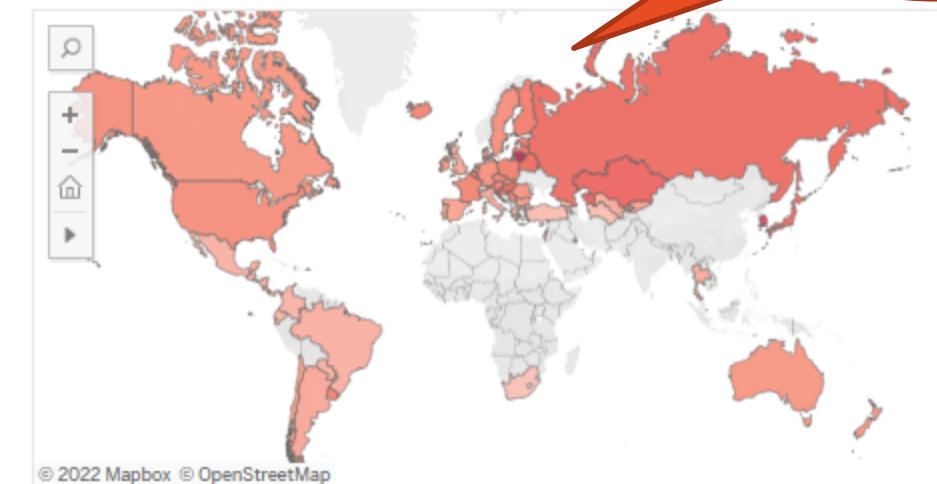
Combining preattentive properties + gestalt to represent **VISUAL SALIENCE**

- Distinct from the norm: in hue, orientation,
- Enclosure: by line or background colour,
- Added marks

More saturated = bigger
Larger = bigger



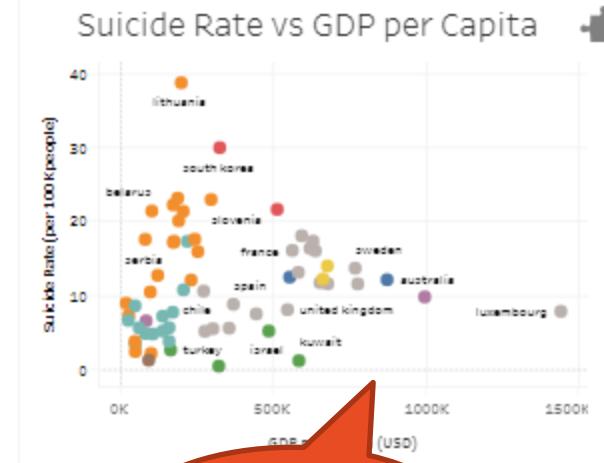
Suicide Rate over the World



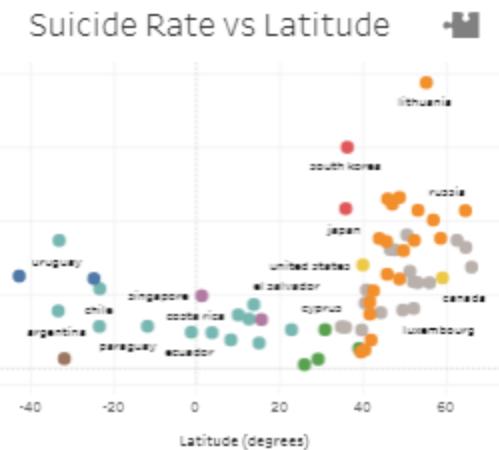
More saturated = bigger



Larger = bigger



Higher = bigger



Key ideas

- 1 Information visualization is a tool that uses our visual perception capacity to digest data and facilitate its understanding.
- 2 Preattentive properties allow maximum efficiency in data communication. Gestalt laws guide perception.
- 3 By combining both we can highlight and relate specific graphs and data.

Sources

- ★ Ware, C. (2020) Information visualization: perception for design. Burlington: Morgan Kaufmann.
- ★ Heeger, D (2006) [Perception Lecture Notes: Retinal Ganglion Cells](#). NY: Department of Psychology, New York University.
- ★ Healey, CG (2012) [Perception in Visualization](#). Department of Computer Science, North Carolina State University.
- ★ Few, S (2012) Show Me the Numbers: Designing Tables and Graphs to Enlighten. Analytics Press.
- ★ van Dijk, D. (2022) [Mind your data visualization](#). Datylon BV.

Thank you for your attention

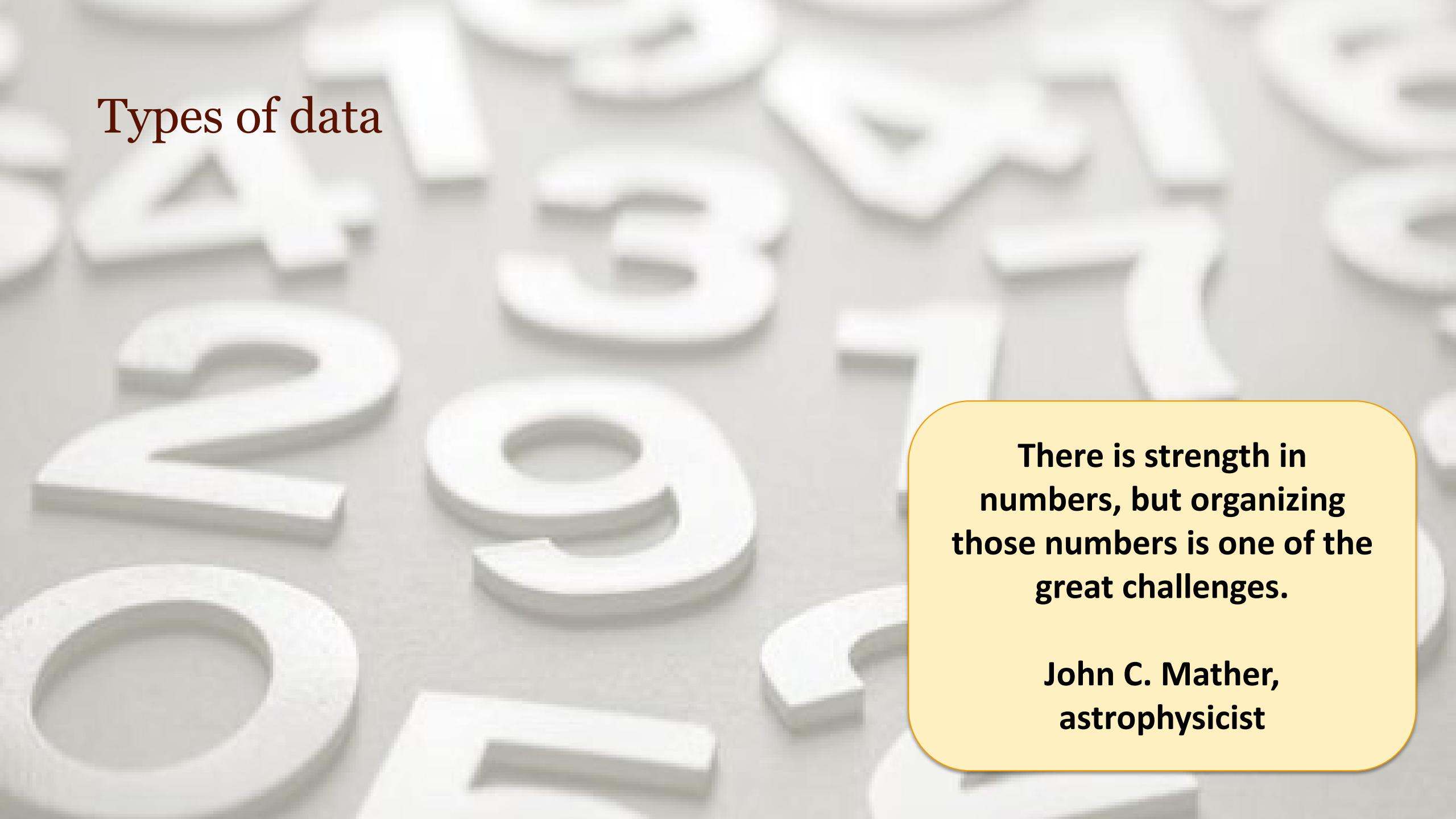


MIREIA RIBERA | ACCESSIBILITAT DIGITAL
| EXPERIÈNCIA D'USUARI
| VISUALITZACIÓ DE DADES



UNIVERSITAT DE
BARCELONA

Types of data



There is strength in numbers, but organizing those numbers is one of the great challenges.

**John C. Mather,
astrophysicist**

Objectives

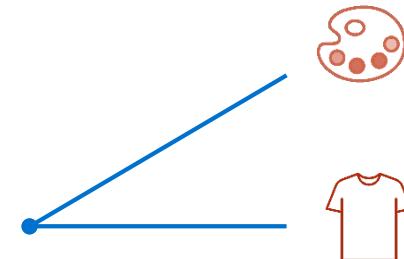
- 1 Know the different types of data.
- 2 Know how to distinguish between absolute distances and distances by convention between values.
- 3 Know how to distinguish between absolute zero values and zero values by convention.
- 4 Understand the different types of order and their relationship to data types.
- 5 Have informed criteria for deciding how to visually encode color data

Data types



Categorical

They classify into groups



Nominal

No order

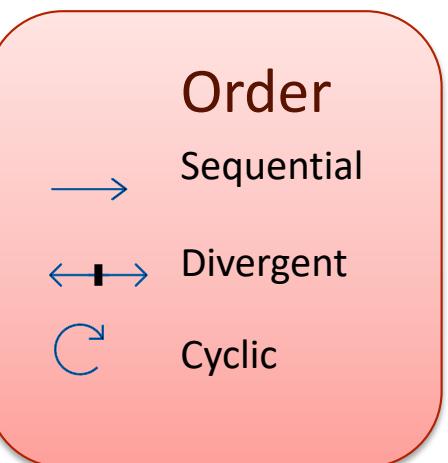
Gender

Eye colour

Ordinal

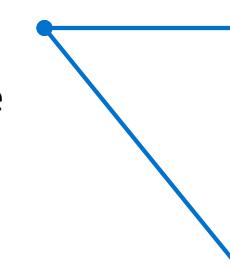
With order

T-shirt size



Numerical

They report a magnitude



Discrete

Integer values

Number of children



Continuous

Float values



0 and distance with meaning

Ratio

Age

Time



0 and meaningless distance

Interval

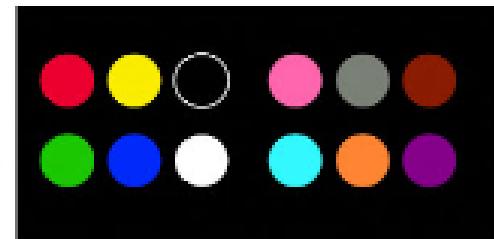
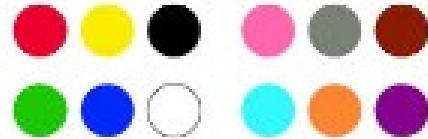
Temperature

Using colour and data types

In ordering:

Higher Saturation = Higher quantity
Darker = Higher

Categorical data. Nominal

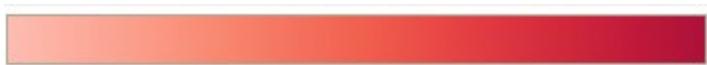


Categorical data. Ordinal



Numerical data. Encoding

Continuous values



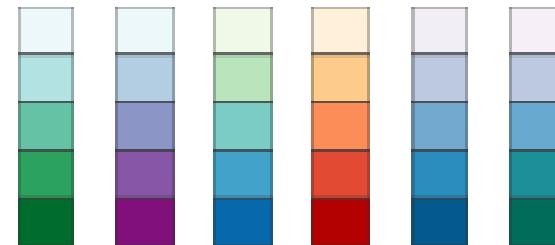
Discrete values



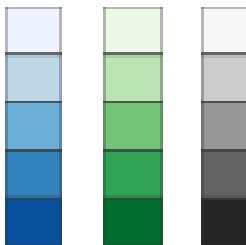
Numerical data or Categorical-Ordinal. Ordering

Sequential: each step differs in saturation or in saturation and lightness.

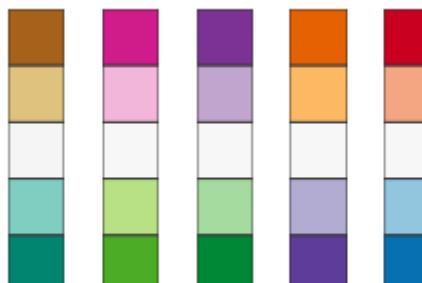
Multi-hue:



Single hue:



Diverging: two hues, a neutral hue in the middle



Source: [Brewer](#)

Key ideas

- 1 The selection of a chart depends on the type of data.
- 2 Although formally two values are numerically encoded in a similar way, their meaning can be very different. Graphical representation should represent meaning.
- 3 Data types are key to deciding how to operate or aggregate our values.

Bibliography

- ★ Frost, J. (2020) Introduction to Statistics: An intuitive guide for analysing data and unlocking discoveries. 1st ed. Pennsylvania: Jim Publishing.

- ★ Brewer C. [Color Brewer 2.0](#)

Thanks you for your attention



MIREIA RIBERA | ACCESSIBILITAT DIGITAL
| EXPERIÈNCIA D'USUARI | VISUALITZACIÓ DE DADES



UNIVERSITAT DE
BARCELONA

Presentation and Visualization. Perception (II)

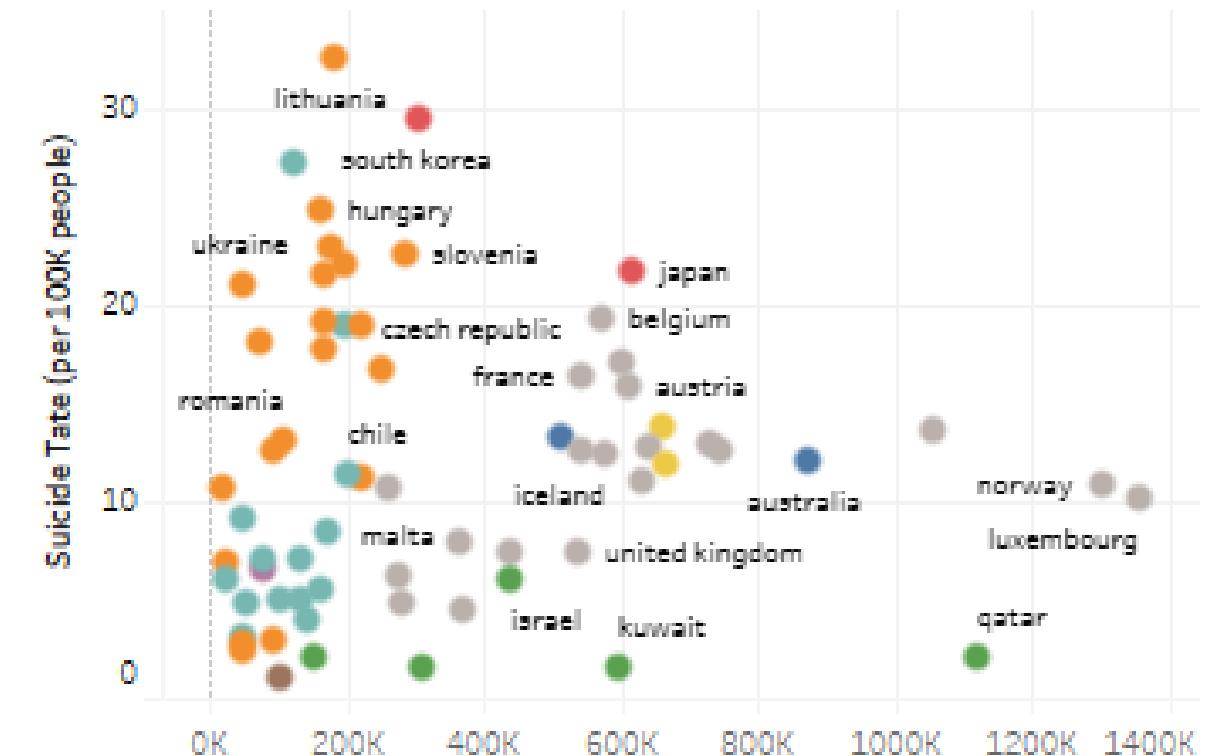


Perception for design

Encoding Guidelines

by Colin Ware “Perception for design”

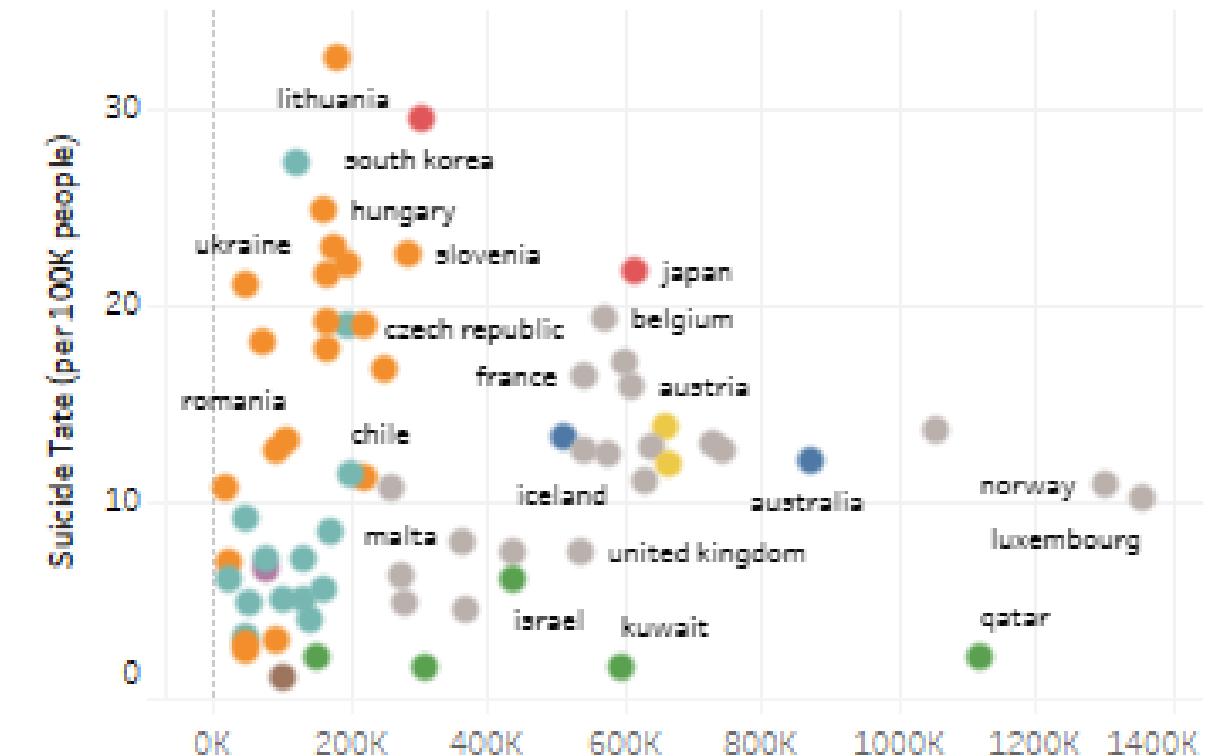
G5.2 “Use different visual channels to display aspects of data so that they are visually distinct”.



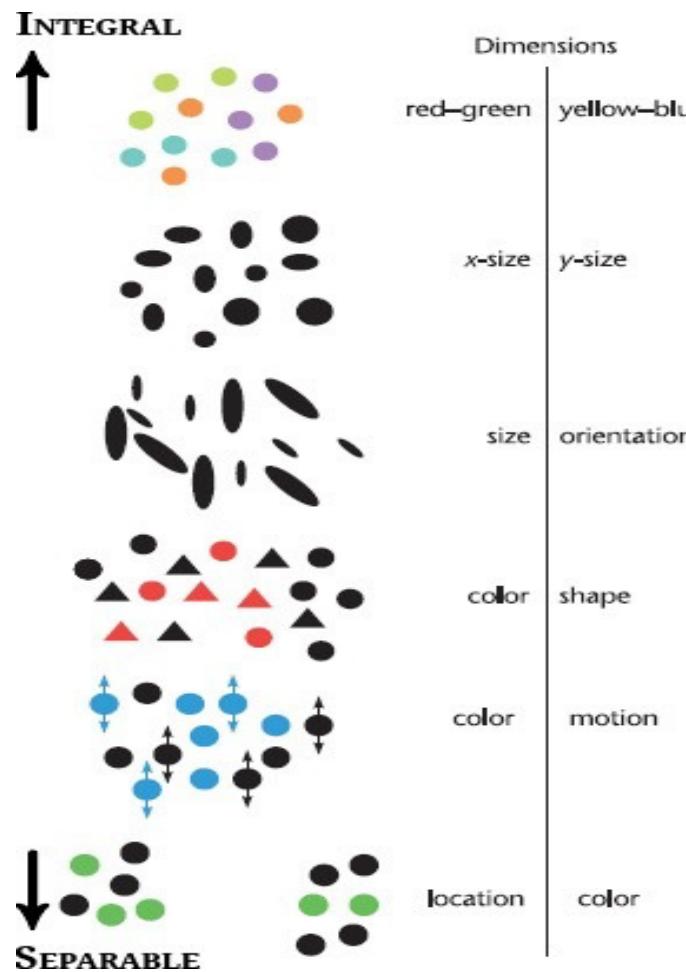
Encoding Guidelines

G5.14 “If it is important for people to **respond holistically** to a combination of two variables in a set of glyphs, map the variables to **integral glyphs** properties”.

G5.15 “If it is important for people to **respond analytically** to a combination of variables, making separate judgments on the basis of one variable or the other, map the variables to **separable glyph** properties”.



Separable vs Integral Glyph properties



- **Integral** dimensions are seen together
- **Separable** dimensions are seen separately

Encoding Guidelines

G5.7 “For **maximum pop out** a symbol should be the **only object** in a display that is **distinctive** on a particular feature channel; for example, it might be the only item that is coloured in a display where everything else is black and white”.

Benefits of slide software:

Visual: Visualizing information helps your readers see what you're explaining.

Versatile: It incorporates photos, illustrations, sketches, and even video if it's posted online.

Interactive: You can embed links and jump around the document itself or out to the Internet.

Tablet-ready: Its aspect ratio makes it easy to load onto devices.

Spreadable: Its modular nature allows slides to be incorporated into other decks and spread it throughout the organization.

Shareable: Platforms like SlideShare™ make it embeddable and shareable.

Encoding Guidelines

G5.8 “Use **positively asymmetric** preattentive cues for **highlighting**”.

Benefits of slide software:

Visual: Visualizing information helps your readers see what you're explaining.

Versatile: It incorporates photos, illustrations, sketches, and even video if it's posted online.

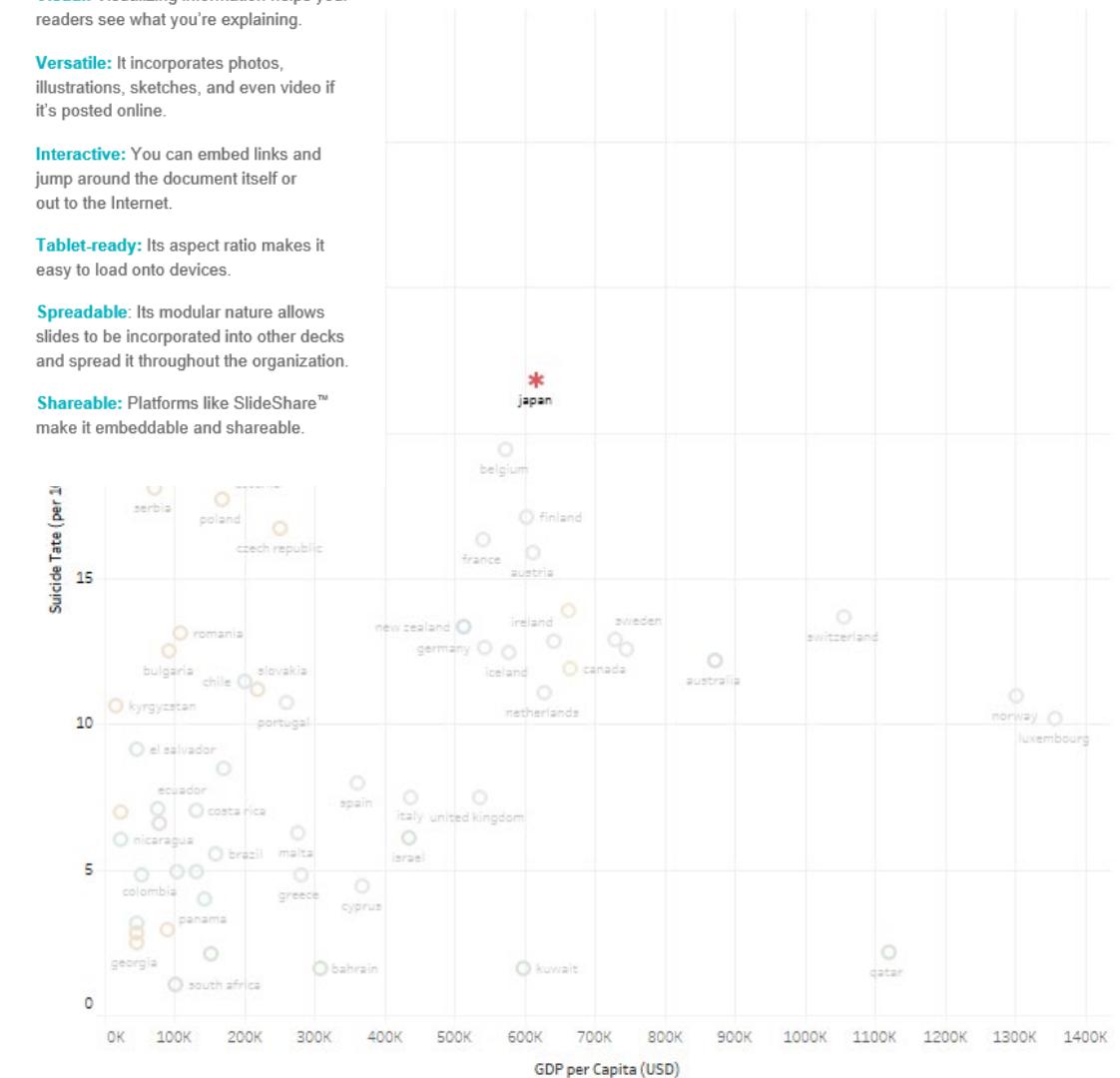
Interactive: You can embed links and jump around the document itself or out to the Internet.

Tablet-ready: Its aspect ratio makes it easy to load onto devices.

Spreadable: Its modular nature allows slides to be incorporated into other decks and spread it throughout the organization.

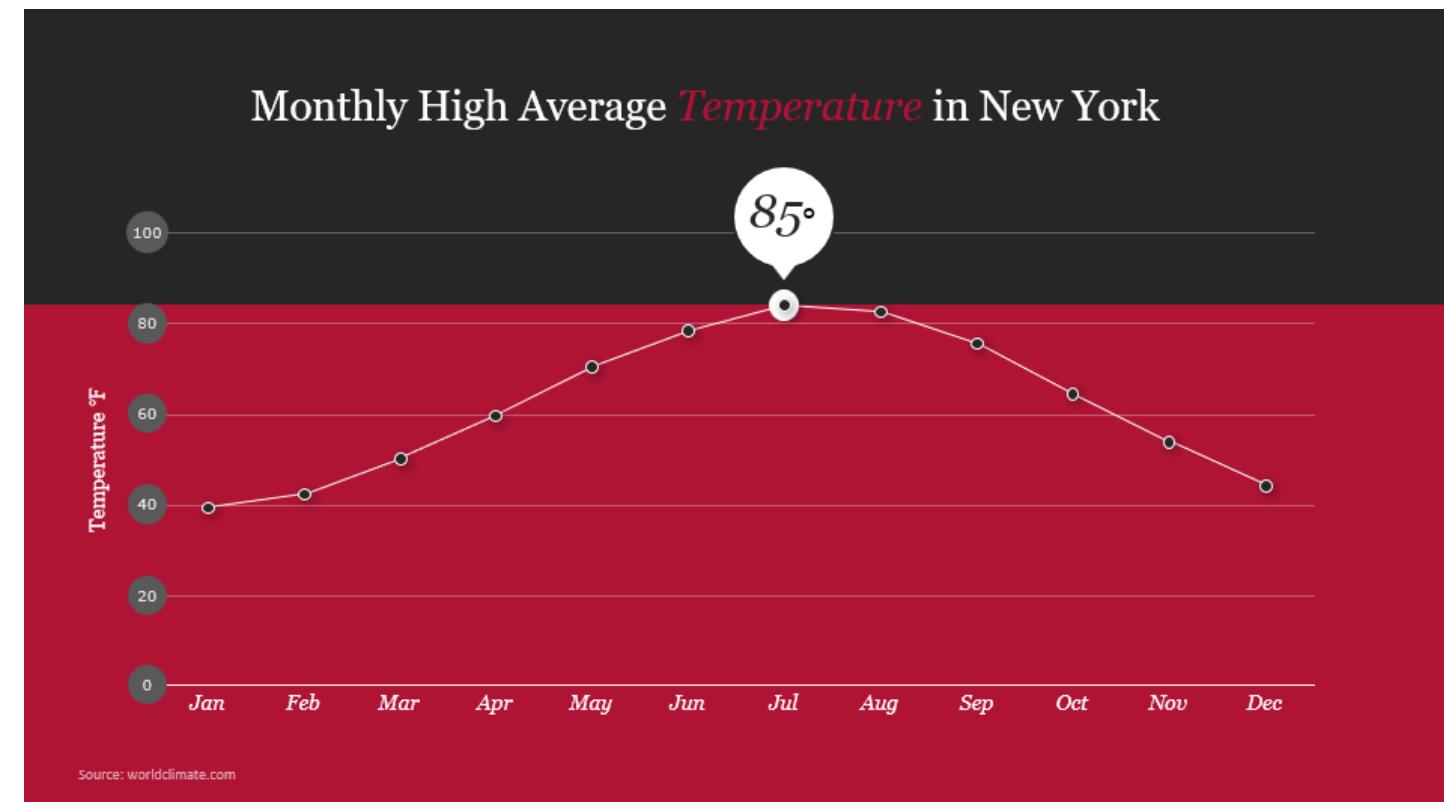
Shareable: Platforms like SlideShare™ make it embeddable and shareable.

SUICIDE RATE VS GDP PER CAPITA



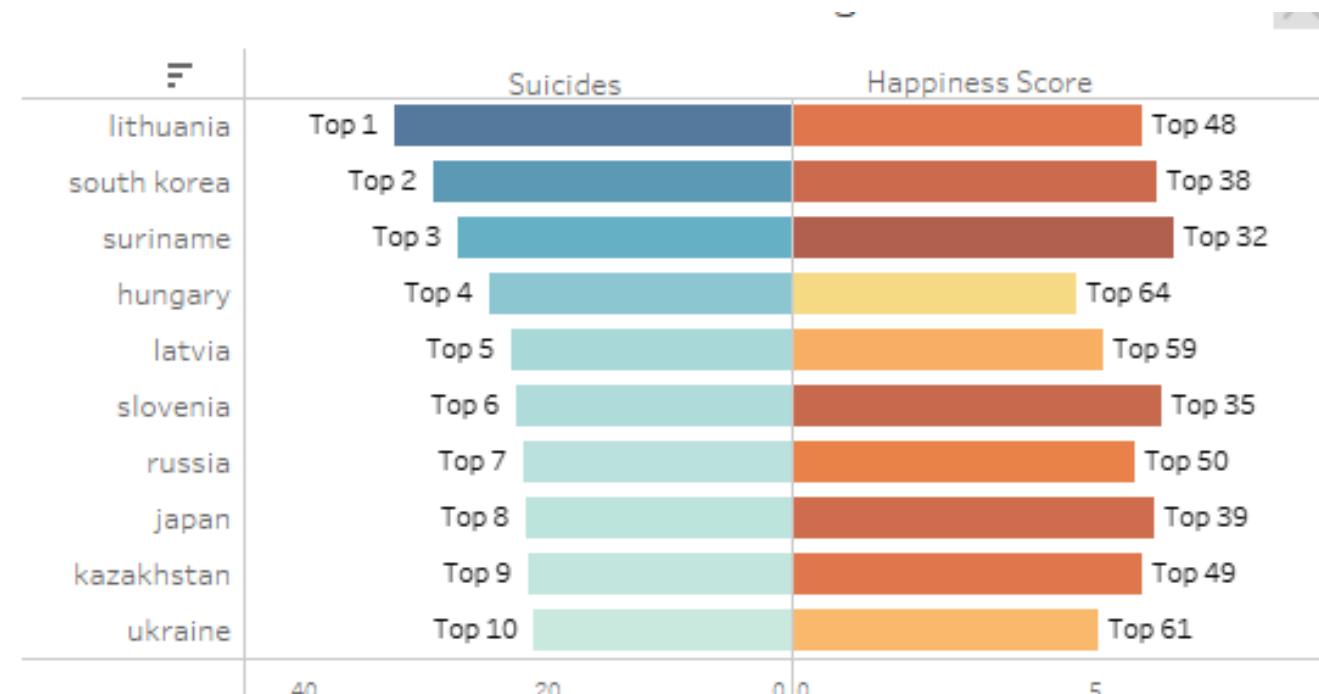
Encoding Guidelines

G5.9 “For highlighting,
use whatever feature
dimension **is used least** in
other parts of the design”.



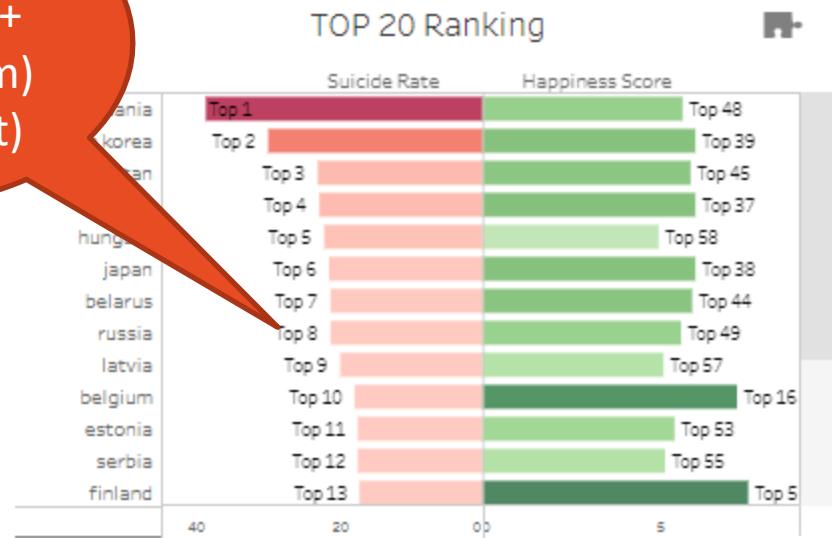
Encoding Guidelines

G5.11 “To make symbols in a set **maximally distinctive**, use **redundant coding** wherever possible; for example, make symbols differ in both shape and color”.

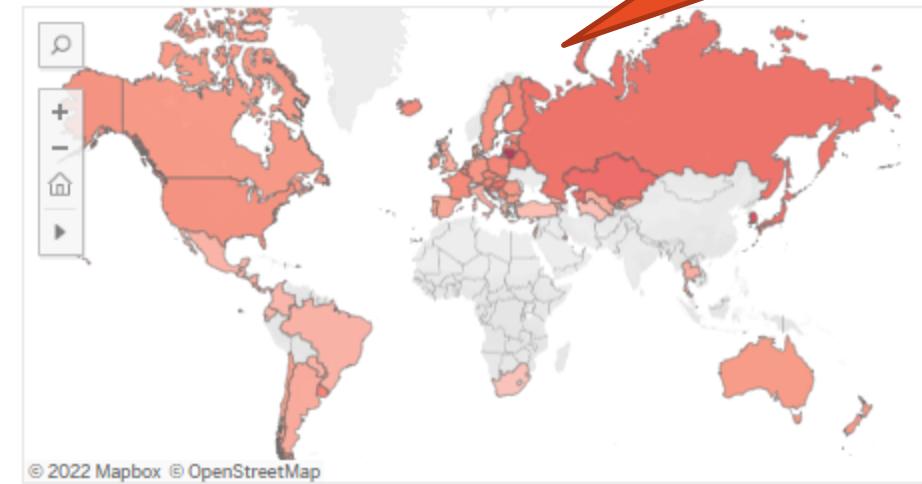


Presentation and Visualization

Color (Hue + Intensity) + length(Form) (redundant)

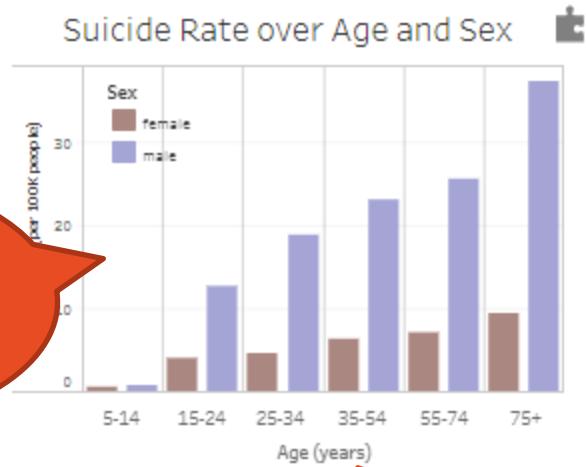


Suicide Rate over the World



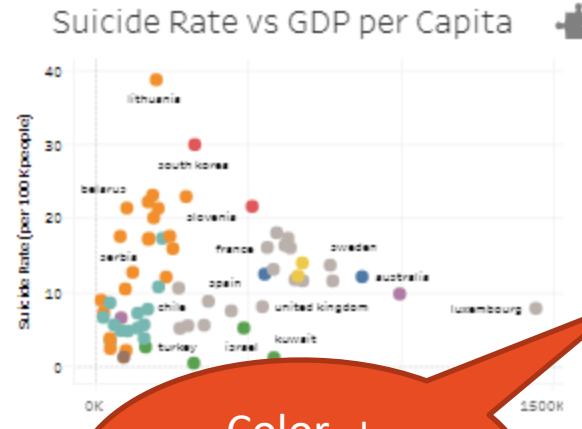
Color (Saturation + Luminosity) = Intensity

Color + length (Form) (separable)

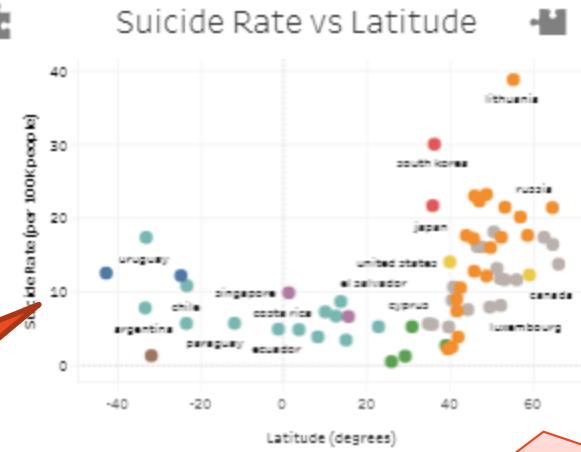


What do women...? What age ...?

Color + Position (separable)

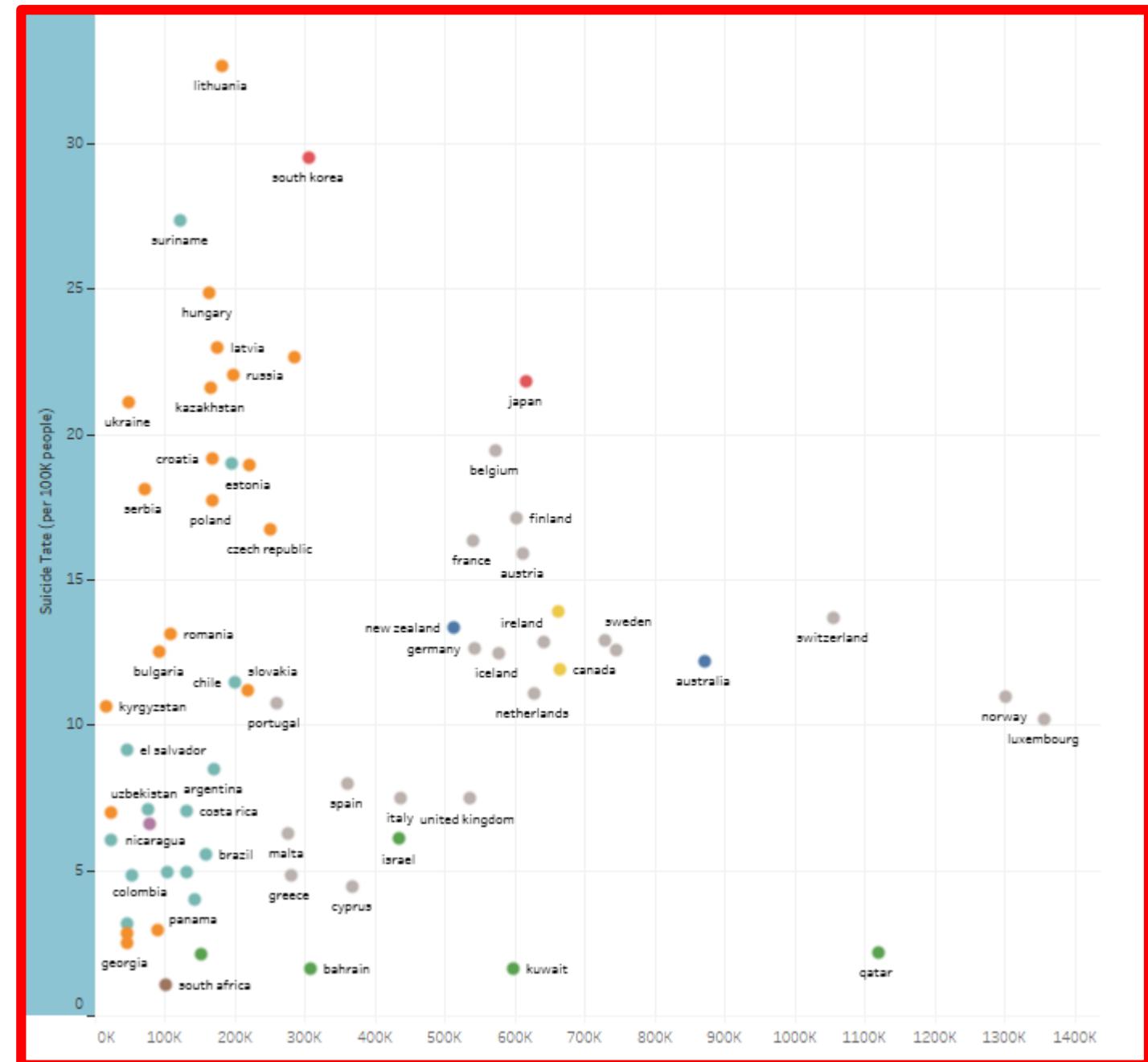


How is Central and Eastern Europe GDP and suicide rate?



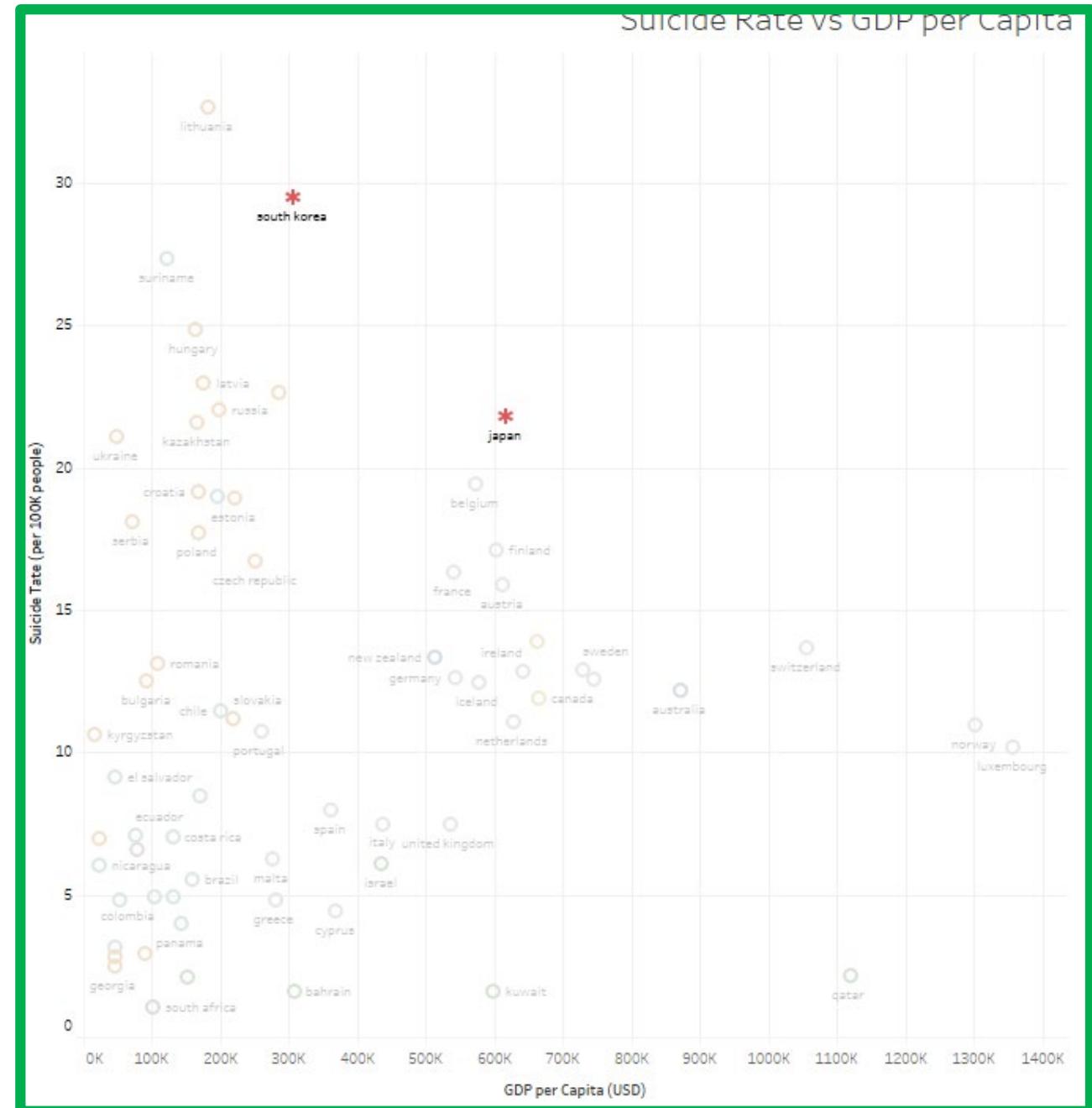
Encoding Guidelines

G5.3 “To make **symbols** easy to find, make them **distinct** from their background and from other symbols”.



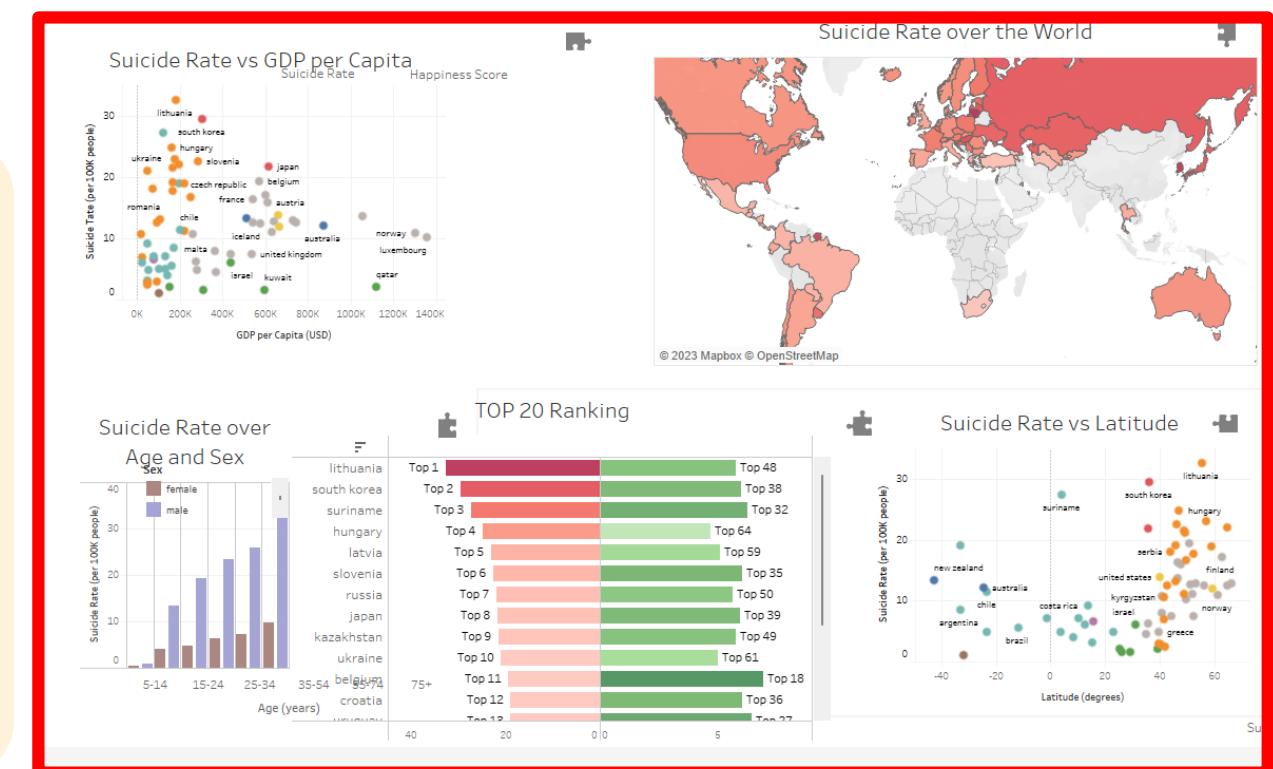
Encoding Guidelines

G5.3 “To make **symbols** easy to find, make them distinct from their background and from other symbols”.



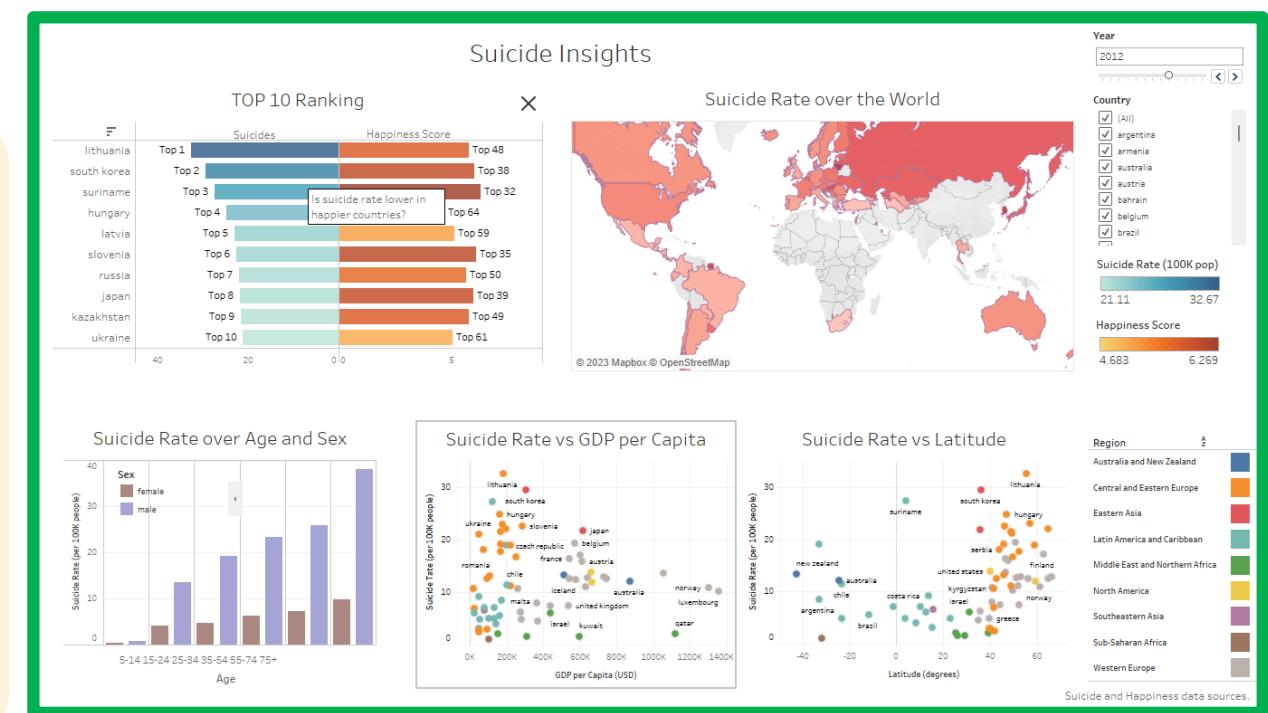
Encoding Guidelines

G6.1 “Place symbols and glyphs representing related information close together”.



Encoding Guidelines

G6.1 “Place symbols and glyphs representing related information close together”.



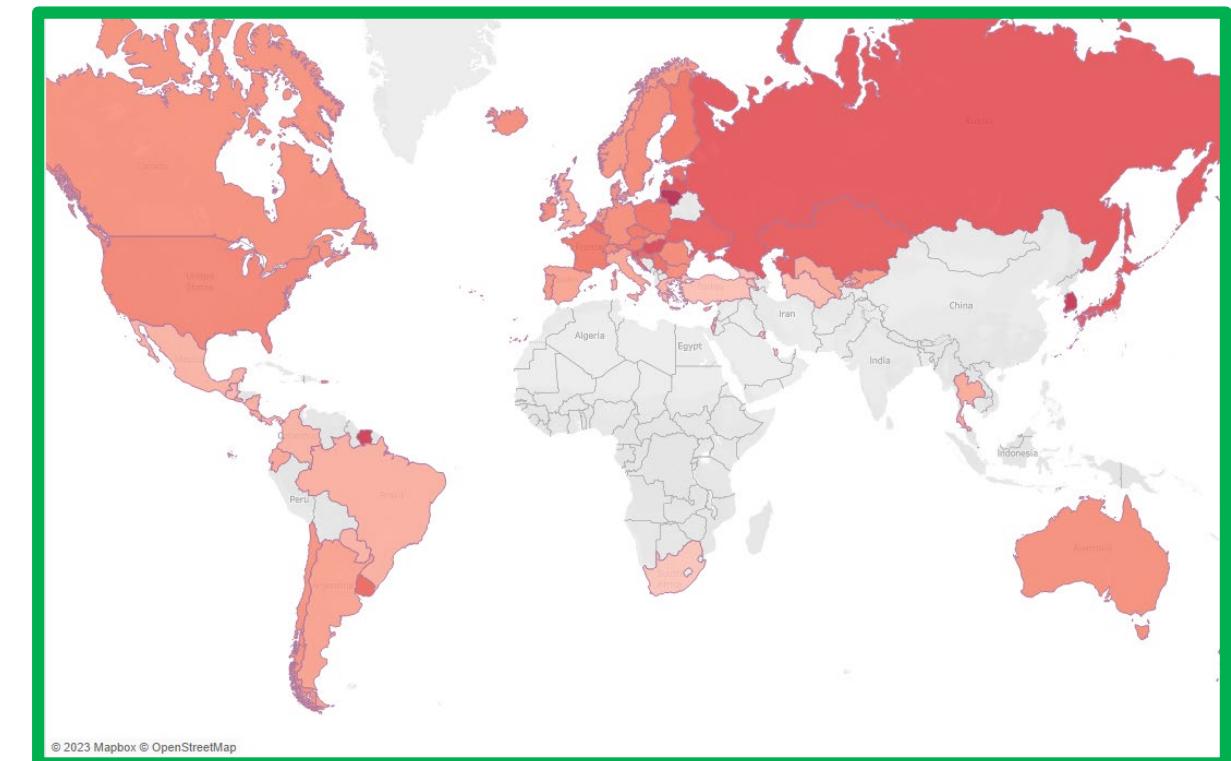
Encoding Guidelines

G6.2 “When designing a **grid layout** of a data set, consider coding rows and/or columns using low-level visual channel properties, such as **colour** and **texture**”.



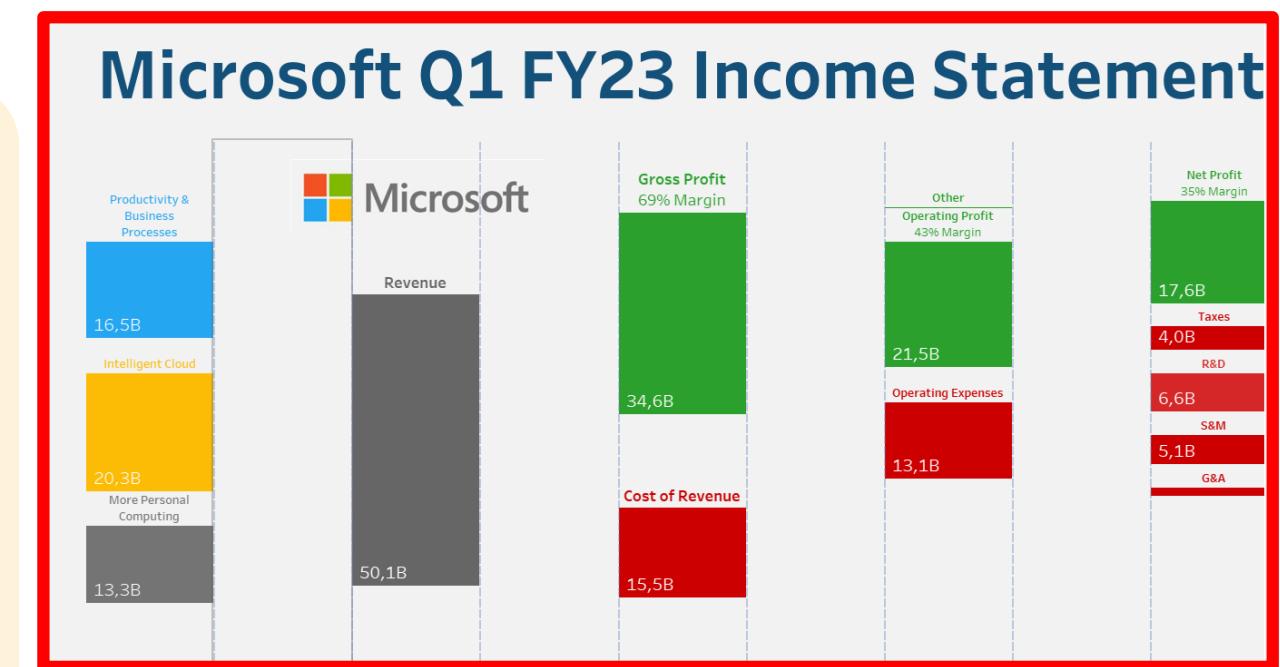
Encoding Guidelines

G6.2 “When designing a **grid layout** of a data set, consider coding rows and/or columns using low-level visual channel properties, such as **colour** and **texture**”.



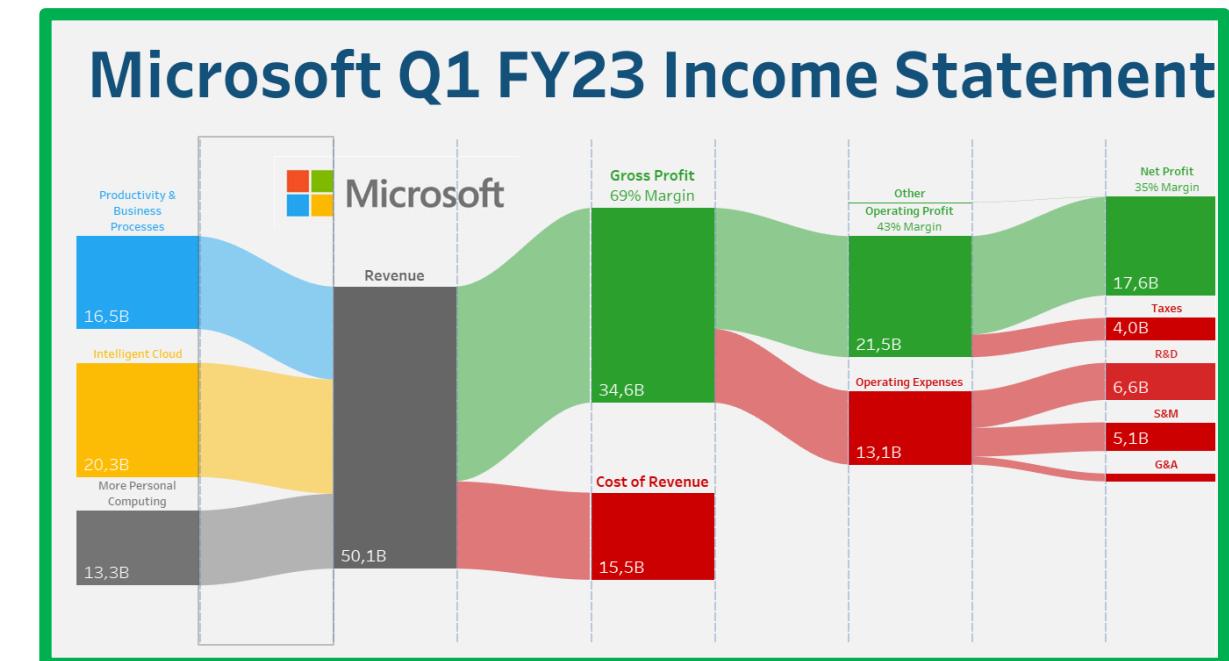
Encoding Guidelines

G6.3 “To show **relationships** between entities, consider linking graphical representations of data objects **using lines or ribbons of colour**”.



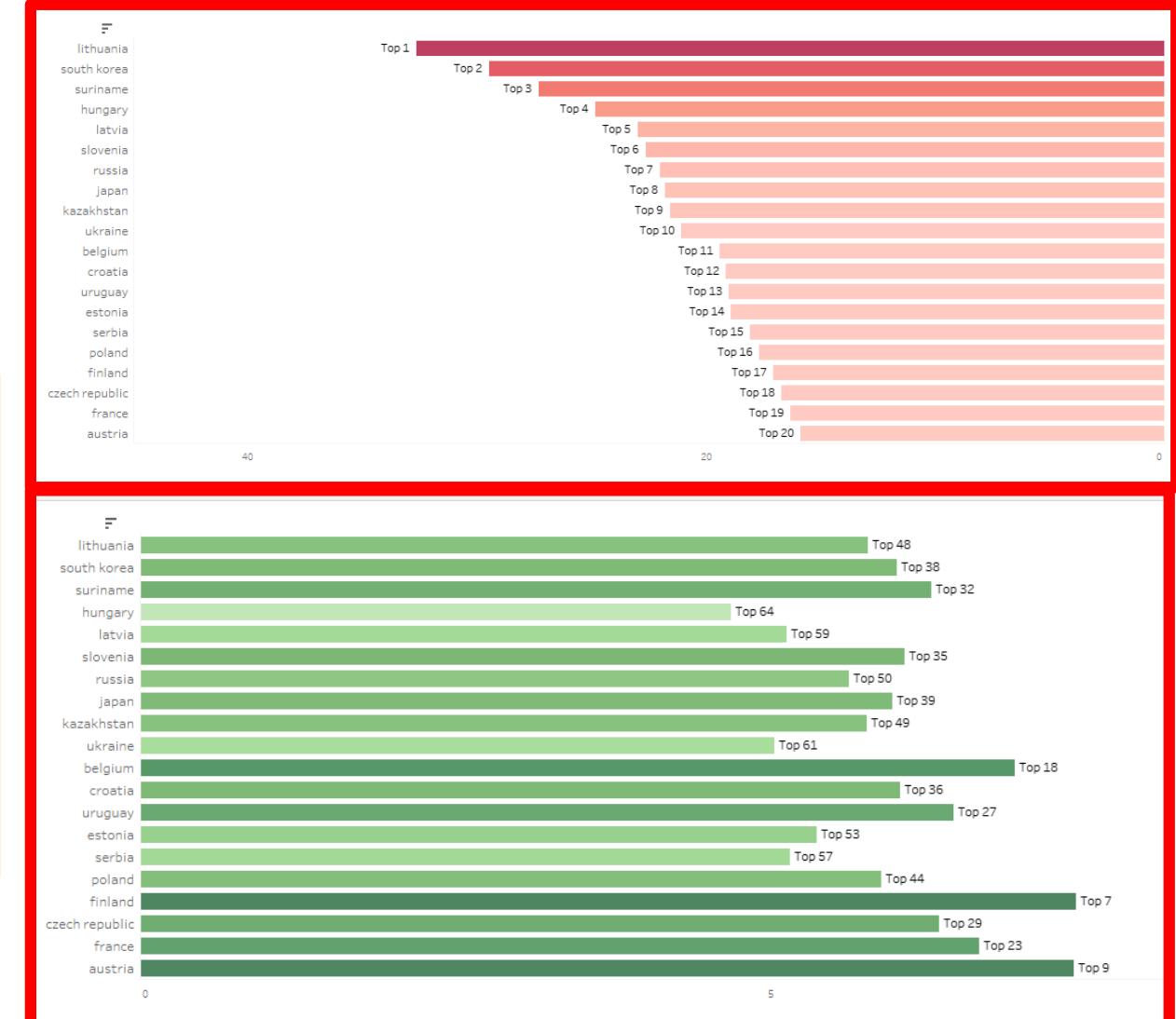
Encoding Guidelines

G6.3 “To show **relationships** between entities, consider linking graphical representations of data **objects** using **lines or ribbons** of colour”.



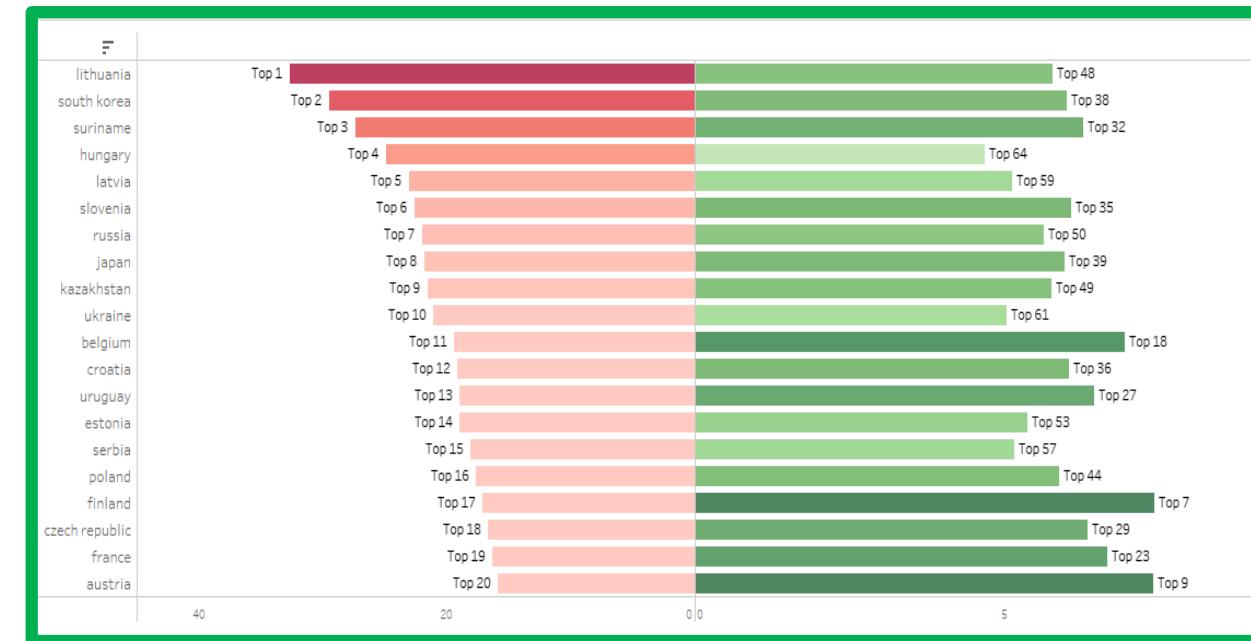
Encoding Guidelines

G6.4 “Consider using **symmetry** to make **pattern comparisons** easier. Symmetrical relations should be arranged on horizontal or vertical axes unless some framing pattern is used”.



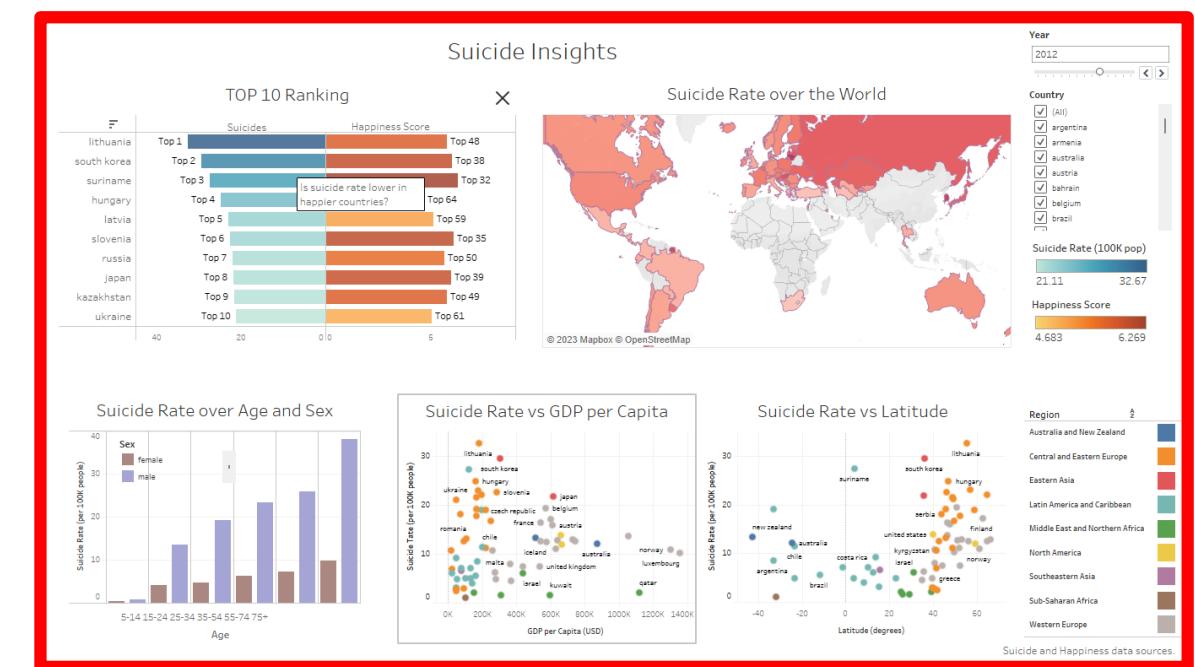
Encoding Guidelines

G6.4 “Consider using **symmetry** to make **pattern comparisons** easier. Symmetrical relations should be arranged on horizontal or vertical axes unless some framing pattern is used”.



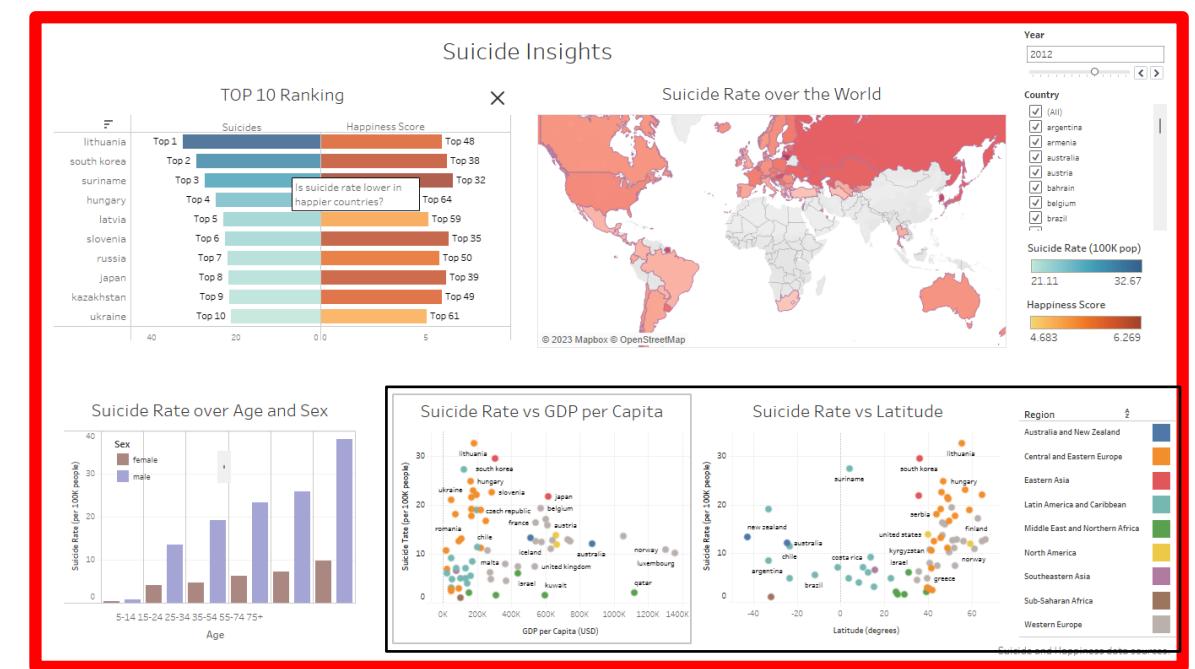
Encoding Guidelines

G6.5 “Consider putting **related information inside a closed contour**. A line is adequate for regions having a simple shape. Colour or texture can be used to define regions that have more complex shapes”.



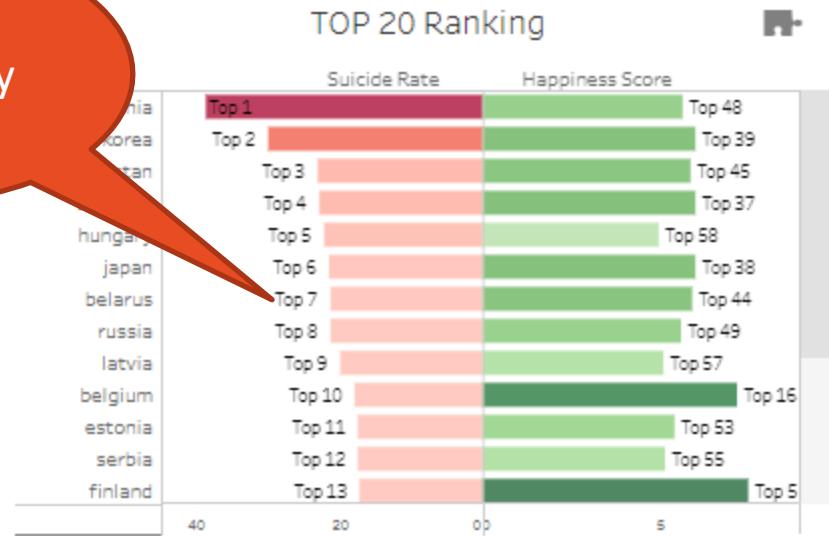
Encoding Guidelines

G6.5 “Consider putting **related information inside a closed contour**. A line is adequate for regions having a simple shape. Colour or texture can be used to define regions that have more complex shapes”.

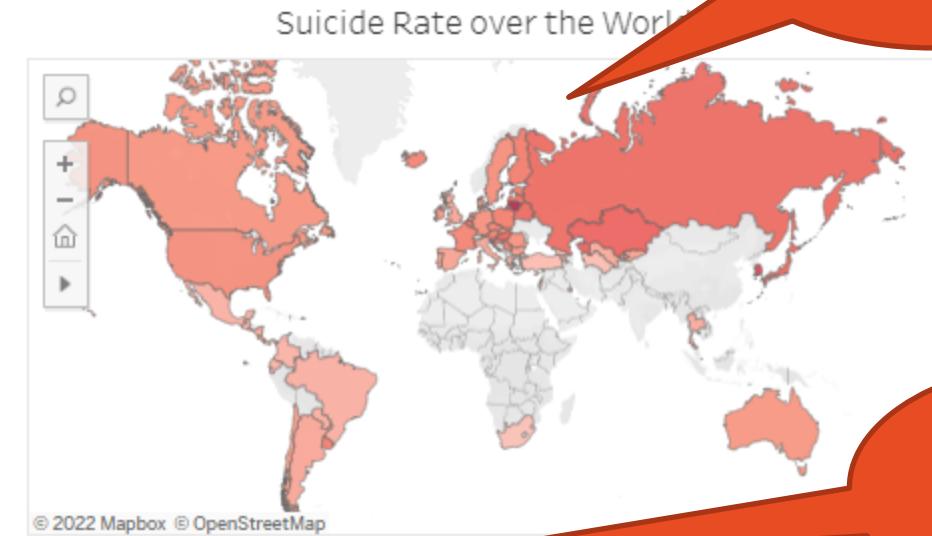


Presentation and Visualization

Symmetry



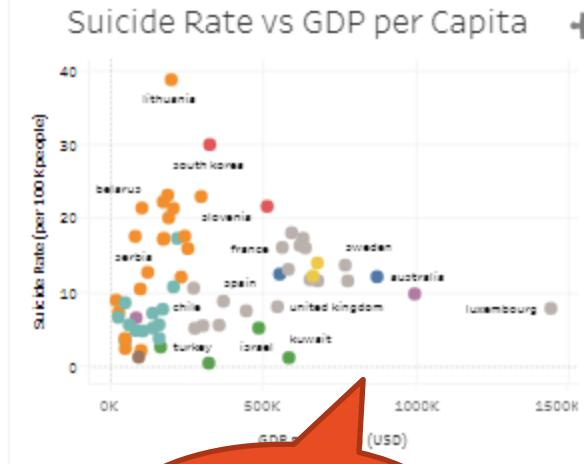
Similarity



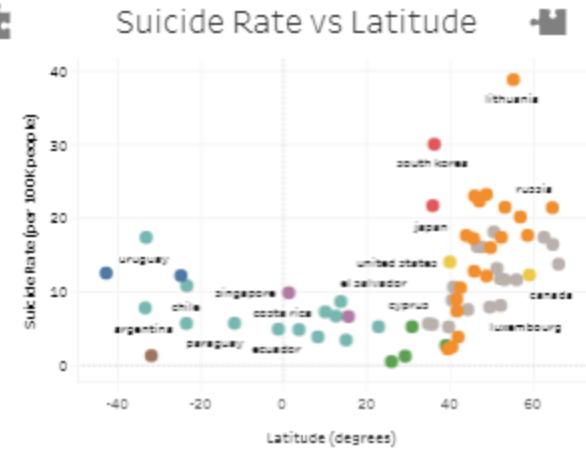
Closure



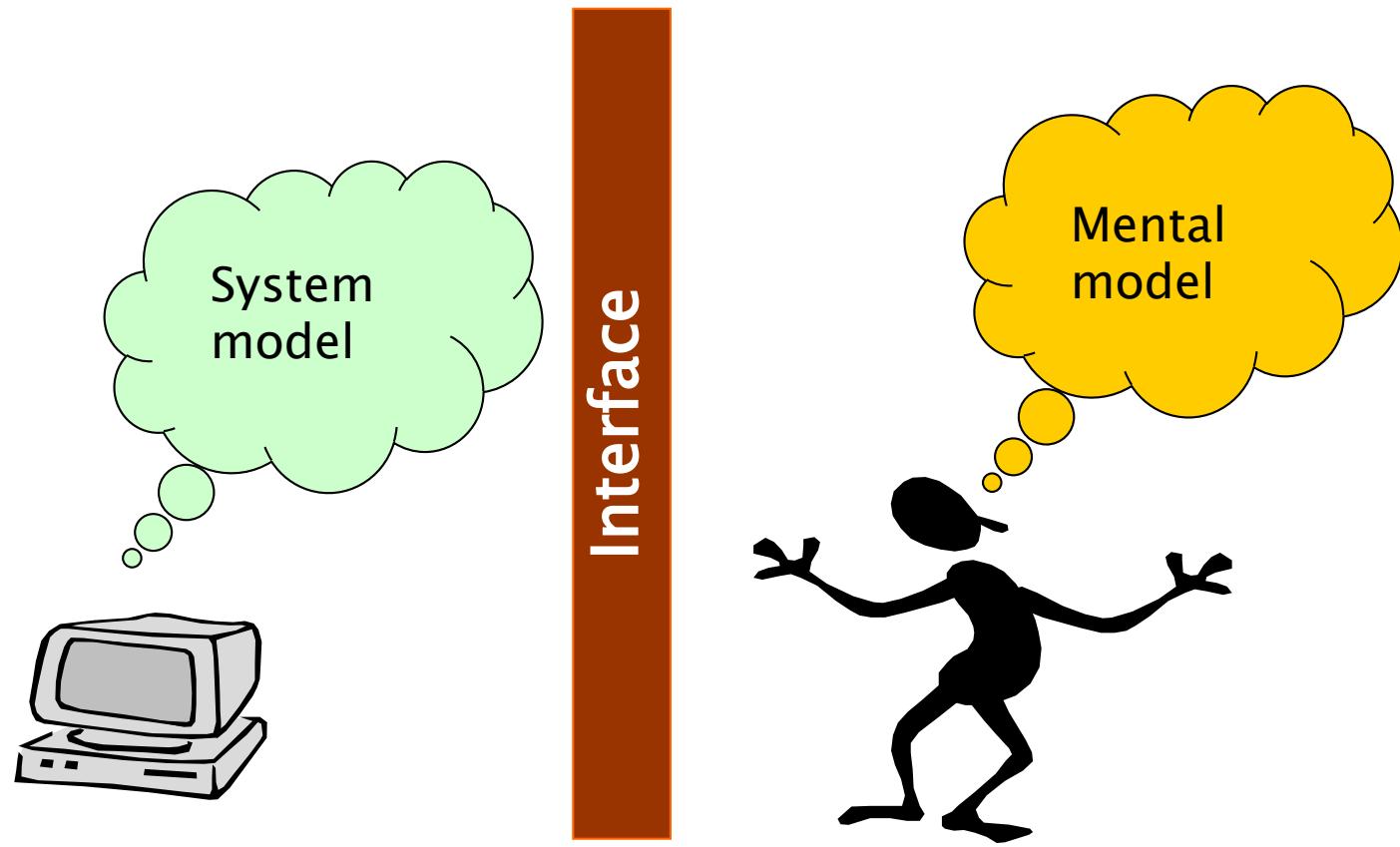
Similarity



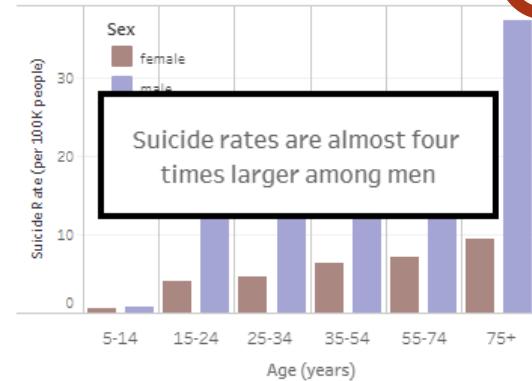
Proximity



Mental models

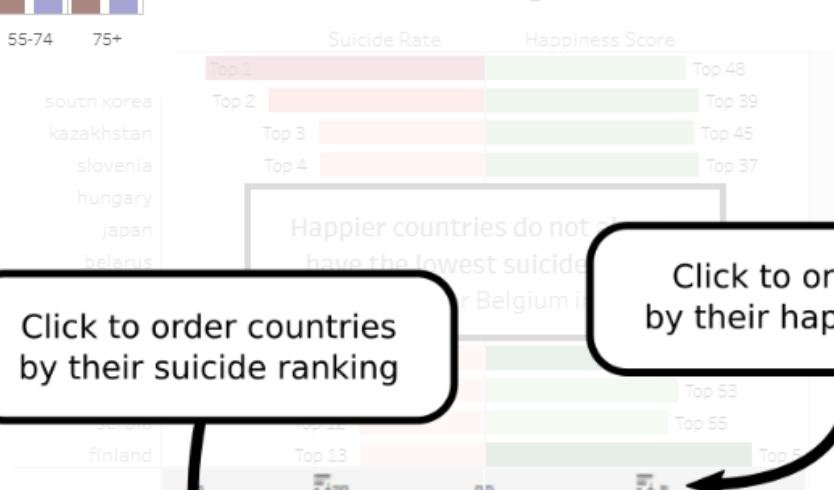


Suicide Rate over Age and Sex



TOP 20 Ranking

Click to order countries by their suicide ranking



Suicide Insights



Slide to the leftmost part to see the average of all years



Select a country

Suicide Rate over Age and Sex



Suicide Rate (per 100K people)



Click on a puzzle piece for data insight

Suicide Rate vs GDP per Capita



Suicide Rate (per 100K people)



Suicide Rate vs Latitude



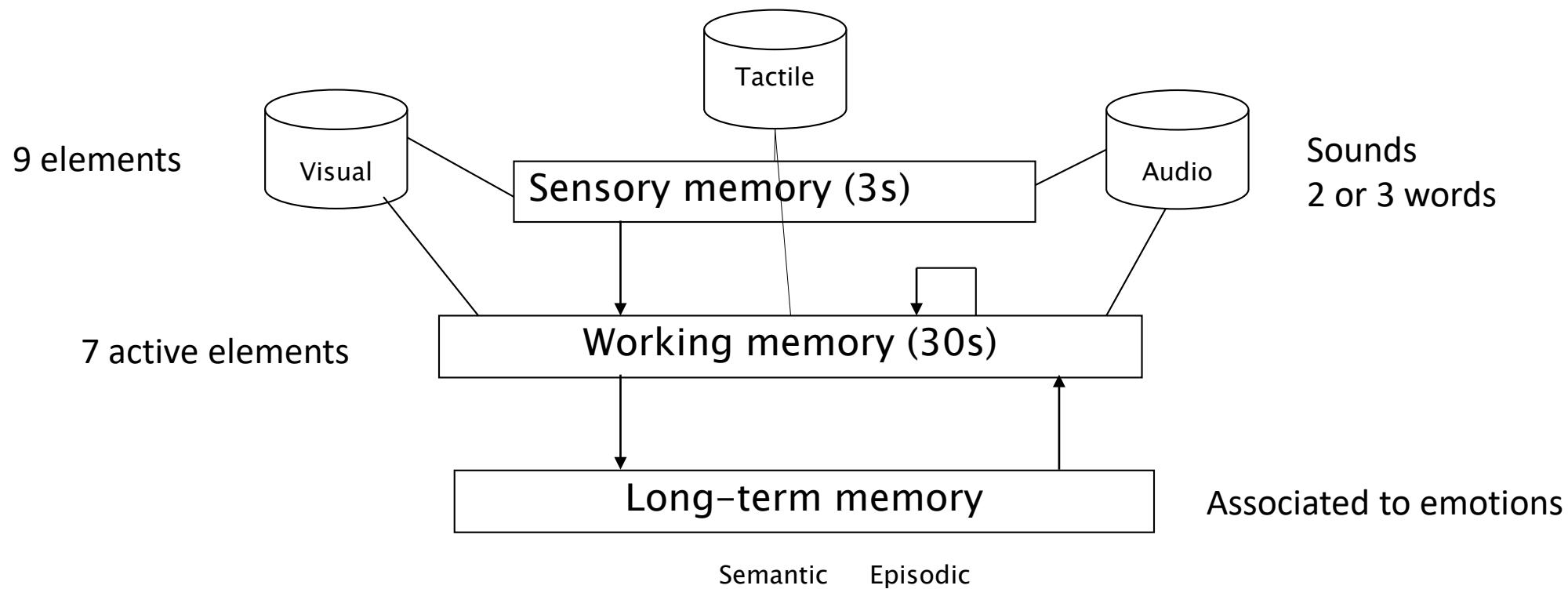
Suicide Rate (per 100K people)



Select a region

Close Help

Memory



Source: Cañas

Try to remember

72410358291064351290

498 745 970 231 443 671 88

What do you have to take first on an ATM: money or card? Why?

Design principles

- Design based on recognition, not recall
- 7 ± 2
- Long tasks in small steps
- Avoid interferences within a channel, enrich with different channels

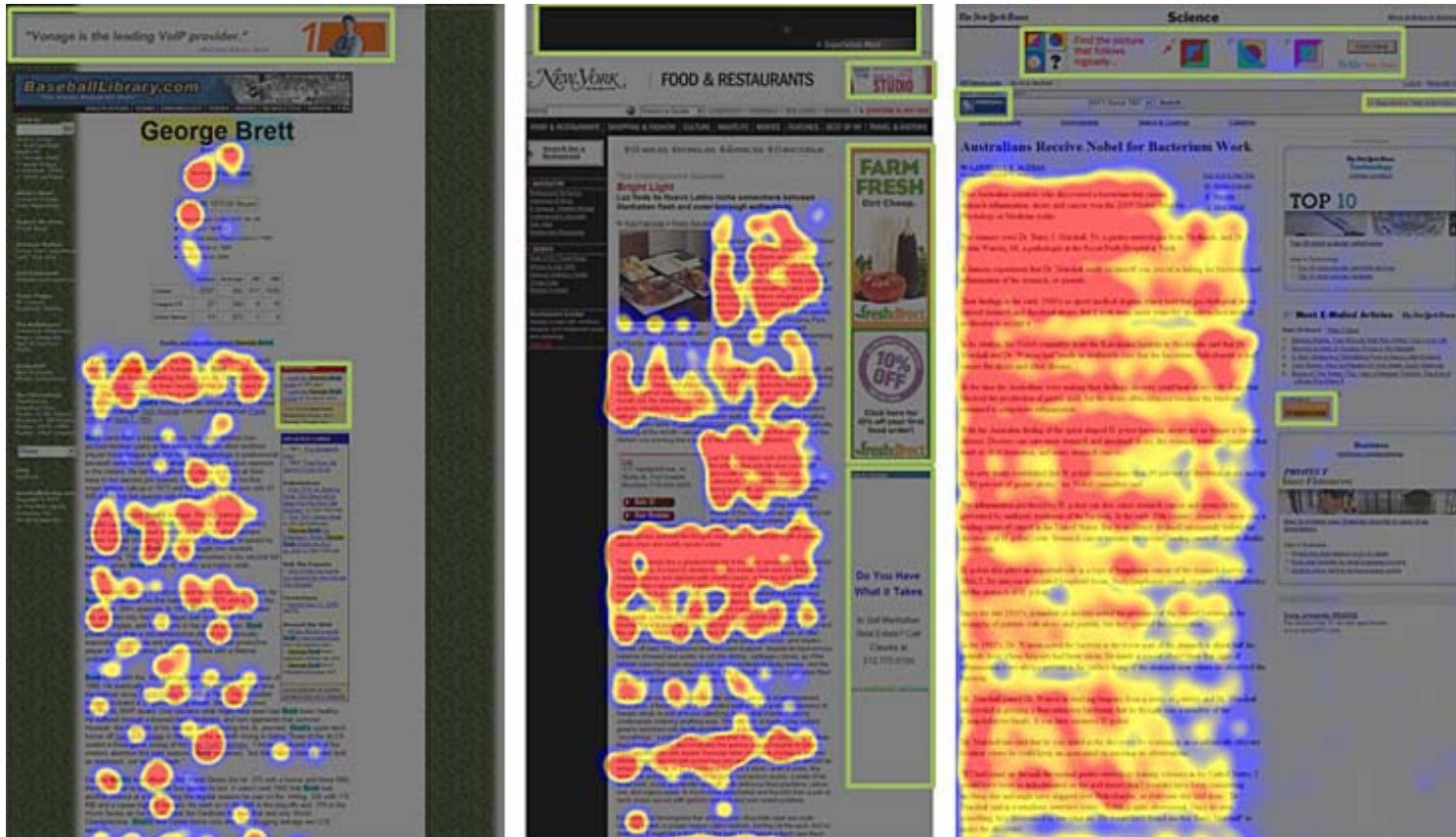
Attention

- Focused attention
 - All our attention in one event
- Divided attention
 - Our attention shifts between two or more events
 - Be careful with balance and interferences

Design principles

- Important information should receive focused attention, it shall appear in preeminent locations and have visual salience
- Secondary information may be on secondary locations or hidden, only visible on demand

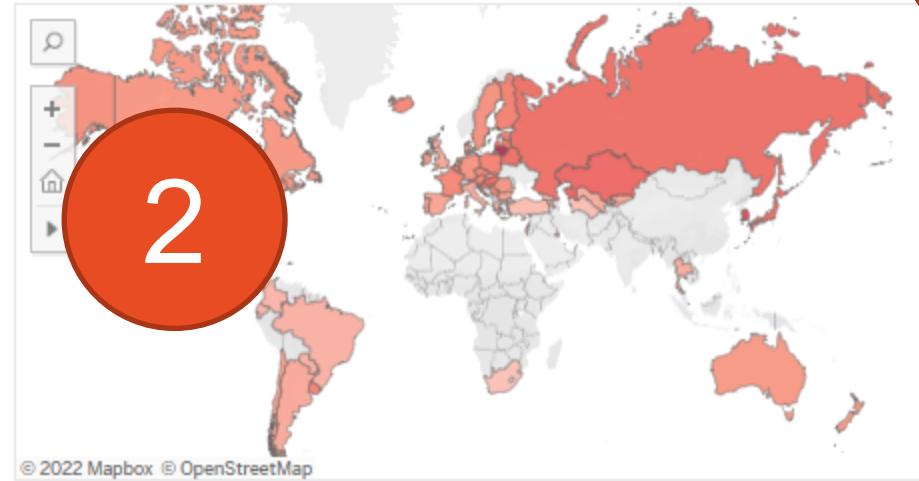
Selective attention and reading patterns



Source: <https://www.nngroup.com/articles/banner-blindness-old-and-new-findings/>

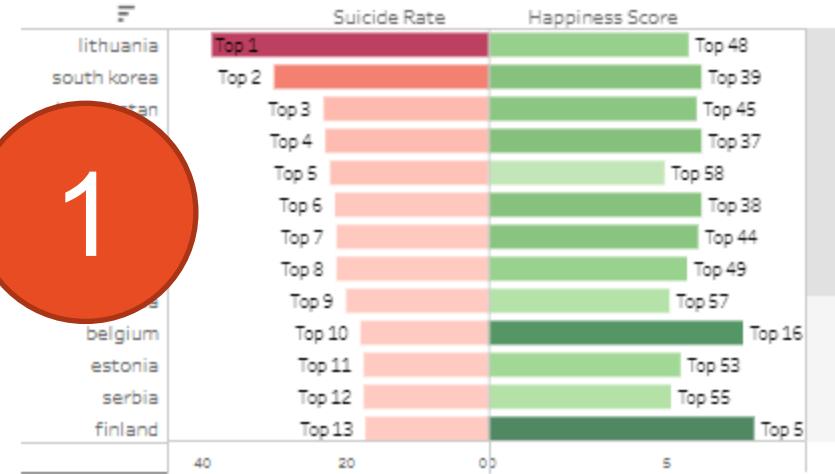
5

Suicide Rate over the World

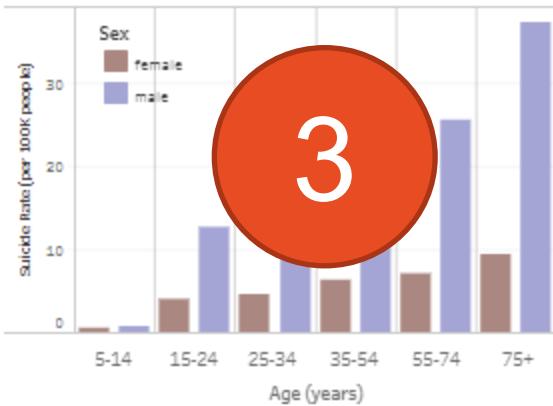


2

TOP 20 Ranking

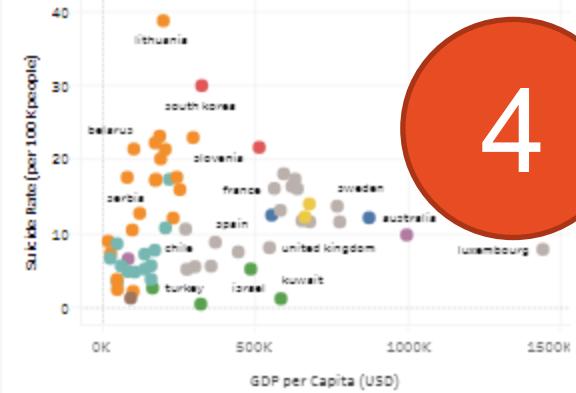


Suicide Rate over Age and Sex



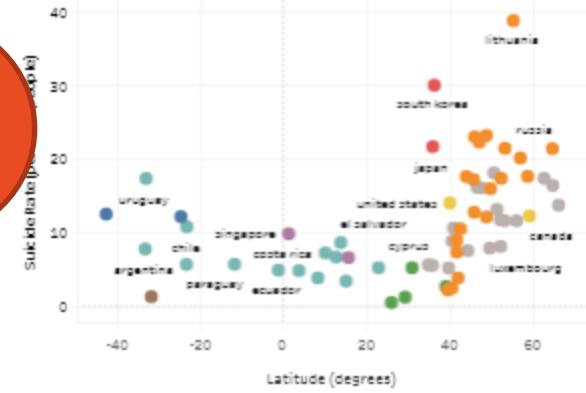
3

Suicide Rate vs GDP per Capita



4

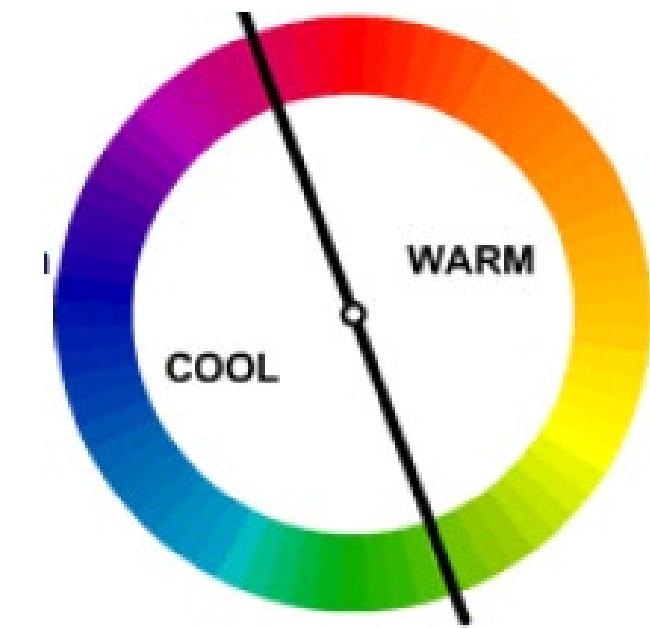
Suicide Rate vs Latitude



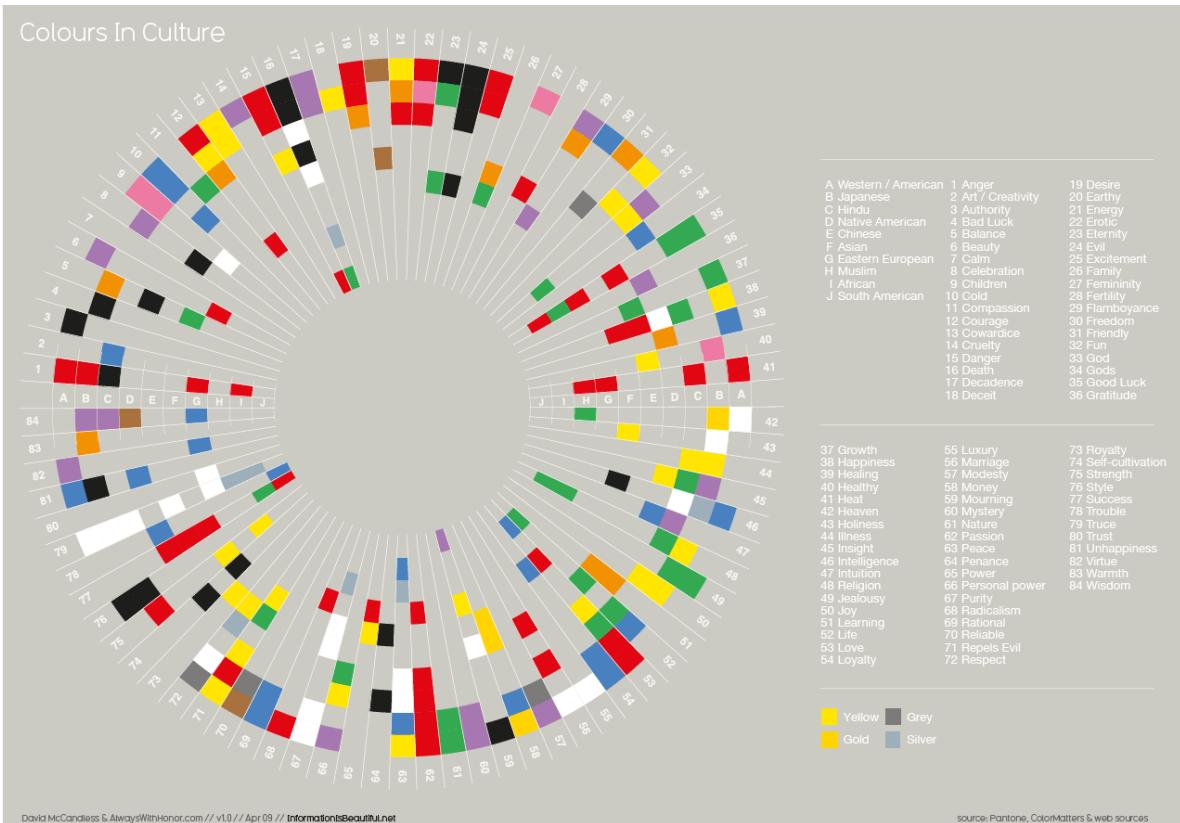
Colour

Colour affect our moods

- Colours affect us in numerous ways, both mentally and physically
- We can divide colours into warm and cool
 - Warm colours are energetic, and tend to advance in space.
 - Cool colours give calm, and tend to work better as background.



Colour meaning is a cultural issue

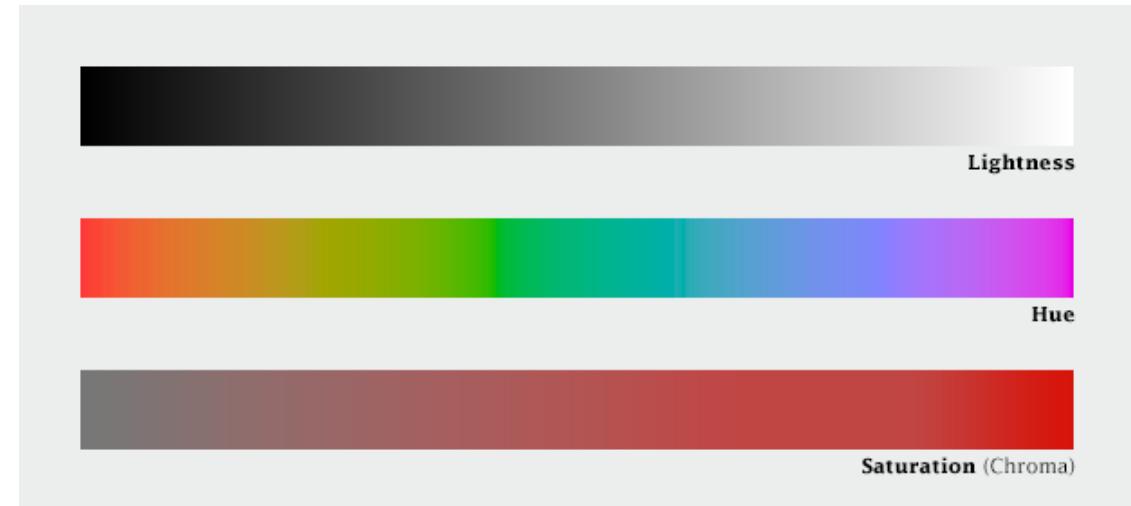


Specification of colors: perceptual dimensions

HSL: Hue Saturation Lightness

- Luminance / Lightness / Value : (it is relative) how much light appears to reflect an object in relation to the White on the scene
- Hue : what we associate to colour names
- Saturation (Chroma): Purity of the colour (vividness)

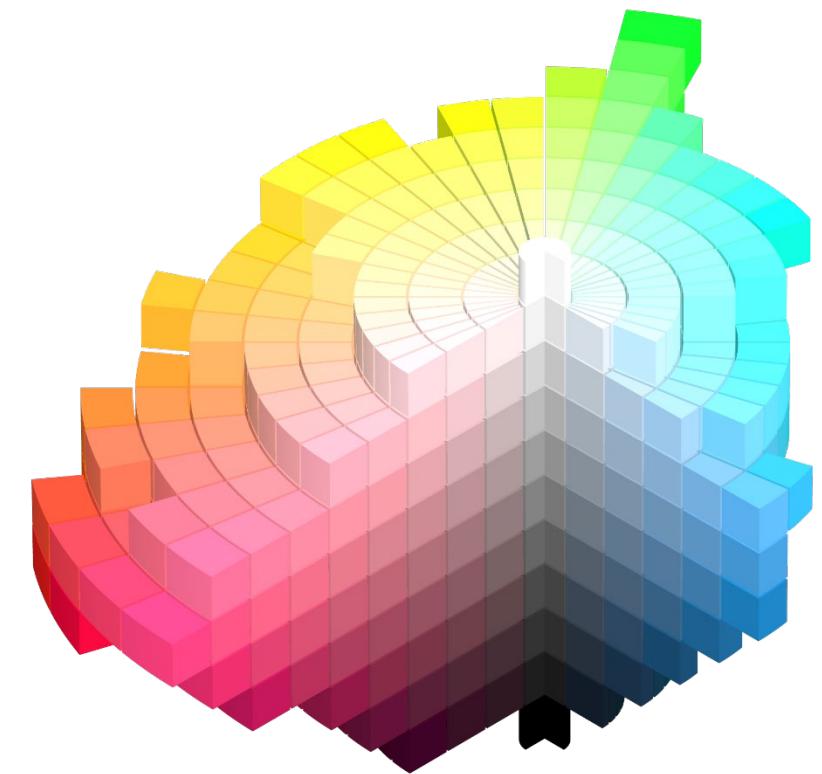
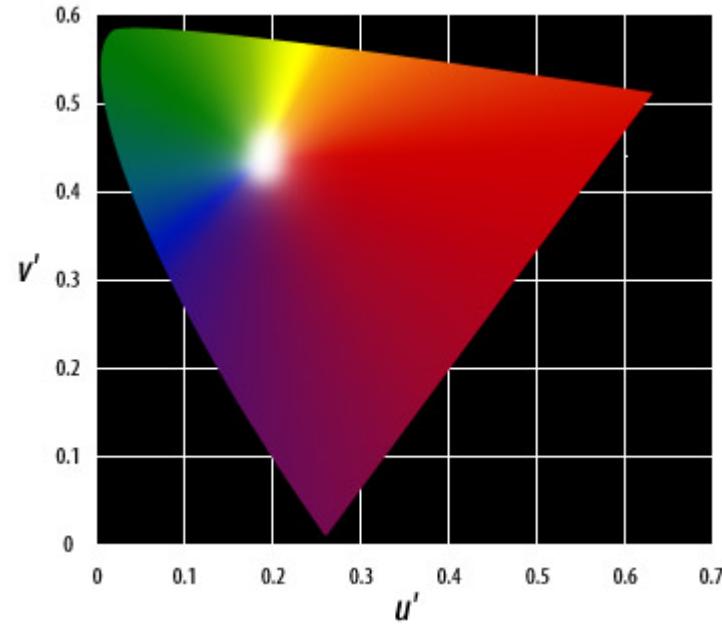
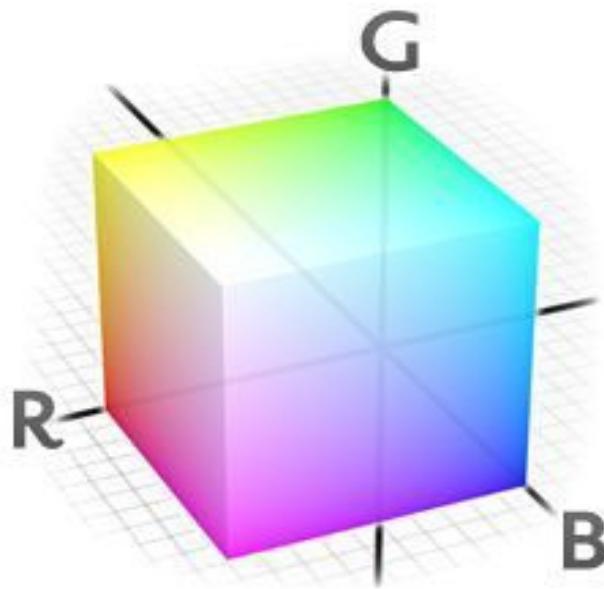
HSV or HSB (Value / Brightness)



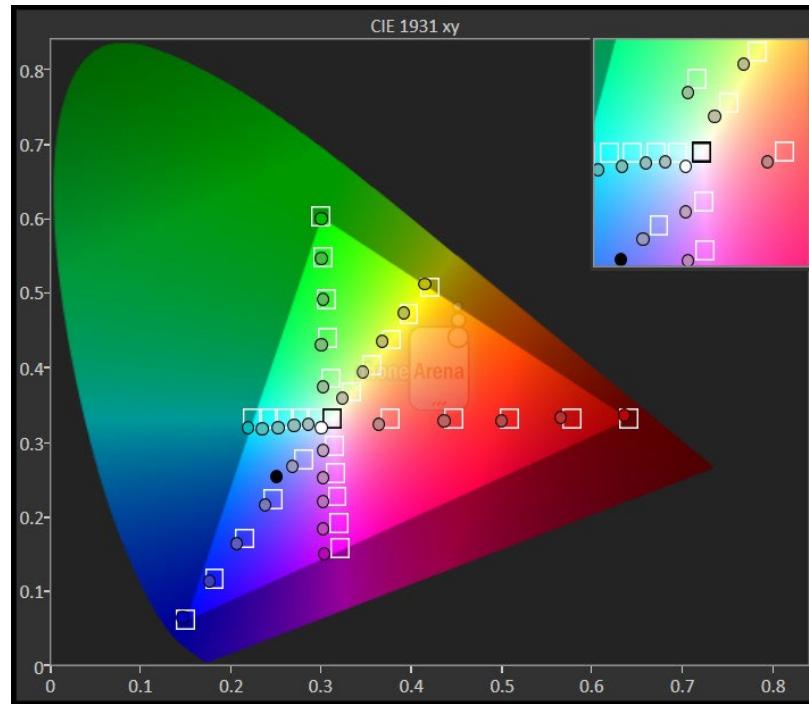
<http://hslpicker.com/>

<http://colorizer.org/>

Color spaces and perceptual uniformity



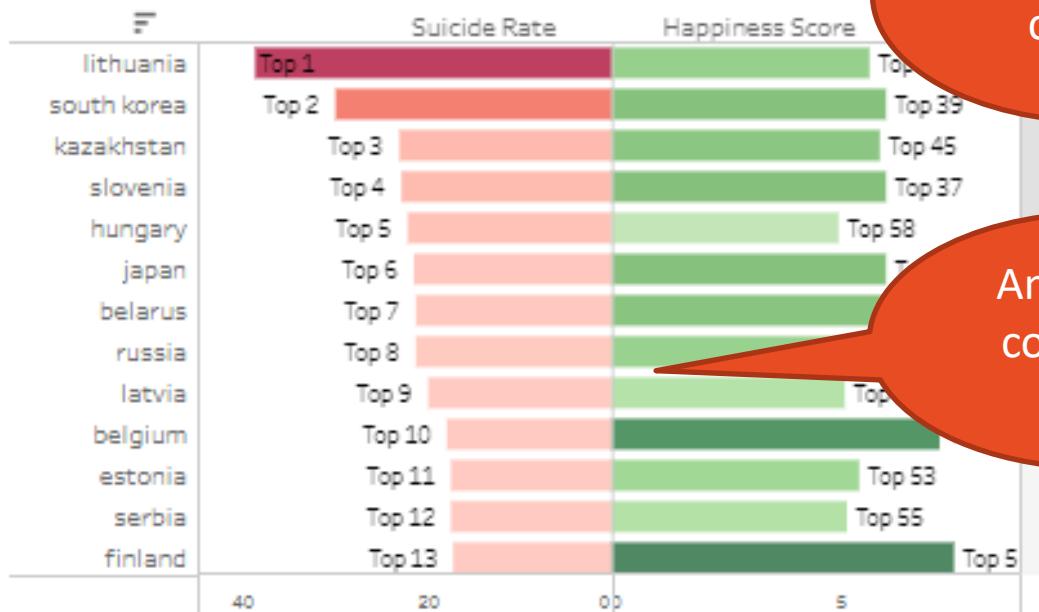
Color gamut



Color for charts

- Assign colour according to function:
 - Use contrast to highlight
 - Analogous colours to group
 - Use greys for context and axis when labelling with colour

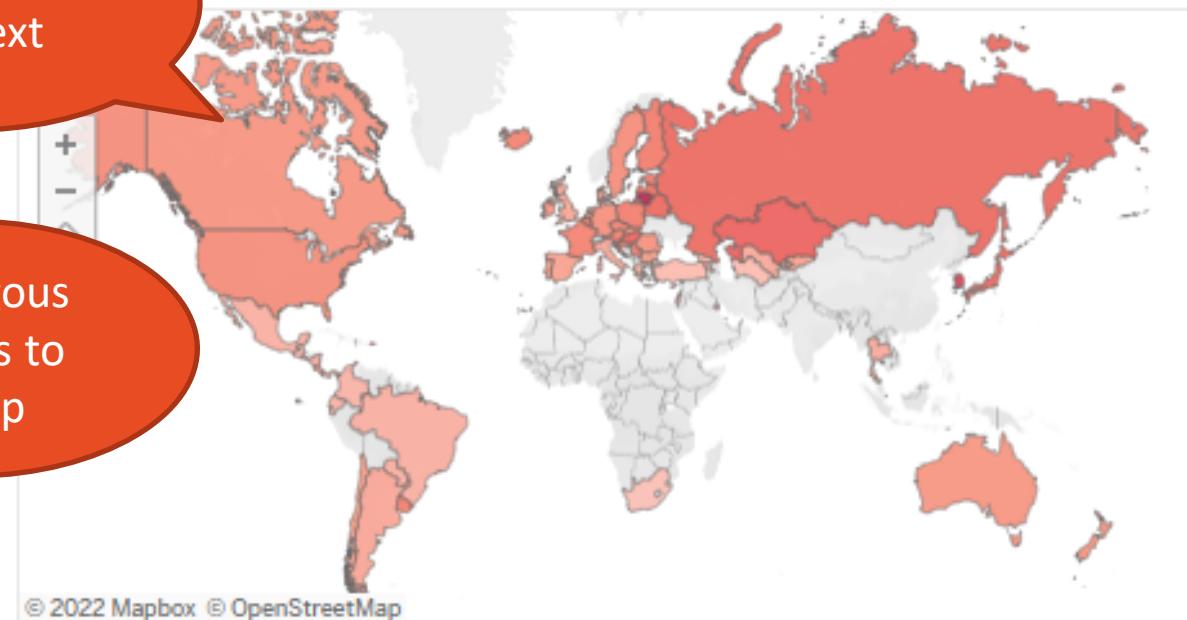
TOP 20 Ranking



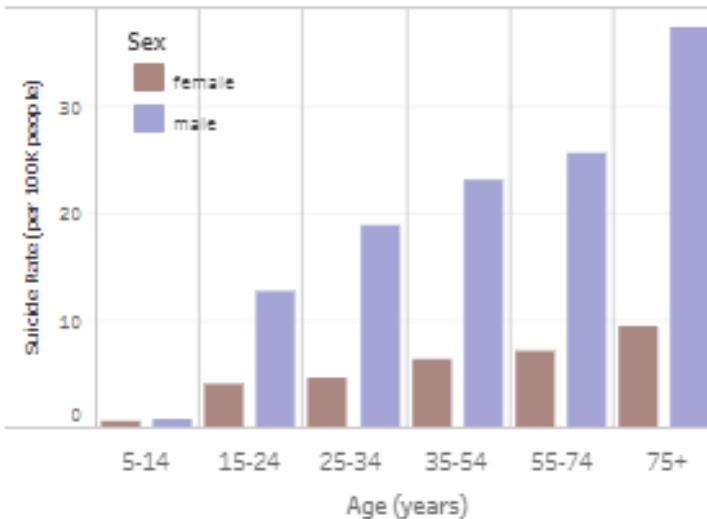
Greys for context

Analogous colours to group

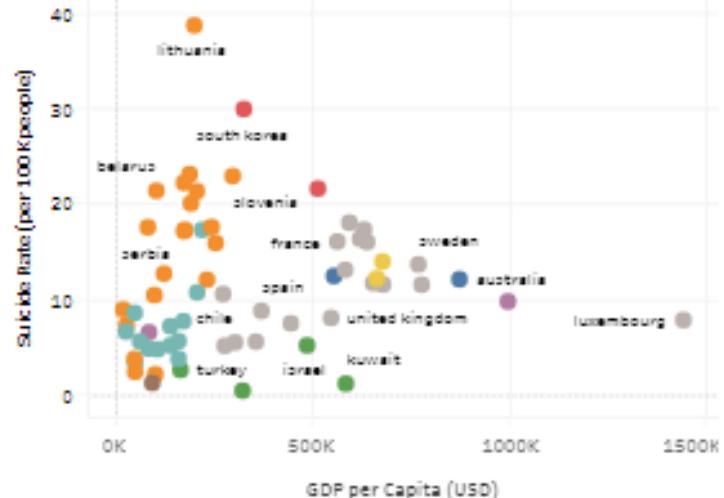
Suicide Rate over the World



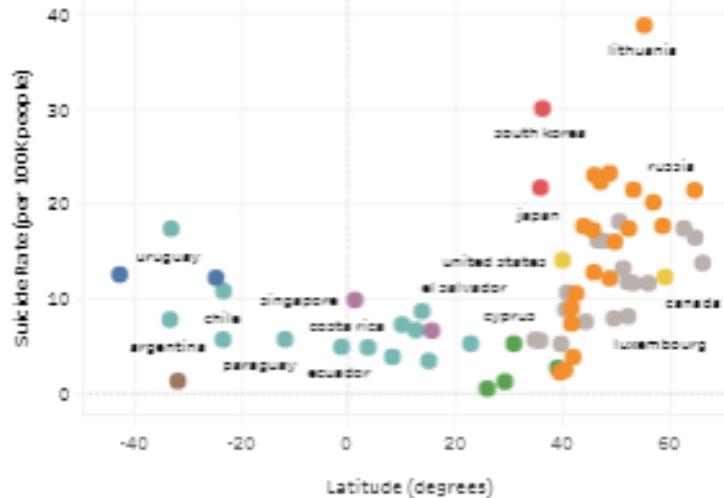
Suicide Rate over Age and Sex



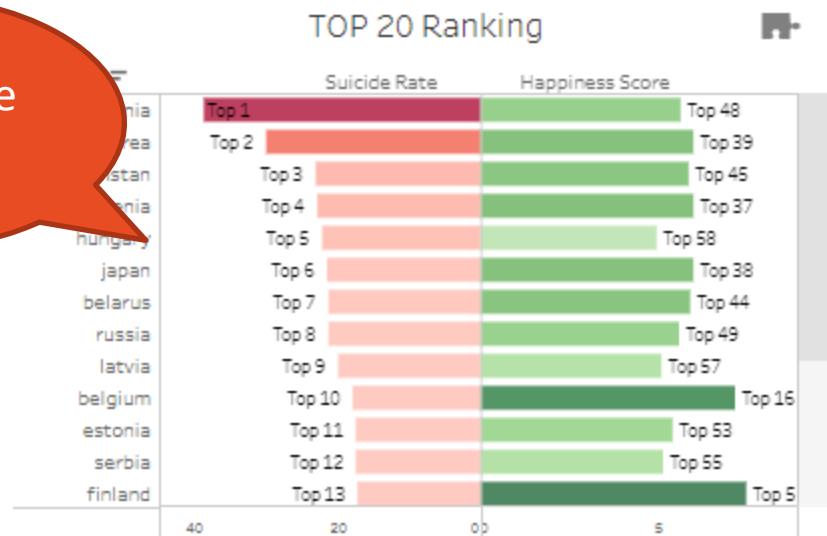
Suicide Rate vs GDP per Capita



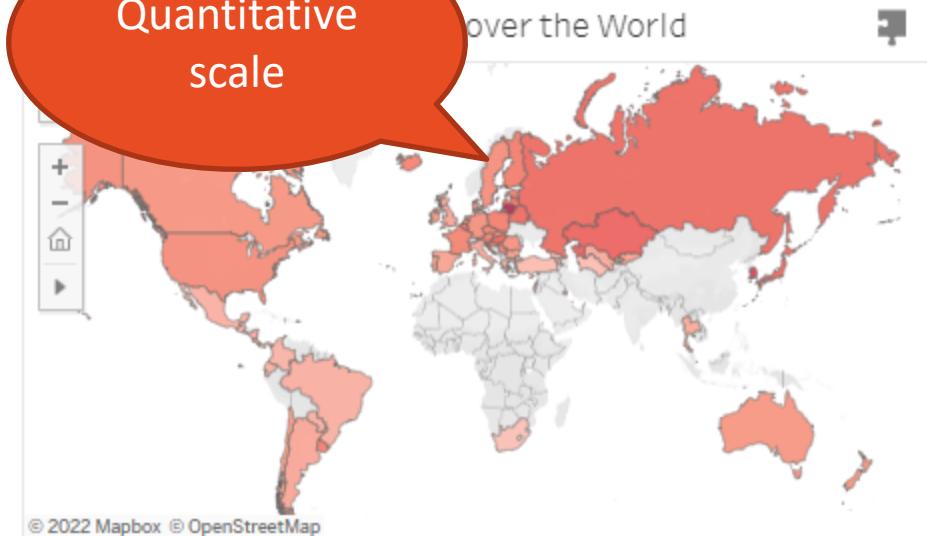
Suicide Rate vs Latitude



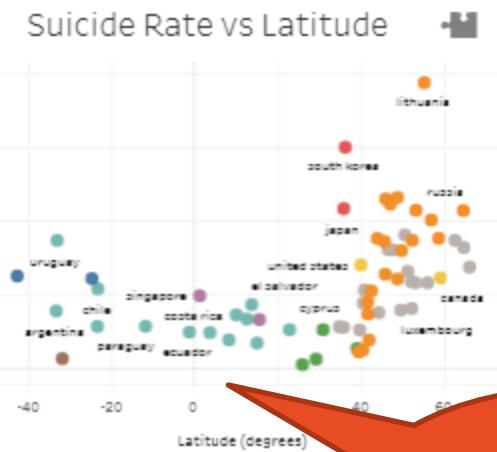
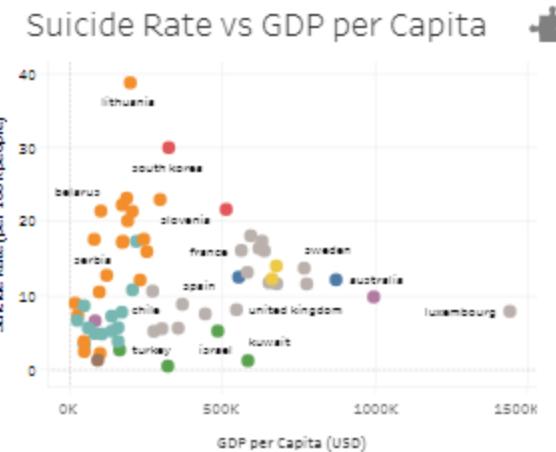
Quantitative scale



Quantitative scale



Qualitative scale



Qualitative scale

Color for maps

- Big areas: low saturation; Small areas: highly saturated
- Ensure hue and luminance contrast with the background (use a border if needed)
- For colour-blindness assure yellow-blue distinction
- See Cynthia Brewer [ColorBrewer tool](#)

Key ideas

- 1 Perception principles should guide our visualization decisions.
- 2 Encoding, layout, highlighting have their own rules.
- 3 The correct use of color is very important

Sources

- ★ Ware, C. (2020) Information visualization: perception for design. Burlington: Morgan Kaufmann.
- ★ The example Dashboard on the slides, is made by Muriel Rovira, Jael Freixanet, Emilio Tylson as last course (2021-2022) task..
- ★ Some highlight examples come from Duarte – Slidedocs templates or Animated Charts (www.Duarte.com)

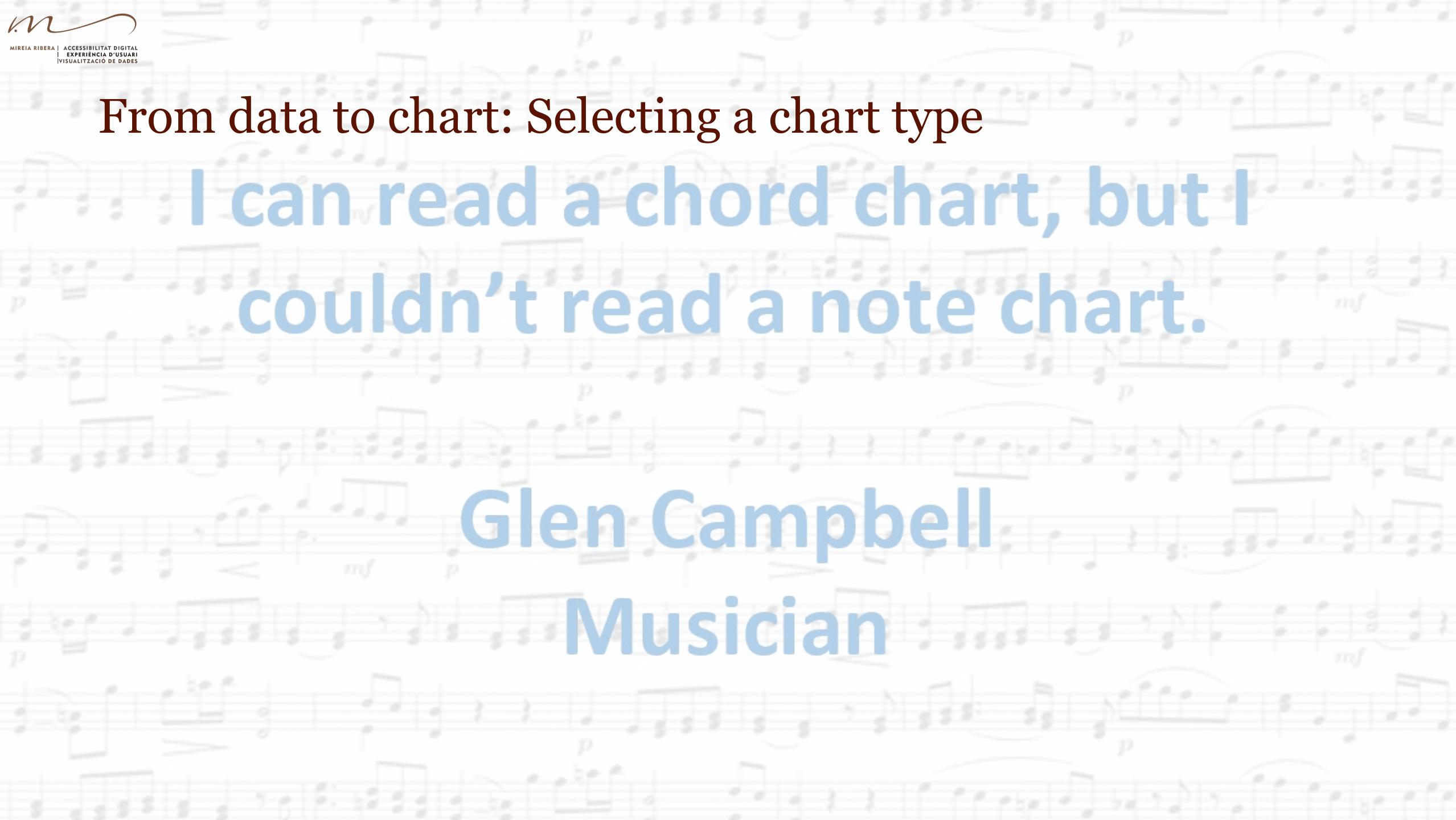
Thanks you for your attention



MIREIA RIBERA | ACCESSIBILITAT DIGITAL
| EXPERIÈNCIA D'USUARI | VISUALITZACIÓ DE DADES



UNIVERSITAT DE
BARCELONA

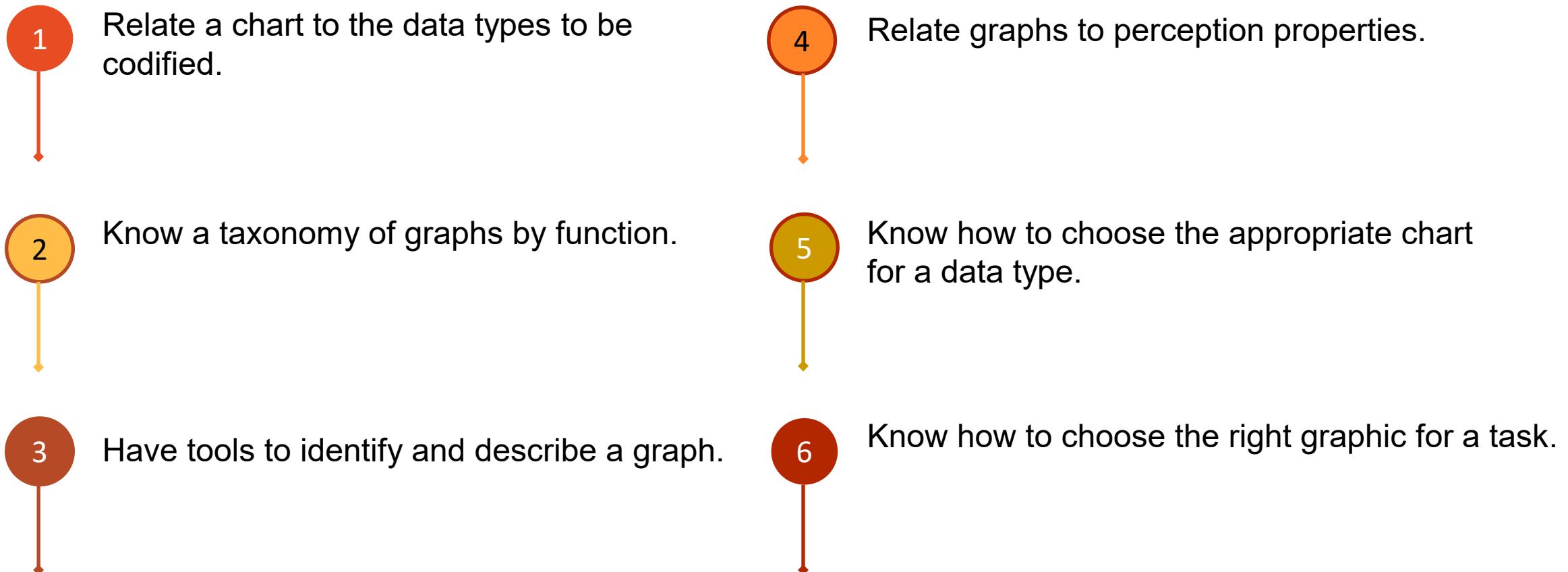


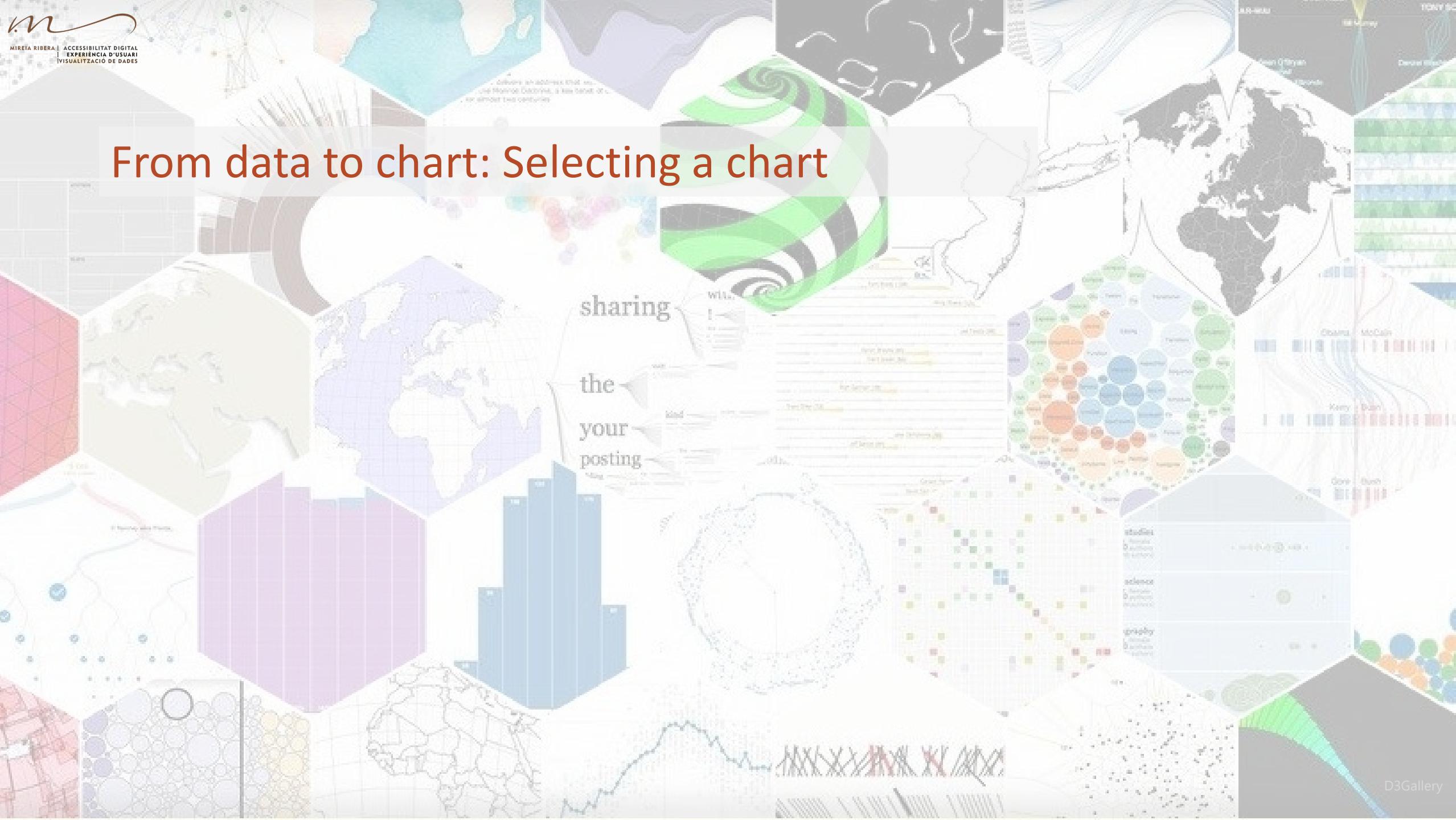
From data to chart: Selecting a chart type

I can read a chord chart, but I
couldn't read a note chart.

Glen Campbell
Musician

Objectives...

- 
- | | |
|---|--|
| <p>1 Relate a chart to the data types to be codified.</p> | <p>4 Relate graphs to perception properties.</p> |
| <p>2 Know a taxonomy of graphs by function.</p> | <p>5 Know how to choose the appropriate chart for a data type.</p> |
| <p>3 Have tools to identify and describe a graph.</p> | <p>6 Know how to choose the right graphic for a task.</p> |



From data to chart: Selecting a chart

sharing
the
your
posting

Charts by data type

In the bottom-up approach we start from the data and its possibilities to start exploring different types of graphs and encodings.

This section is based on the project classification “from Data to Viz”



Overview (data)

2 numerical variables. With or without order

Shows the relationship between two or more variables

2 or more numerical variables. With or without order

Displays values and their frequency

1 categorical variable

Size comparisons

2 or more categorical variables. With relationships

Geographical patterns are the most relevant

- 1
- 2

- 3
- 4

- 5
- 6

- 7
- 8

1 numeric variable

Emphasizes variations

2 numerical variables. With order

Position is more important than value

More than 2 numerical variables. With order

Emphasizes trends

2 or more categorical variables. With hierarchy

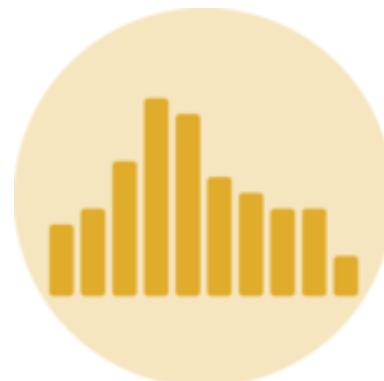
Shows the division of an element into components

1

1 numerical variable

Histogram

The variable is grouped into bins and the chart displays the number of observations.



Density diagram

Displays the number of observations without groupings.



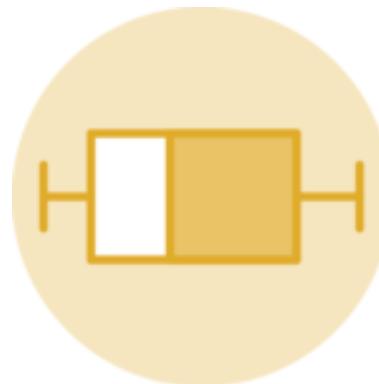
In these graphs we play with the values of the variable (x-axis) and with the count of observations (y-axis). They are based on the property of length.

2

2 numerical variables. With or Without order

Boxplot

It shows the distribution and basic descriptive statistics: median, Q1, Q3 and outliers.



Violin chart

Similar to the boxplot, it is ideal if there are many observations.



Scatter plot

Relates 2 variables.
The X-axis can be categorical.



In boxplot and violin we play with the values of the variable and with the count of observations, its design allows to compare 2 or more variables.

In the scatter plot we show the relationship between 2 variables. They are based on the position property.

3

2 numerical variables. With order

Line chart

Shows the evolution of numerical values.



Area chart

Shows the evolution of numerical values.
Reports on the volume of the value y.
The y-axis must start at 0.



Both graphs allow you to combine observations of 2 or more numerical variables, facilitating their comparison.
They are based on the principle of continuity.

4

2 or more numerical variables. With or without order

Bubble chart

Adds a third dimension to the scatter plot with the size of the points.



Heat map

Adds a third dimension to the scatter plot with the color of the points.



These graphs allow you to display 3 variables with the preattentive properties of position, color and size.

5.

More than 2 numerical variables. With order

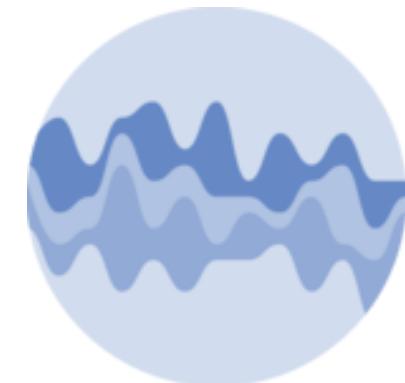
Stacked area chart

Visualizes several variables, one on top of the other. Differences are perceived, not absolute values.



Stream graph

Variation that emphasizes evolution



The x-axis reflects the order in one of the numerical variables and the y-axis its magnitude. They allow the comparison of several variables. They are based on the principle of continuity.

6

1 categorical variable

Word Cloud

Displays the frequency of each word with size or color saturation.



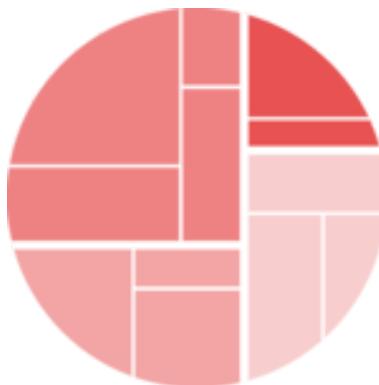
In this graph we play with the values of the variable (words) and with the count of observations (size and/or saturation).

7

2 or more categorical variables. With hierarchy

Tree map

Categories are displayed as overlapping rectangles. The size reflects a numeric attribute.



Dendrogram

Visually displays hierarchy



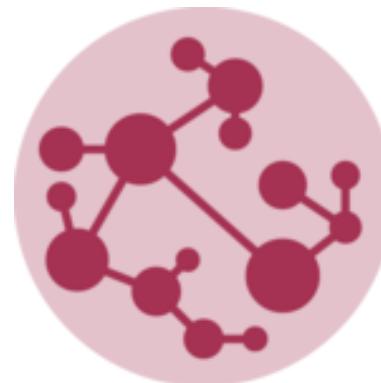
In these graphs the emphasis is on the partition or grouping relationship. They use the principles of closure and the principle of connection.

8

2 or more categorical variables. With relationships

Network or Graph

Shows the interconnections between various entities.



Sankey diagram

Shows transitions through key steps.



Each categorical variable is represented by an entity, its numerical attributes are encoded with size, length... The emphasis is on their relationship. They use the principle of continuity.

Charts by function

In the top-down approach we start from the audience of the visualization and its objective to select the most appropriate graphic.

In this approach it is important to know the function of each type of chart.

This section is based on the classification of the [Visual Vocabulary](#), de Financial Times.



Overview (function)

Correlation

Shows the relationship between two or more variables

Distribution

Displays values and their frequency

Magnitude

Size comparisons

Spatial

Geographical patterns are the most relevant aspect to display

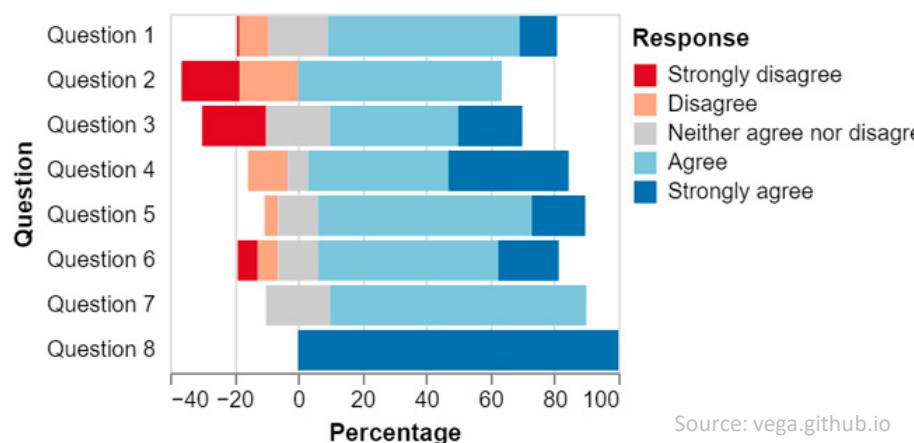
- 1 Deviation
Emphasize variations
- 2 Ranking
Ordinal position is more important than value
- 3 Evolution over time
Emphasize trends
- 4 Part of a whole
Shows the division of an element into components
- 5 Flow
Intensity between two states

1

Deviation

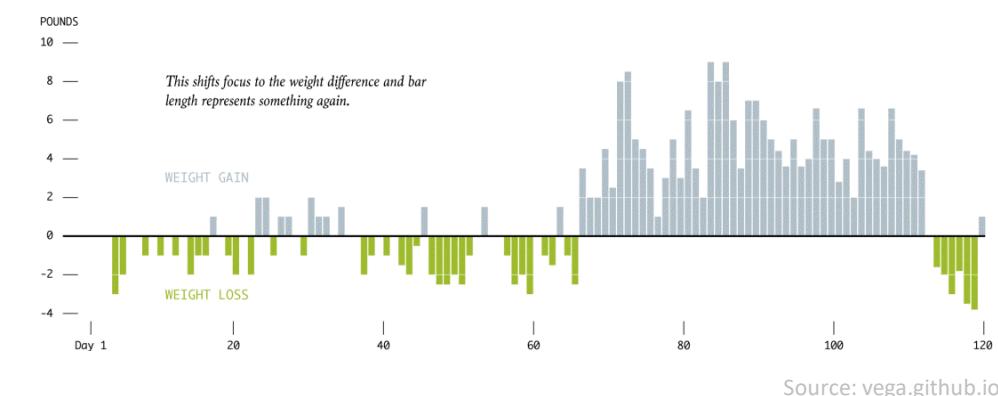
Stacked divergent bars

Perfect for opinion polls



Differential bar chart

A measure separates values into less or greater than it



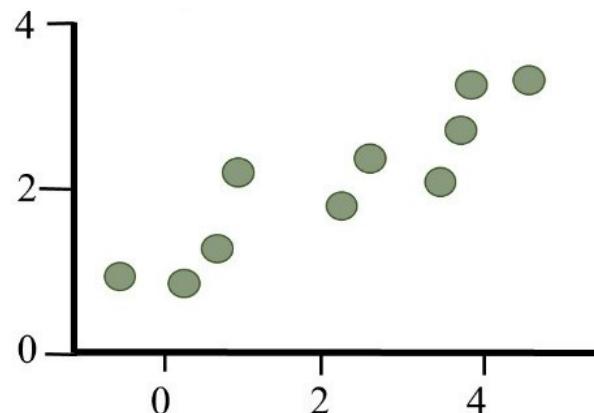
Emphasizes variations (+/-) from a reference point. The reference point is usually 0 but it can also be another relevant measure. Also used to show opinion (positive/neutral/negative)

2

Correlación

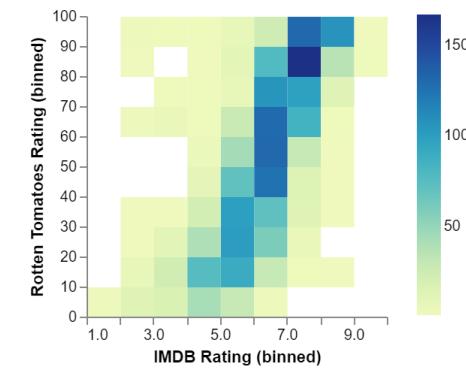
Scatter plot

Shows correlation types: positive, negative, nonexistent



Heat map

Ideal for showing patterns.
Enables high data density.



Source: vega.github.io

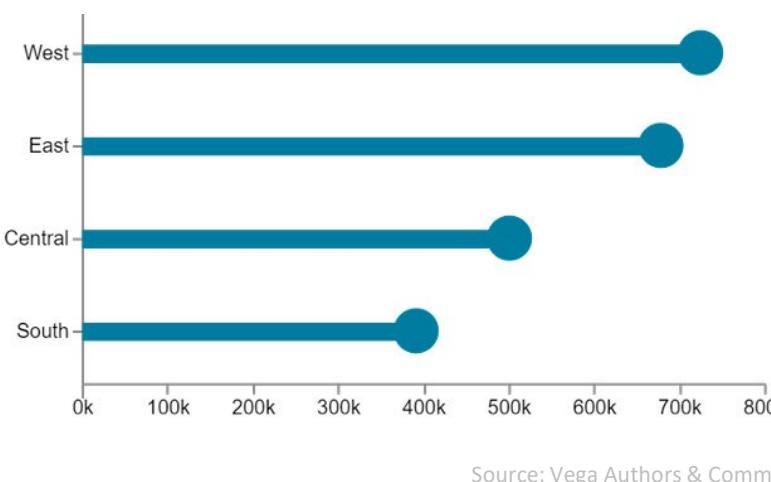
Correlation plots show the relationship between 2 or more variables. Often readers will assume that it is causal, so it must be made explicit that only correlations are shown.

3

Ranking

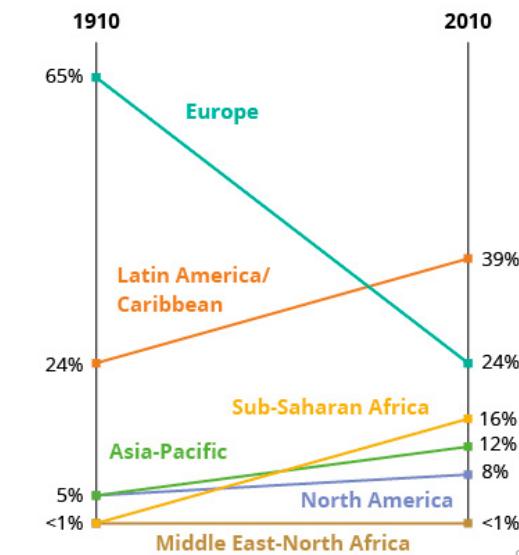
Lollipop chart

Ordered values with emphasis on the final value



Slope chart

Variation in ranking over time



Source: The Huffington Post

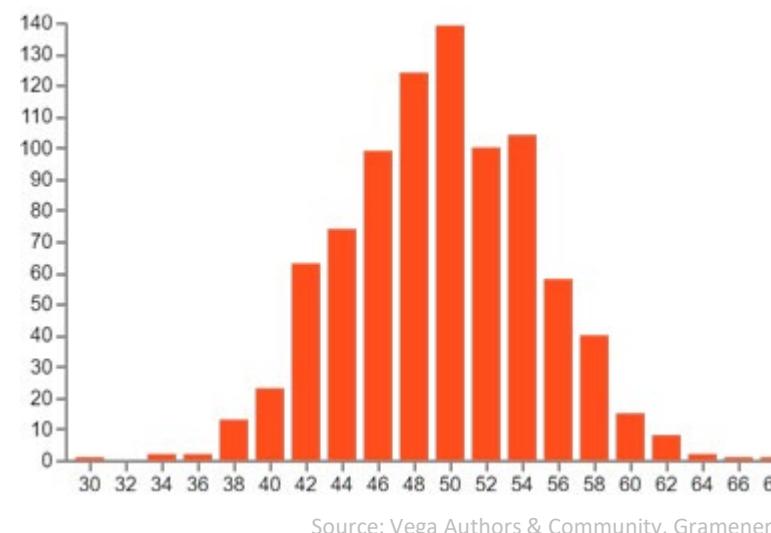
They are used if the ordinal position of an item relative to others is more important than its value. Points of interest can be highlighted

4

Distribution

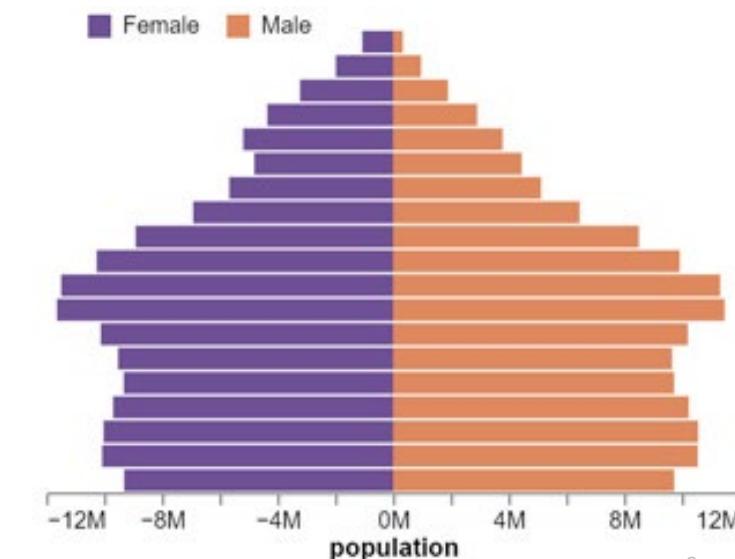
Histogram

Displays statistical distributions



Butterfly chart

Displays a value according to 2 categories



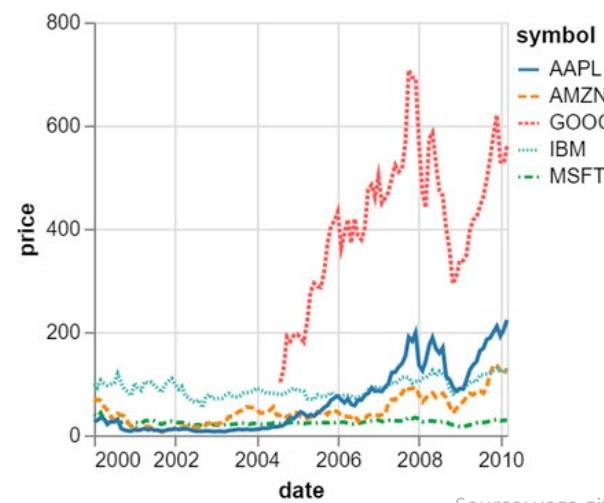
Displays the values and their frequency. The form (or bias) of the distribution is a way of highlighting the heterogeneity of the data and its normality.

5

Evolution over time

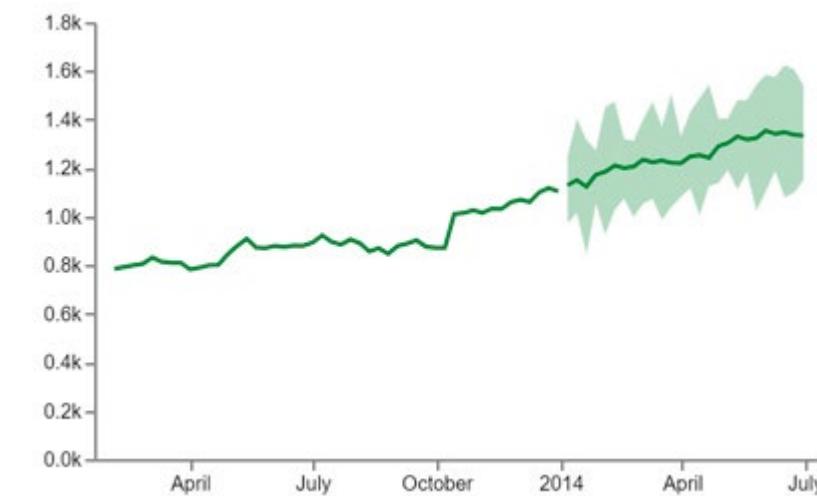
Line chart

The standard chart for showing changes in a time series



Fan chart

To show uncertainty



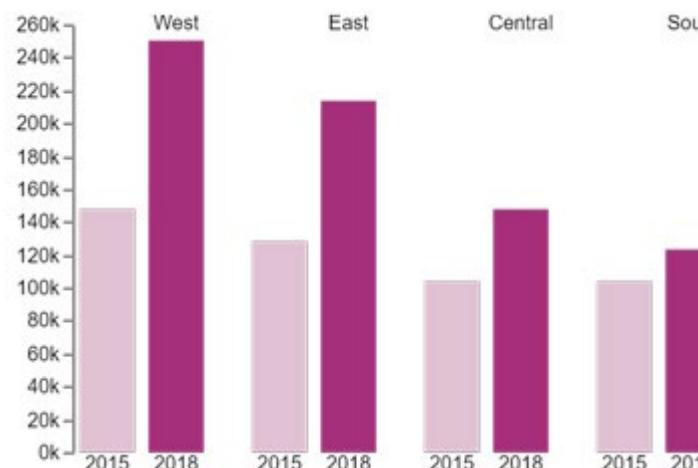
Charts to emphasize trends. Choosing the right period of time is key to providing the reader with the right context.

6

Magnitude

Parallel columns

Perfect for comparison. Maximum 2 categories



Source: Vega Authors & Community, Gramener

Bullet chart

Displays a value in the context of various reference measures



Source: Vega Authors & Community, Gramener

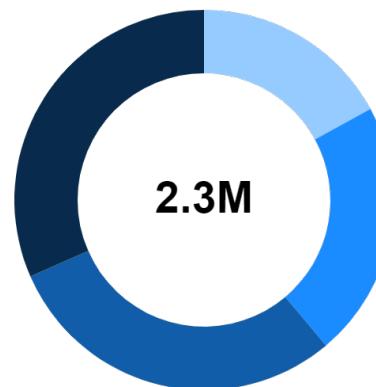
They show relative or absolute size comparisons.
Typically, with discrete values

7

Part of a whole

Doughnut chart

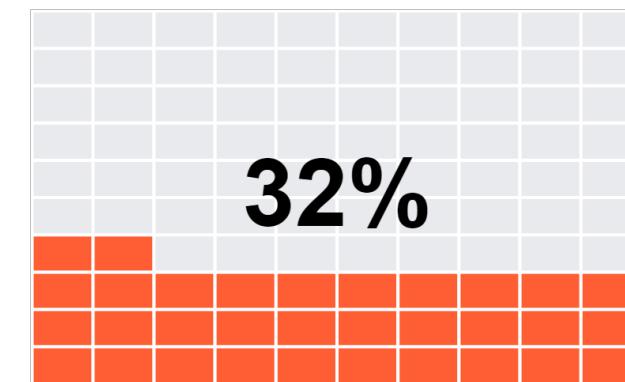
Do not use with many categories. The emphasis is on proportion, not exact measure.



Source: Vega Authors & Community, Gramener

Waffle chart

Ideal for displaying percentages



Source: Vega Authors & Community, Gramener

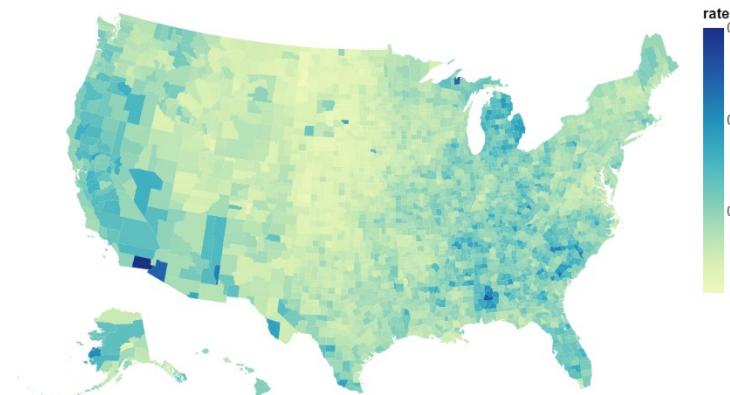
They show how a single element is divided into different components. If the most important thing is the size of the components, better to use a magnitude graph.

8

Spatial

Choropleth map

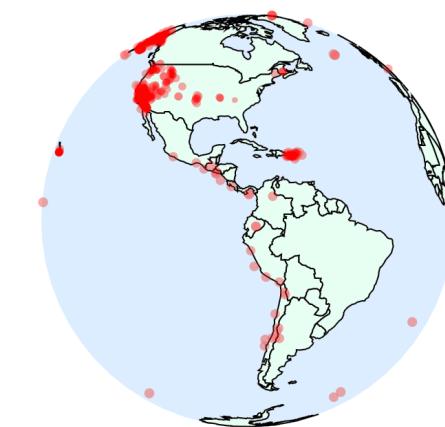
Use with ratio



Source: Vega-Altair

Symbol Map

Absolute values with their exact location



Source: vega.github.io

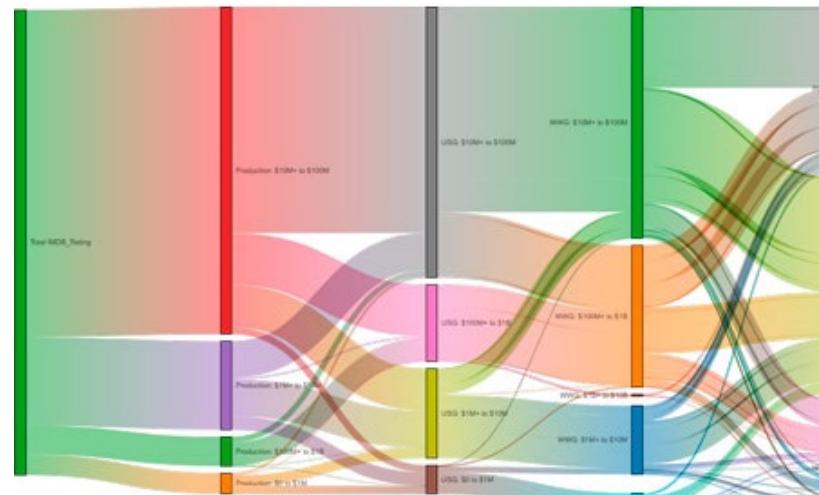
Use these charts only when there are precise locations or when geographic patterns in the data are most important to the reader.

9

Flow

Sankey diagram

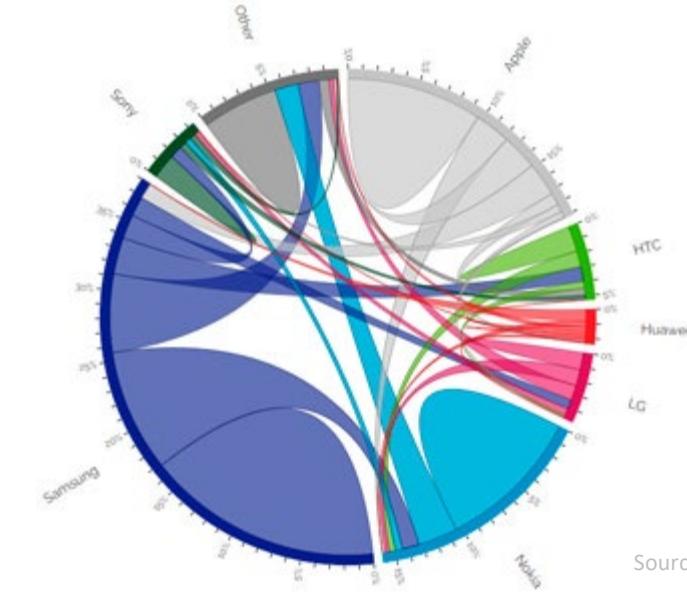
Perfect for process tracking.



Source: Observable, Inc.

Chord diagram

Visually appealing, a bit complex.



Source: Visual Cinnamon

It shows the reader the volumes or intensity between two states or conditions.
These can be logical sequences or geographic locations.

Some well-known graphics

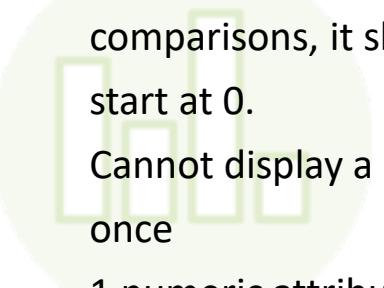
Bar chart

It relies on length to show magnitude. Ideal for comparisons, it should always start at 0.

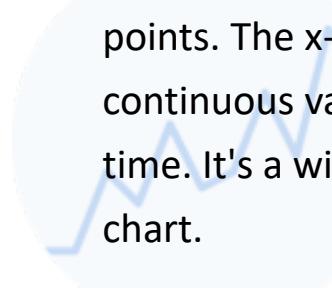
Cannot display a lot of data at once

1 numeric attribute

1 or more categorical attributes



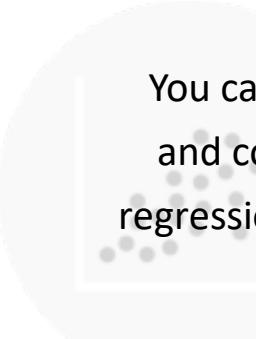
Line chart



Similar to the scatter plot, it emphasizes the connection of points. The x-axis must be a continuous variable, often time. It's a widely adopted chart.

Scatter plot

It is based on position to show magnitude.



You can add other attributes with size and colors, and be enriched with the regression line. It's a well-known graphic.

1 numeric attribute

1 categorical attribute

If our audience is not very familiar with graphics, we will prioritize highly adopted graphics.

Key ideas

- 1 For a visualization to be effective, it will be necessary to know the data, the audience and the data coding techniques in interactive graphic language.
- 2 The selection of a chart depends on the type of data and its function.
- 3 Adoption and familiarity is also a criterion to keep in mind.
- 4 The graphics rely on preattentive properties and Gestalt principles to be very efficient.

Sources

- ★ Financial Times Visual Vocabulary [Internet] <https://github.com/Financial-Times/chart-doctor/tree/main/visual-vocabulary>
- ★ From Data to Viz [Internet] <https://www.data-to-viz.com/about.html>
- ★ Visual Vocabulary in Tableau:
<https://www.tableau.com/solutions/gallery/visual-vocabulary>

Thanks you for your attention



MIREIA RIBERA | ACCESSIBILITAT DIGITAL
| EXPERIÈNCIA D'USUARI | VISUALITZACIÓ DE DADES



UNIVERSITAT DE
BARCELONA

Presentation and Visualization. Interaction



Mireia Ribera
ribera@ub.edu
Office: 206, near T1

Contents

- 1. Why interaction?**
- 2. Data manipulation or encoding**
- 3. Exploration and navigation**
- 4. Problem solving**
- 5. Final Thoughts**

*“Overview first,
zoom and filter,
details on demand”*

Schneiderman's Mantra

Objectives

- 1 Know the main interaction techniques and their properties.
- 2 Systematize the different objectives, triggers and actions of the different types of interaction.
- 3 Have criteria for including one type or another of interaction in a visualization.

Types of interaction



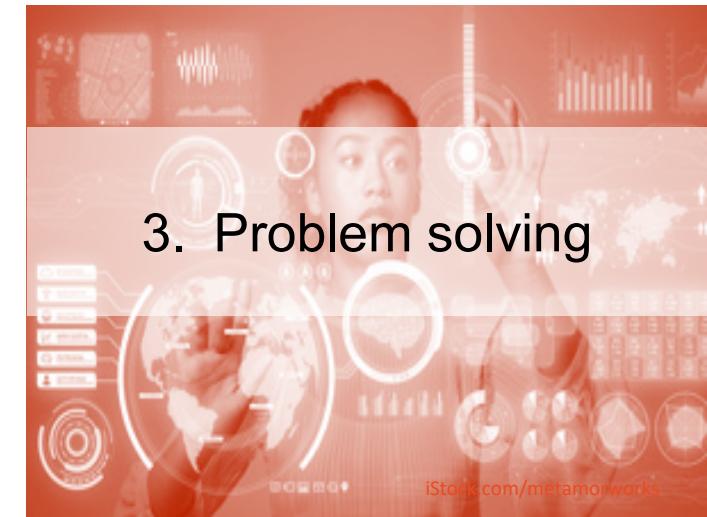
1. Data manipulation or encoding

iStock.com/Jirsak



2. Exploration and navigation

iStock.com/Olivier Le Moal



3. Problem solving

iStock.com/metamorworks

What goal do we pursue with the interaction?

1. Change *how* data or *what* data is displayed
2. Moving around in the visual space of data
3. Answer questions such as why? or what if...?

PROS y CONS

- ✓ Interaction is the **greatest contribution** of the digital world to visualization.
- ✓ Interaction means a **cognitive effort** for the user.

Manipulation of displayed data or encoding



What to show



Filter, add or select

Select the variables or attributes to display.



Layers

In maps, display just part of the total information. Avoid overloading.

How to show it



Order

Display information in ascending or descending order for better comparison.



Change position

The user repositions the elements.



Change style

The user customizes the way the information is displayed.



Project

Change the transformation model from 3D to 2D.



What to show: Filter, add or select

Objective

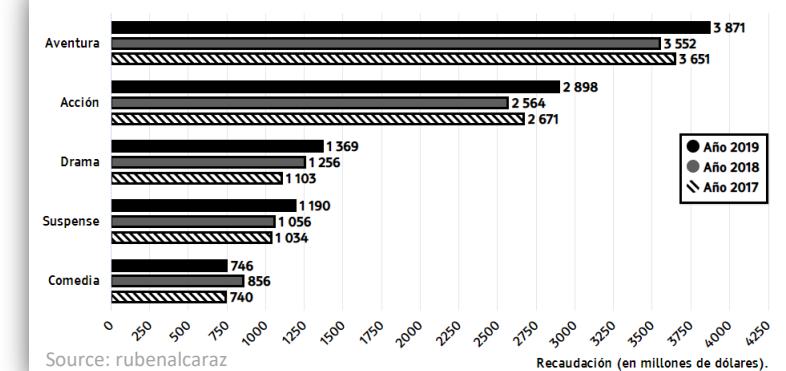
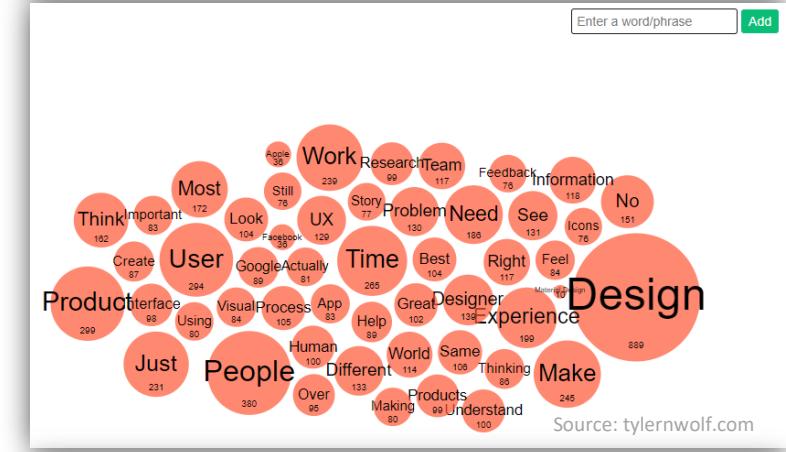
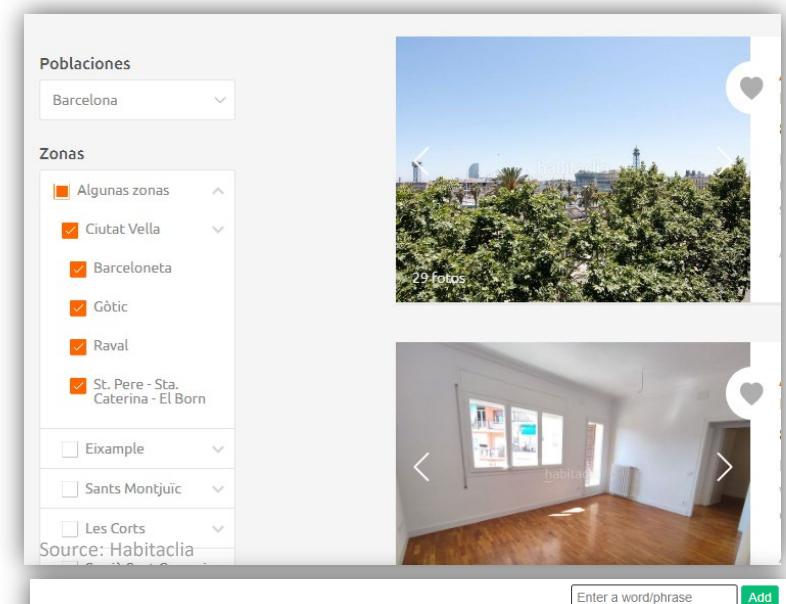
Select the variables or attributes to display.

Trigger

Select an option, select an area, type text.

Action

Selected items are highlighted, unselected items disappear or fade.





What to show: Layers

Objective

In maps, display a type of information. Avoid overloading.

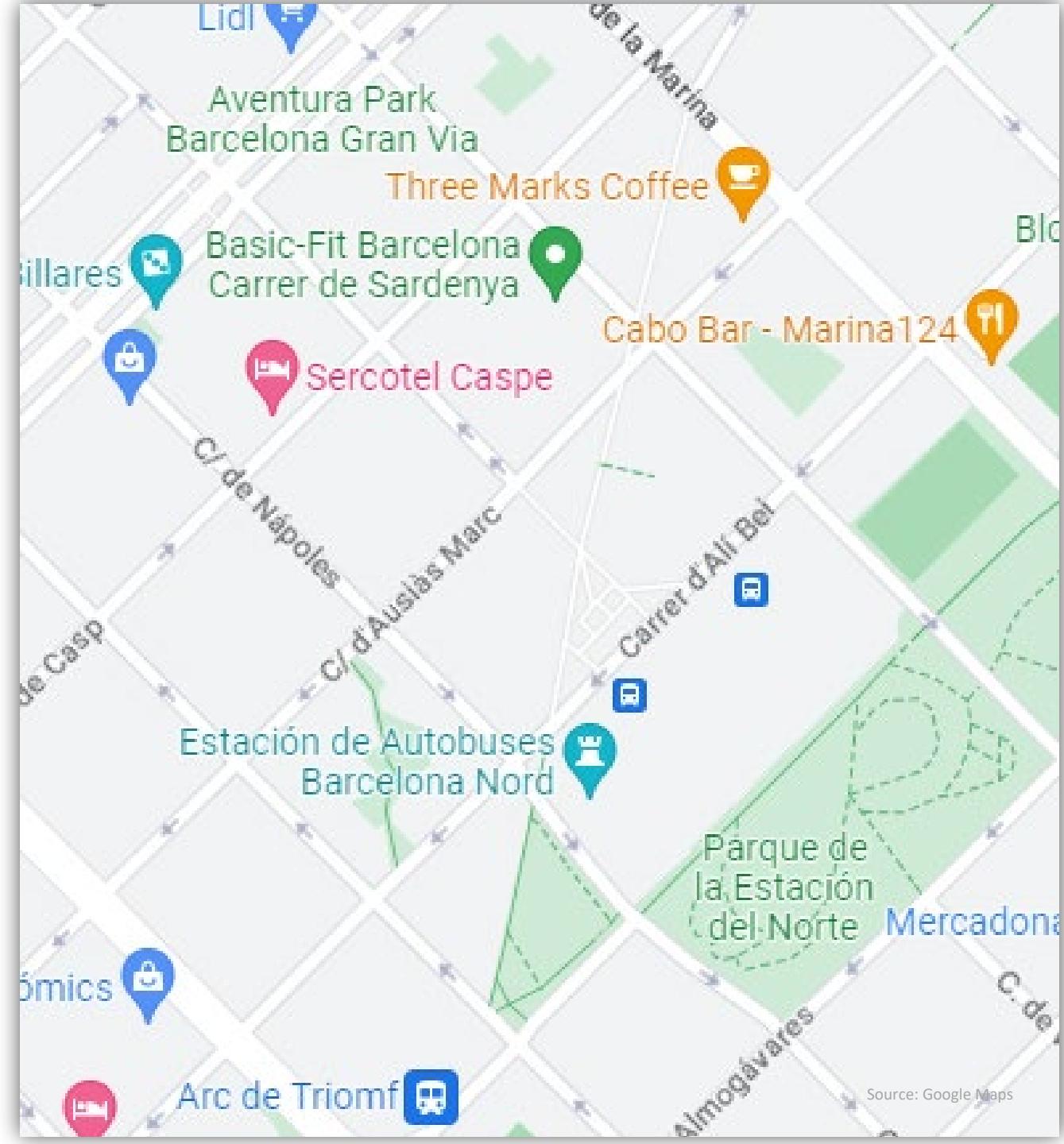
Trigger

Select an option.

Action

A new layer of information is displayed in the visualization.

Related to: Filter and add.



Source: Google Maps

[Sort Alphabetically](#)[Sort by EL](#)[Sort by Ever EL](#)

↑ Order How to show: Order

Objective

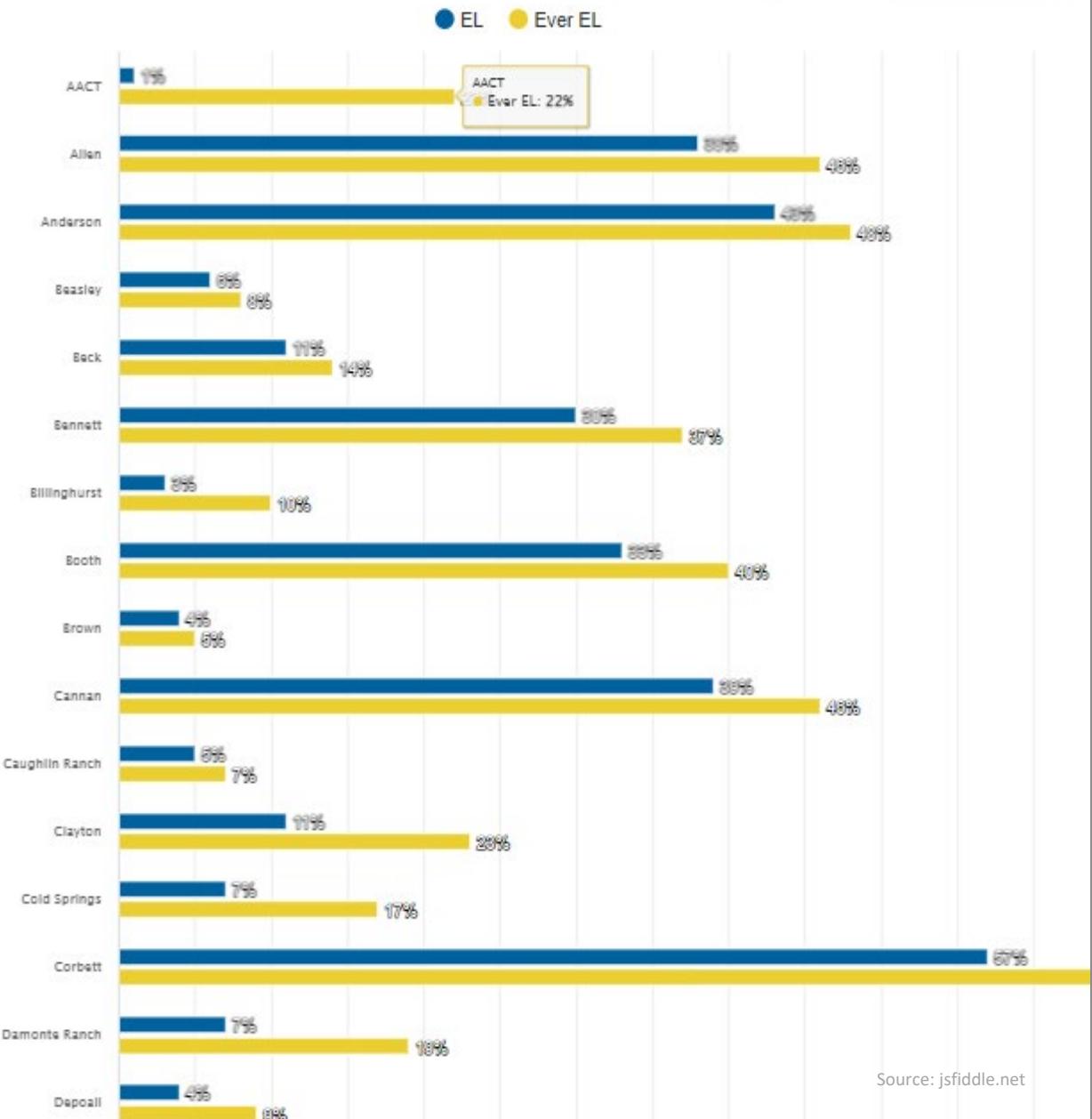
Display information in ascending or descending order to better compare it.

Trigger

Sort button or specific "widget".

Action

Items are reordered.





How to display: Change style

Objective

Change the data encoding, colors, line type...
even the chart type.

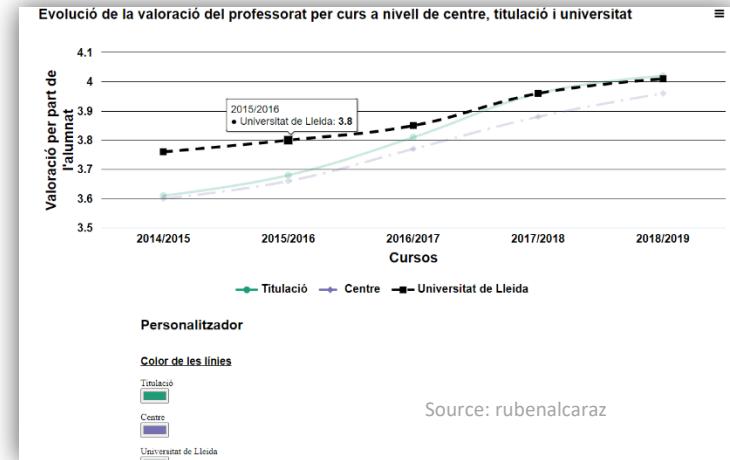
Sometimes it's the solution for accessibility.

Trigger

Select an option.

Action

The display is renewed with the new encoding.



How to show: Change position

Objective

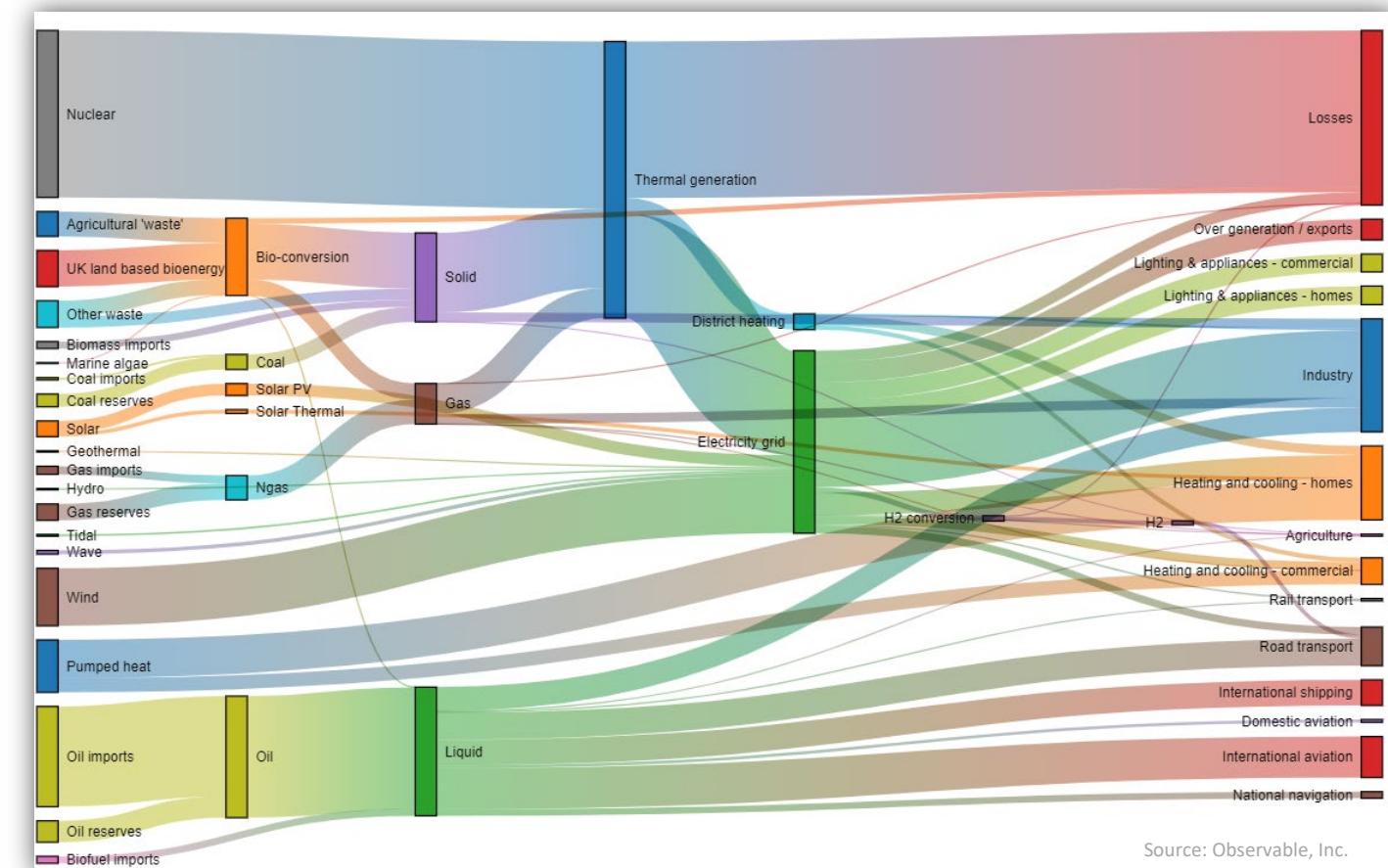
The user repositions the elements.

Trigger

Click and drag.

Action

The selected items change their position. Other elements can be relocated as well.





How to show: Project

Objective

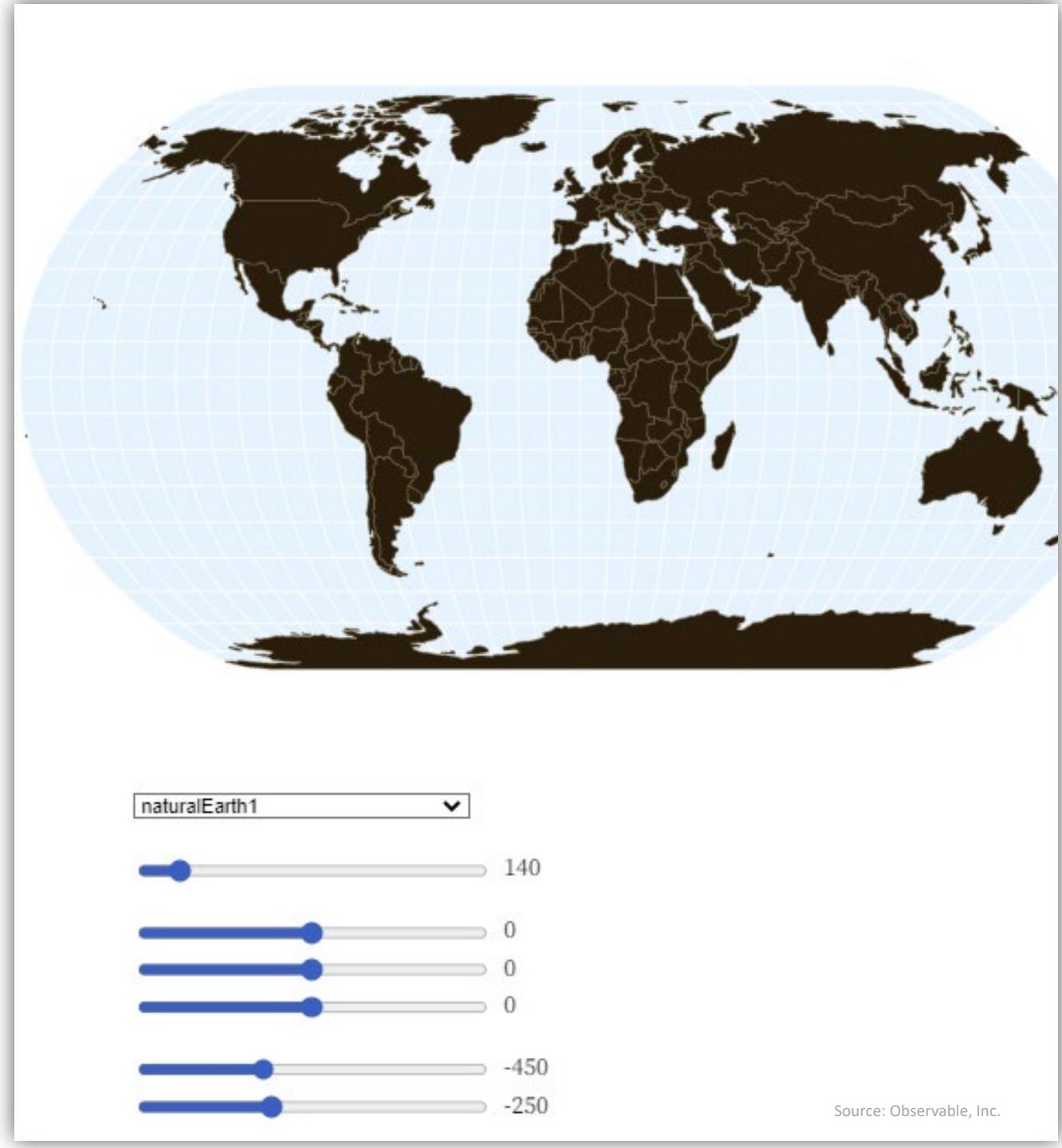
Change the transformation model from 3D to 2D.

Trigger

Specific buttons.

Action

The projection of the displayed items changes to the new projection chosen.



Exploration and navigation



Zoom



Optical zoom

Increase or decrease the displayed area.



Semantic zoom

Similar to optical zoom. When it is increased, new details appear.



Drill down

We move forward/backward in a hierarchy to see more detailed information.

Navigation



Change the point of view

Use a new perspective. May derive in cutting or slicing the object.



Drag (pan)

Navigate the display area.



Time as a third dimension

We change the visualization over time.

+

 Zoom: Optical zoom

Objective

Increase or decrease the area shown.

Trigger

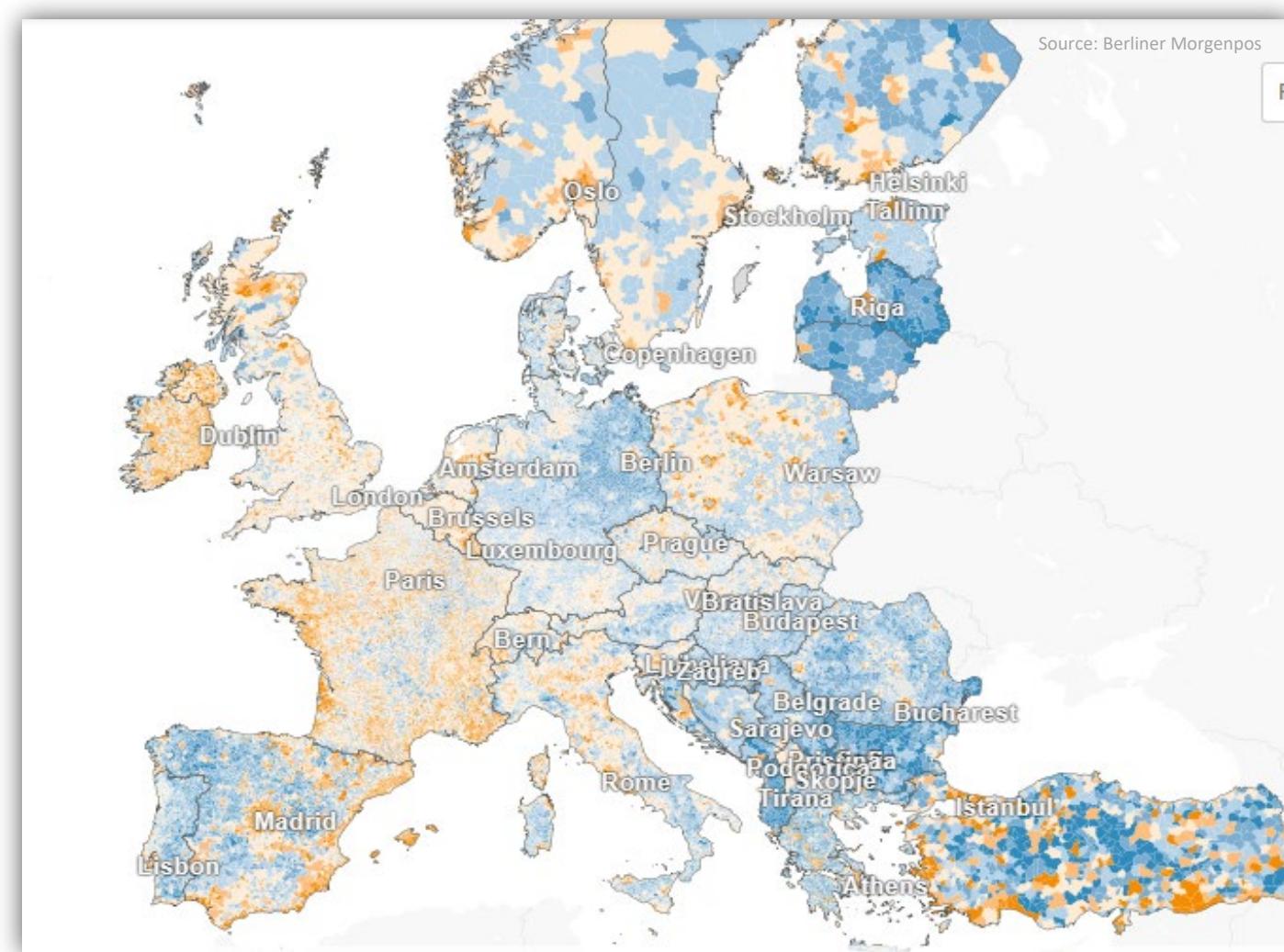
Action with mouse or keyboard or zoom or pinch gesture.

Action

The view is scaled.

Related to:

Semantic zoom.



Zoom: Semantic zoom

Objective

Similar to optical zoom. When it is increased, new details appear.

Trigger

Action with mouse or keyboard or zoom or pinch gesture.

Action

The view is scaled. New details appear.

Related to: Optical zoom.





Zoom: Drill down

Objective

We move forward in a hierarchy to see more detailed information.

Trigger

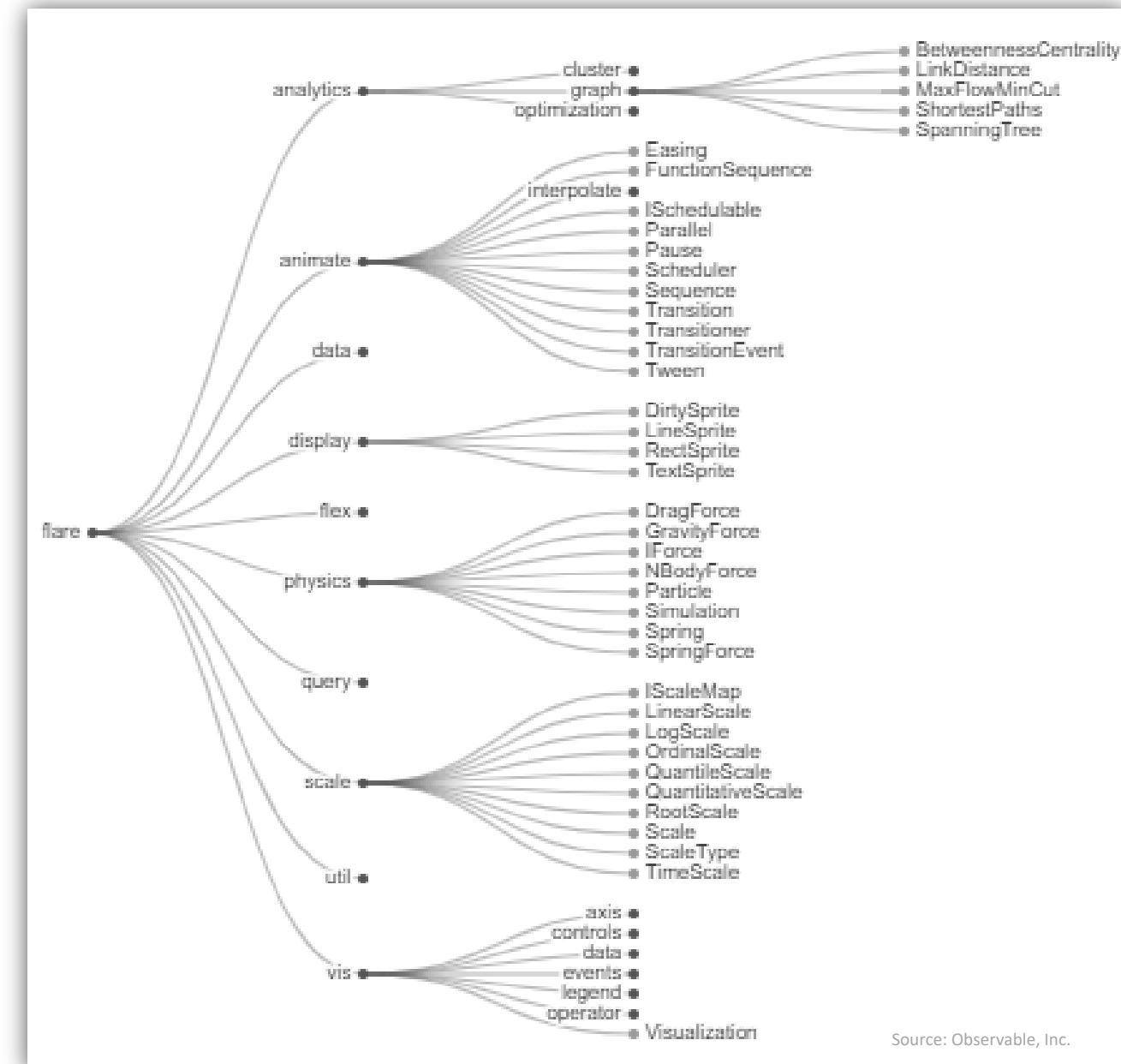
Select one of the categories.

Action

The selected category expands to show its descendants.

Related to:

Problem solving.



Navigation: Change point of view

Objective

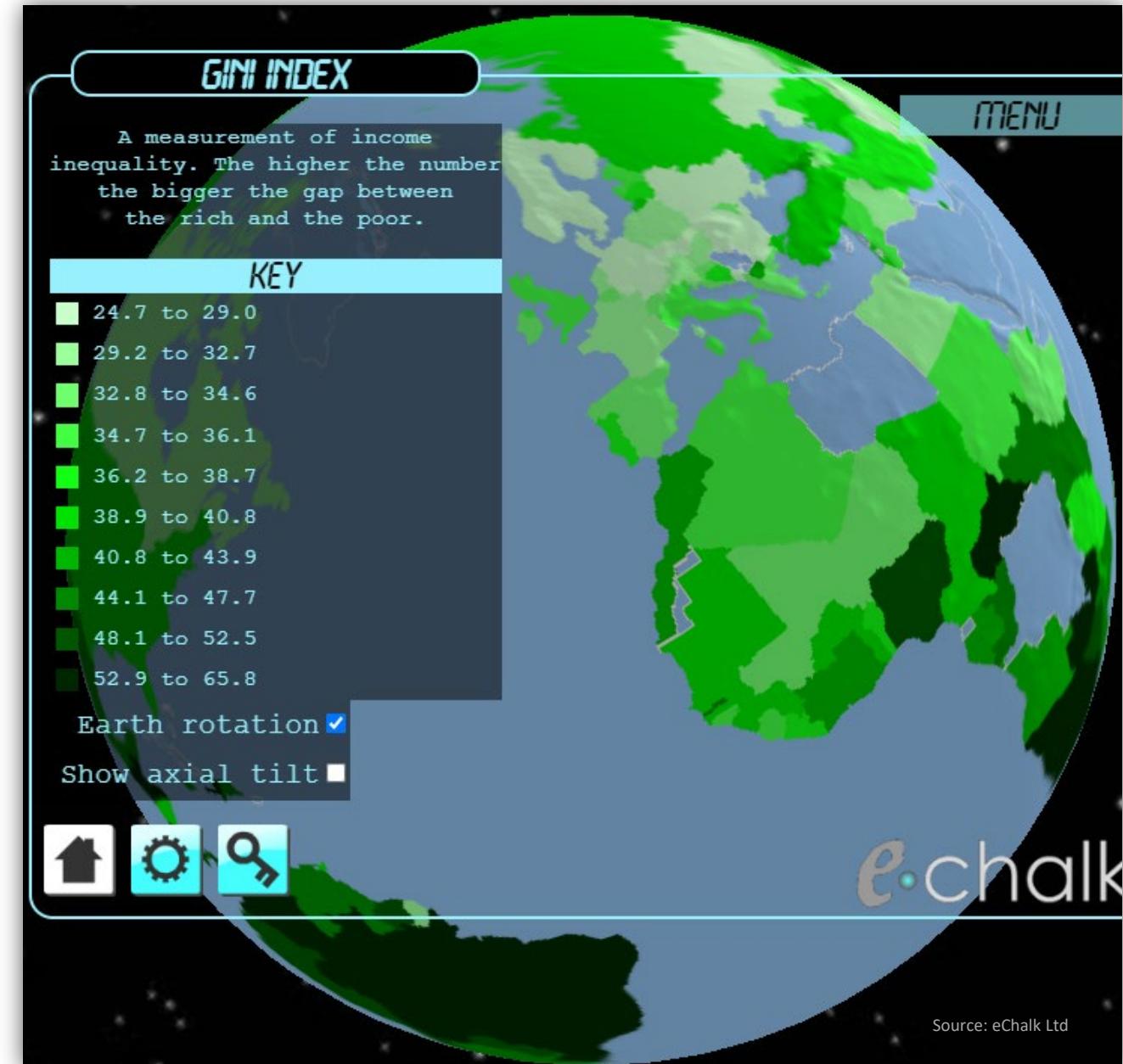
Use a new perspective. It can mean cutting or slicing the object.

Trigger

Direct manipulation with the mouse, with the arrows or dragging gesture.

Action

The orientation of the displayed objects varies.





Navigation: Drag(pan)

Objective

Navigating the display area.

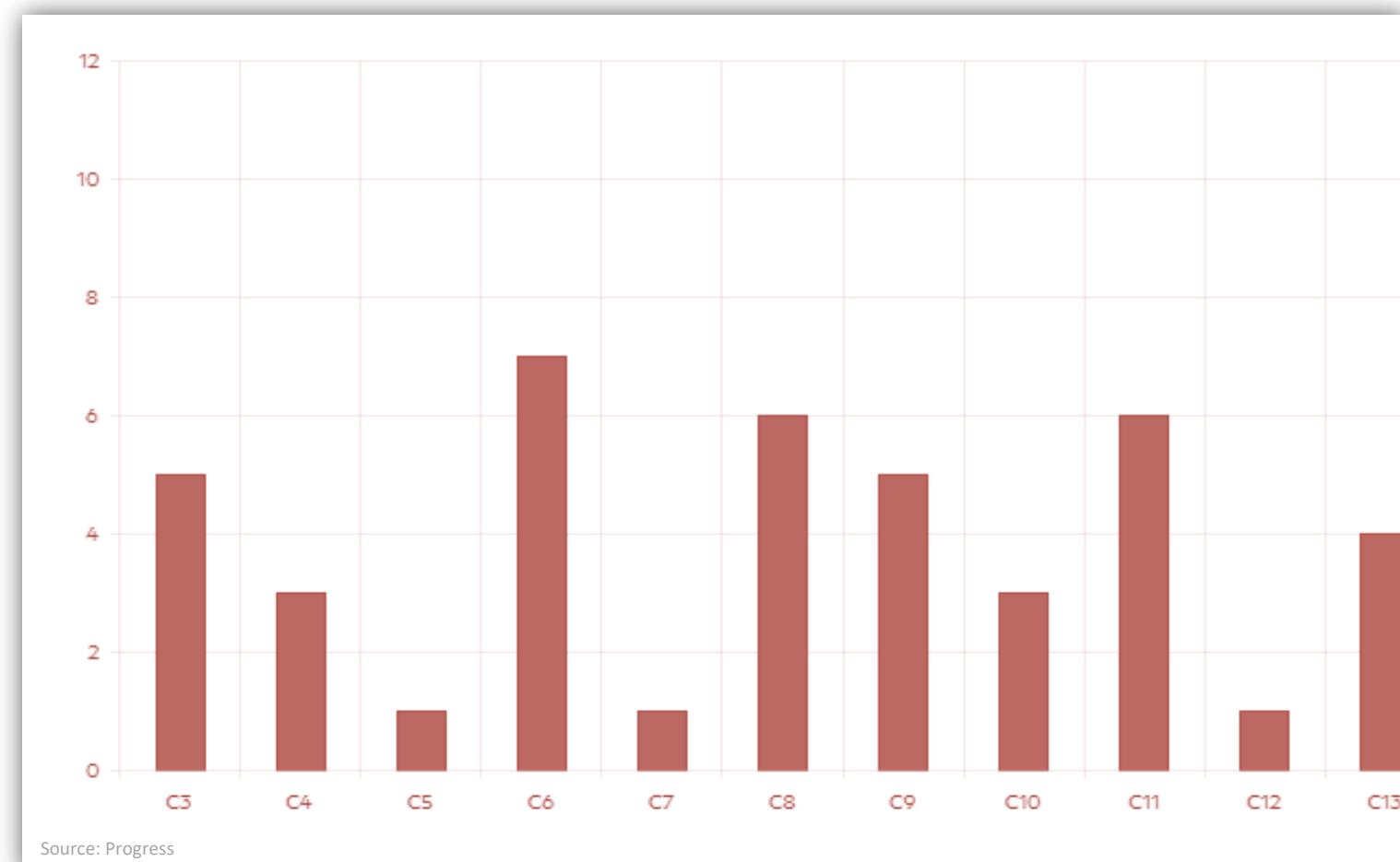
Trigger

Drag with the mouse or finger.

Action

The view window scrolls through the visualization.

Related to: Optical zoom.



Navigation: Time as a third dimension

Objective

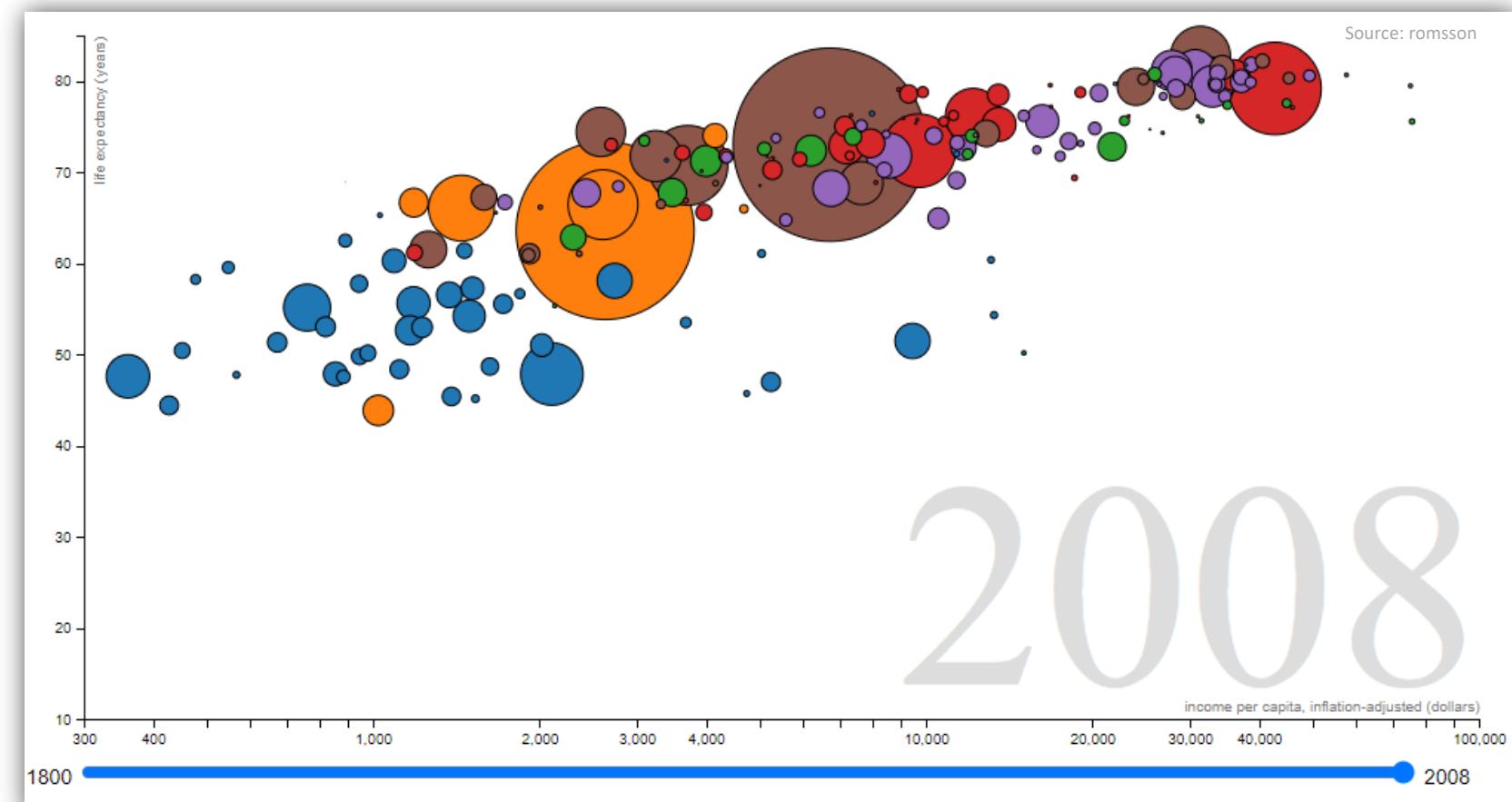
Change the display over time

Trigger

Select box or "Play" button

Action

The display is updated with the data from the new date.



Problem solving

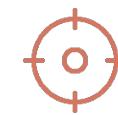


Problem solving



Linked views

Different charts share domain or selection.



Focus and context

Look more closely at a specific area while viewing the whole thing.



Overview and detail

There are 2 views, a general one of the whole set and a detailed one.



Details on demand

Offer 2 levels of information and show the second level only when users ask for it.

🔗 Linked views

Objective

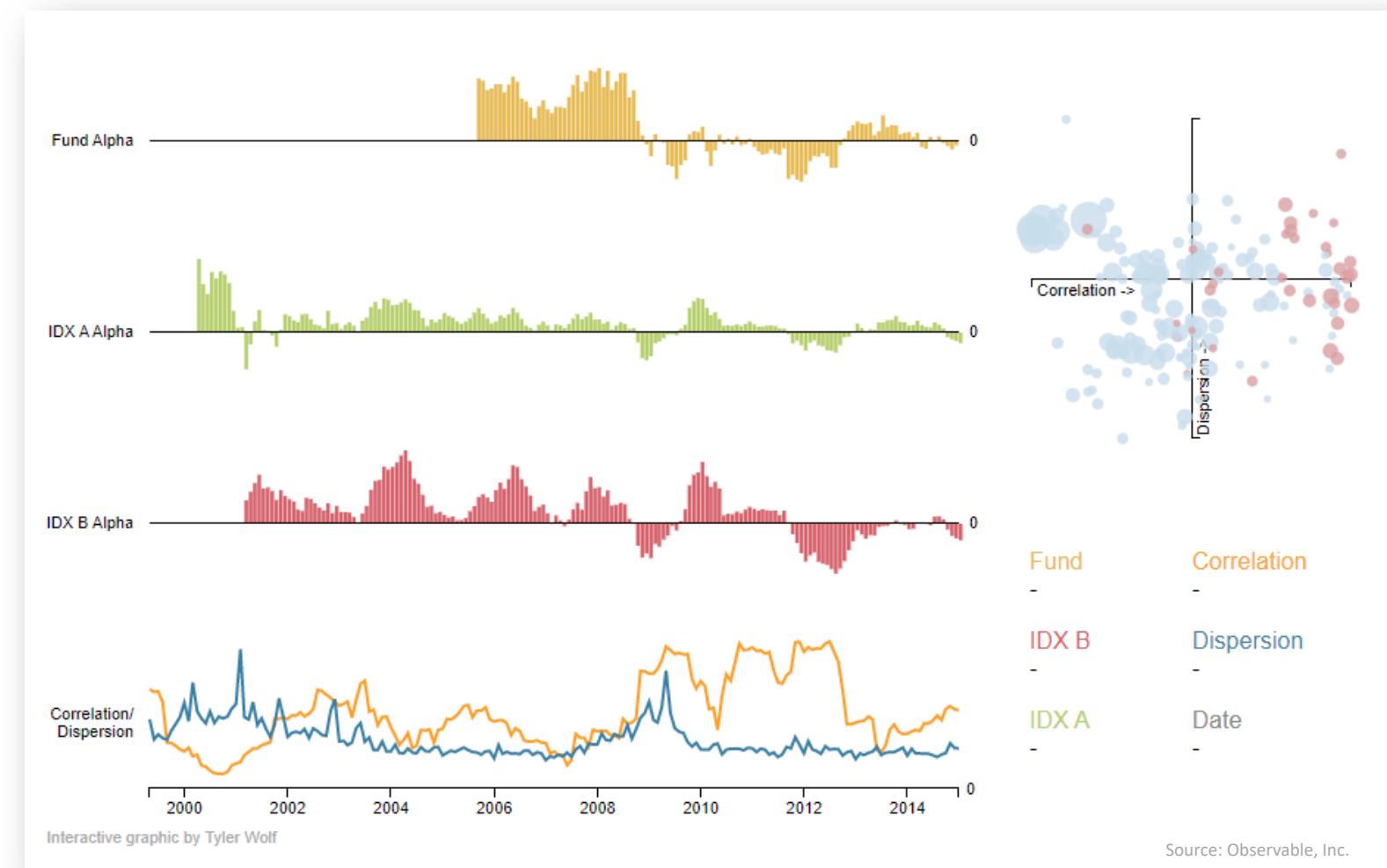
Different charts share domain or selection.

Trigger

An action in one of the views.

Action

The action in one view (filter, drag, select...) affects the others.



Source: Observable, Inc.

Focus and context

Objective

Look more closely at a specific area while viewing the whole thing.

Trigger

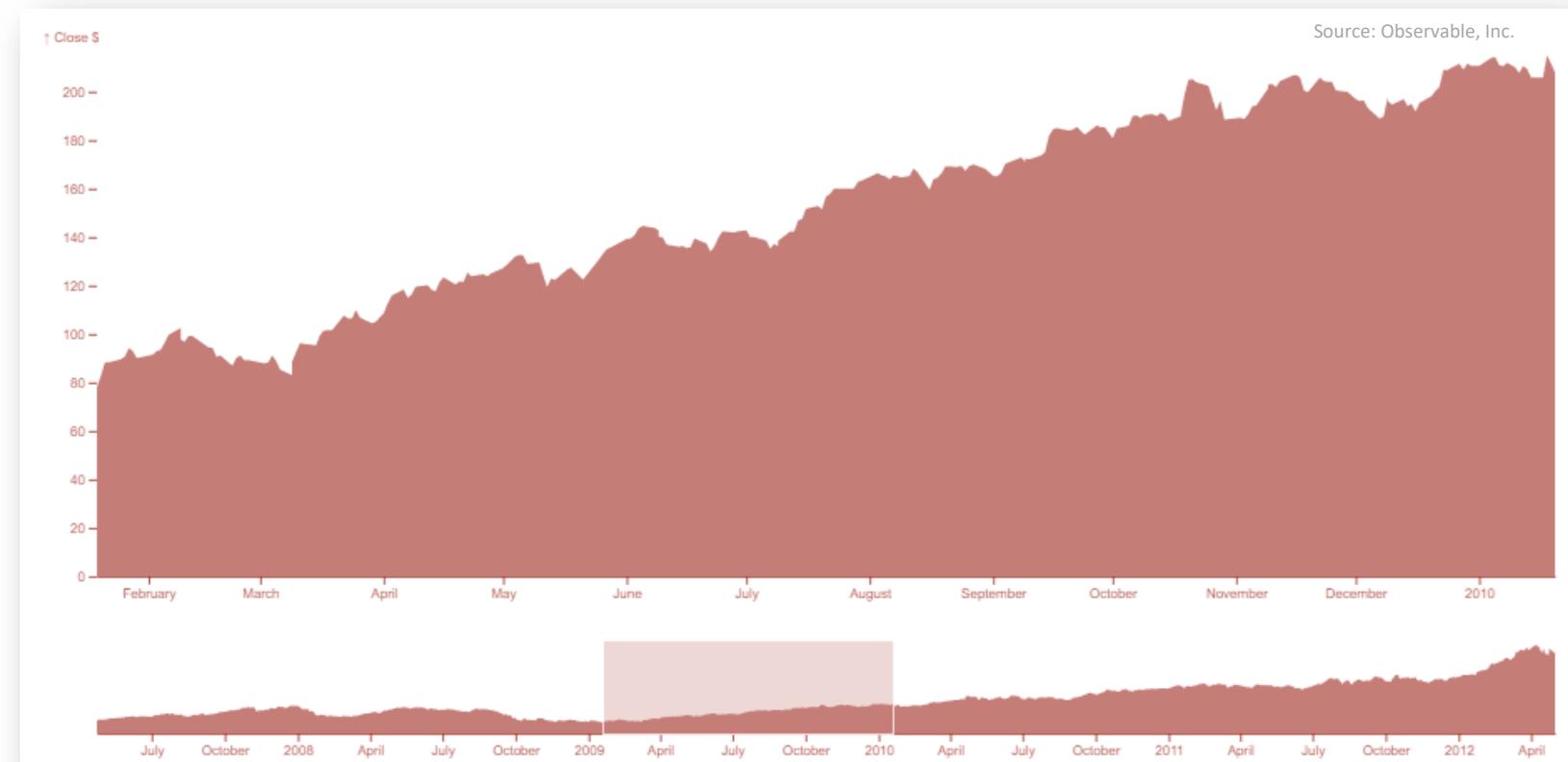
Brushing, filtering.

Action

The area that receives focus is shown in more detail.

Related to:

Zoom, linked views.





Overview and detail

Objective

Two views are offered, a general one of the whole and a detailed one.

Trigger

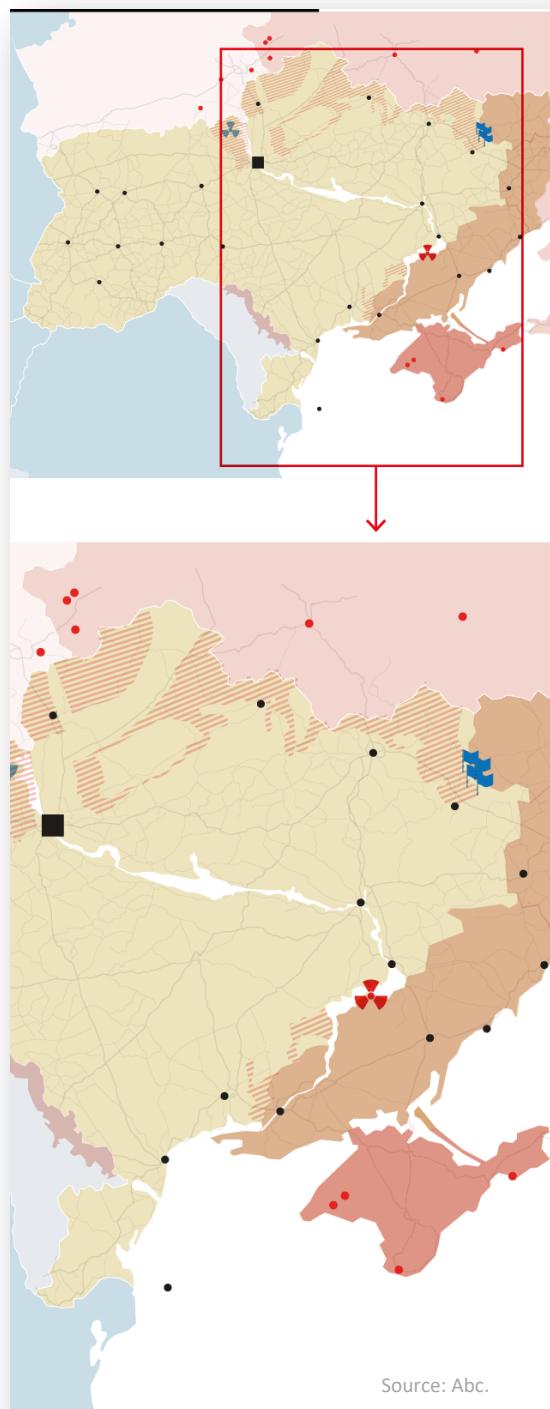
Zoom and navigation in detail.

Action

The overview and detail view are linked views with different scales.

Related to:

Zoom, linked views.



ⓘ Details on demand

Objective

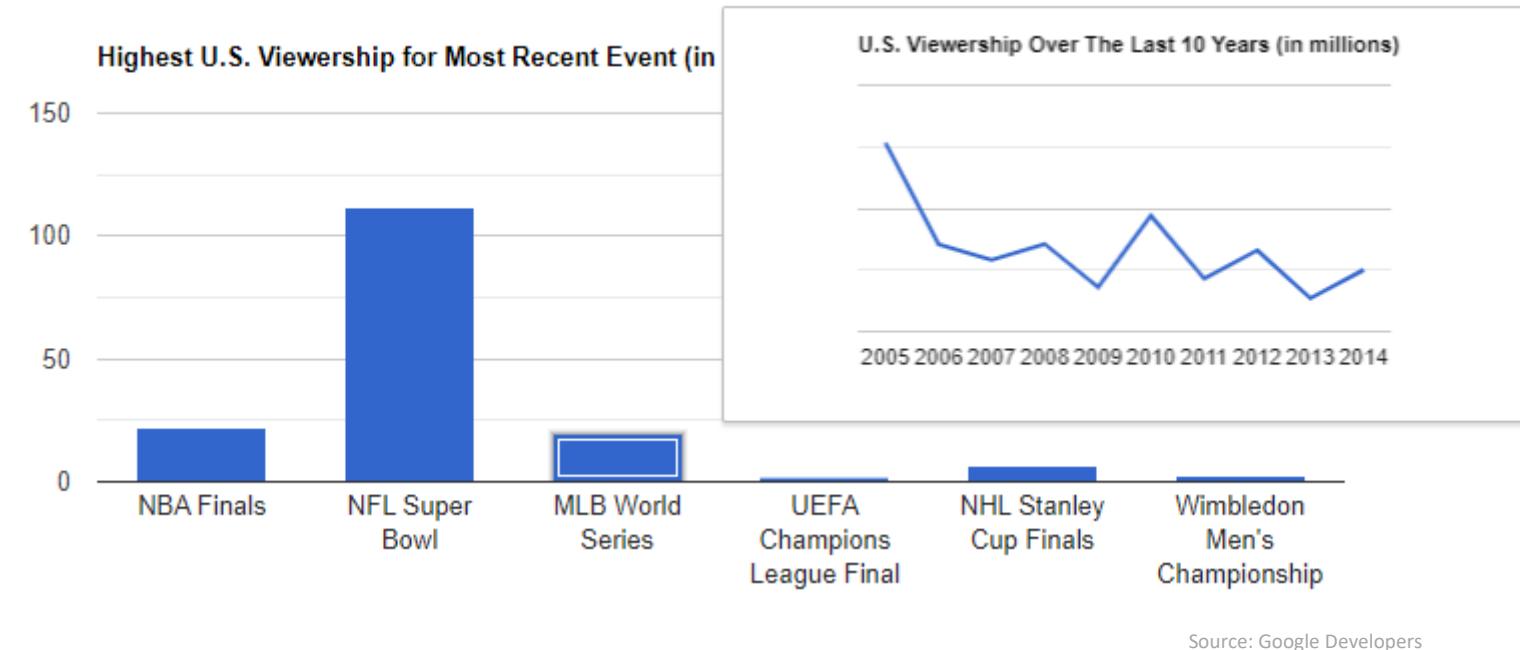
Offer 2 levels of information and show the second level only when users ask for it.

Trigger

Select, hover over.

Action

A tooltip or information box related to the selected item appears or the displayed information is updated.



Source: Google Developers

Final Thoughts



Final Thoughts

Interaction involves an effort on the part of the user.

- 1.** Interaction patterns may **not be known**, so:
 - Include instructions
 - Follow the conventions
 - Give immediate feedback
- 2.** The interaction is not free: the user must decide **the action to perform and reposition himself** when the view changes.
- 3.** Plan the interaction to be within the problem-solving natural flow.

Key ideas

- 1 In the digital environment, interaction offers new possibilities.
- 2 With the interactions of manipulation and encoding of the data, the user chooses what to see and how to display it.
- 3 With the interactions of exploration and navigation the user navigates through the informational space.
- 4 With problem-solving interactions, the user delves into the data and relates data and details.
- 5 Interaction has a cognitive cost for the user.

Sources

- ★ Ware, C. (2020) Information visualization: perception for design. Burlington: Morgan Kaufmann.

Thanks you for your attention



MIREIA RIBERA | ACCESSIBILITAT DIGITAL
| EXPERIÈNCIA D'USUARI | VISUALITZACIÓ DE DADES



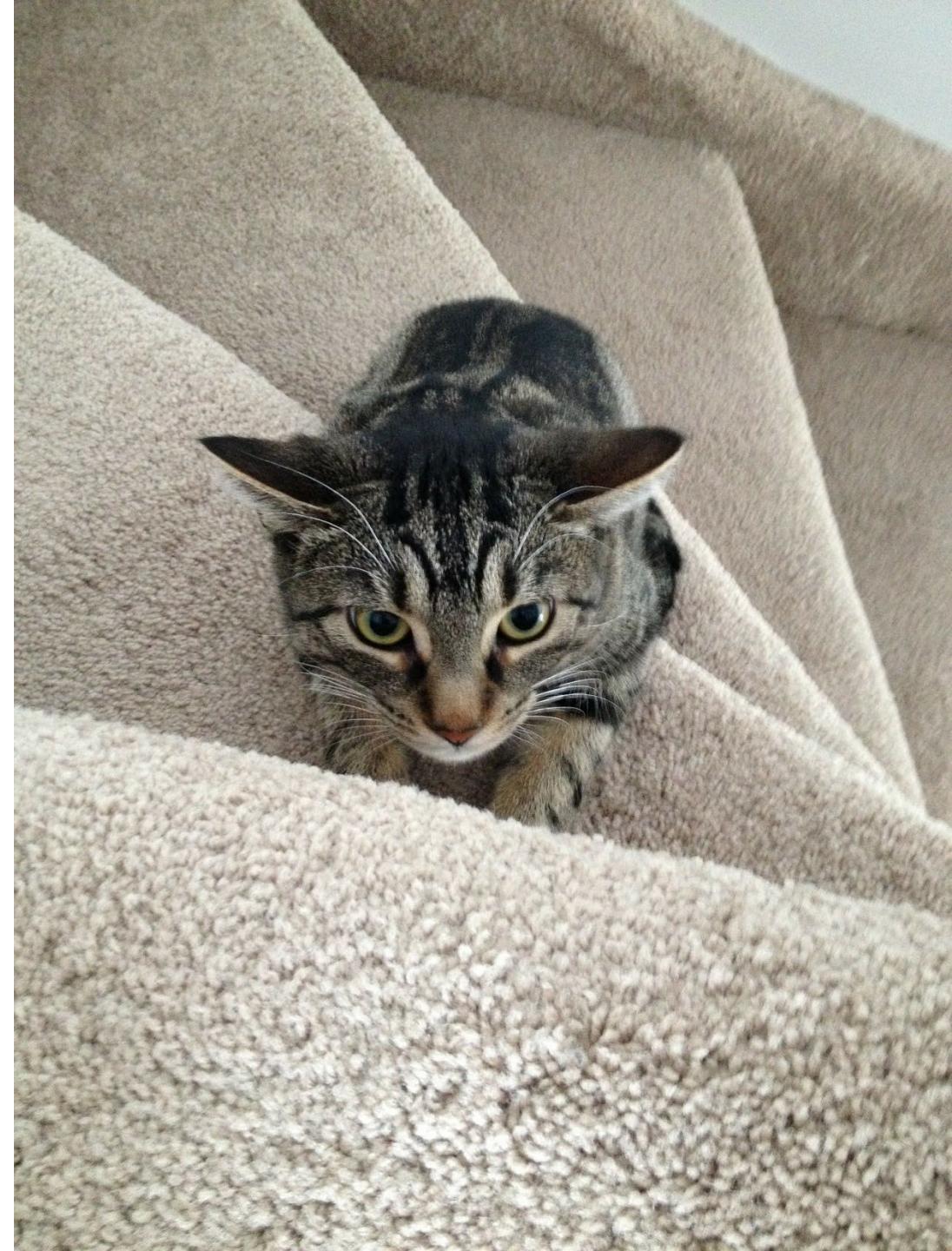
UNIVERSITAT DE
BARCELONA

How do I start a visualization?
Let's review our approaches



Bottom-up approach: From data to viz

- Exploring the data
- Identifying key aspects





Top-down approach: From goal to viz

- Define your message
- Decide
 - Type, style, ... of the charts
 - Highlight
 - to aggregate, ...
- May need to complement available data

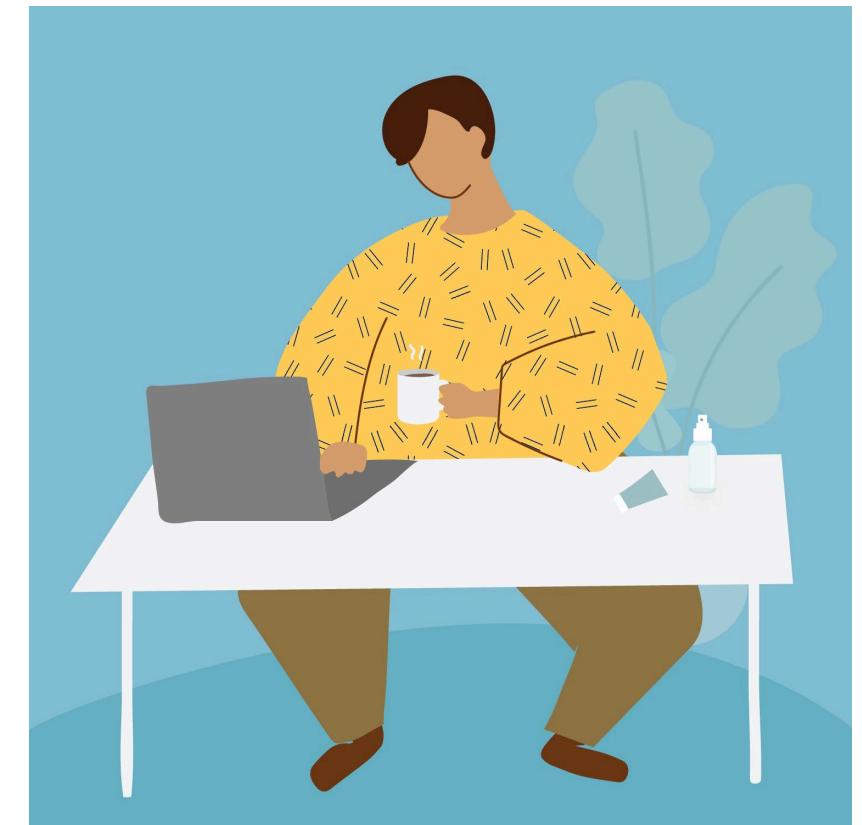
Audience is key!

- It's not Bottom-Up *OR*
Top-Down
- It's both of them!
...in an iterative way



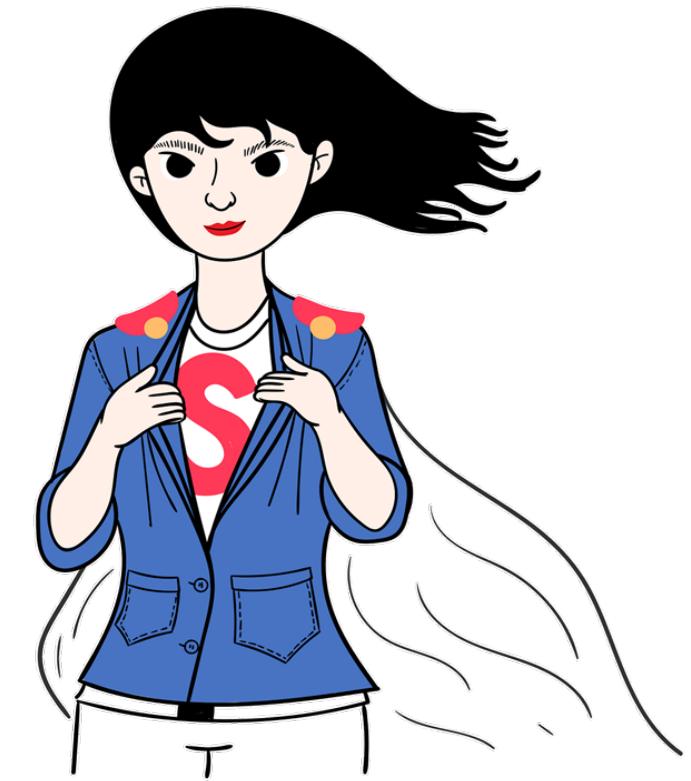
Why shall we learn about the user?

To be better equipped
in our journey from
data technician



Why shall we learn about the user?

To be better equipped
in our journey from
data technician
to **data hero**



What skills does a data hero possess?



What skills does a data hero possess?



You'll have to be...

1

A psychologist.



2

A treasure hunter.



3

A story teller



4

A graphic designer.



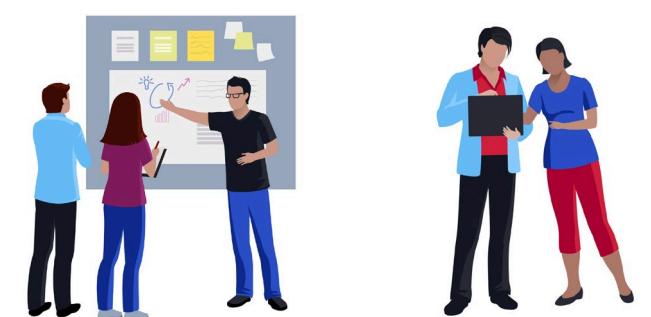
5

A youtuber.

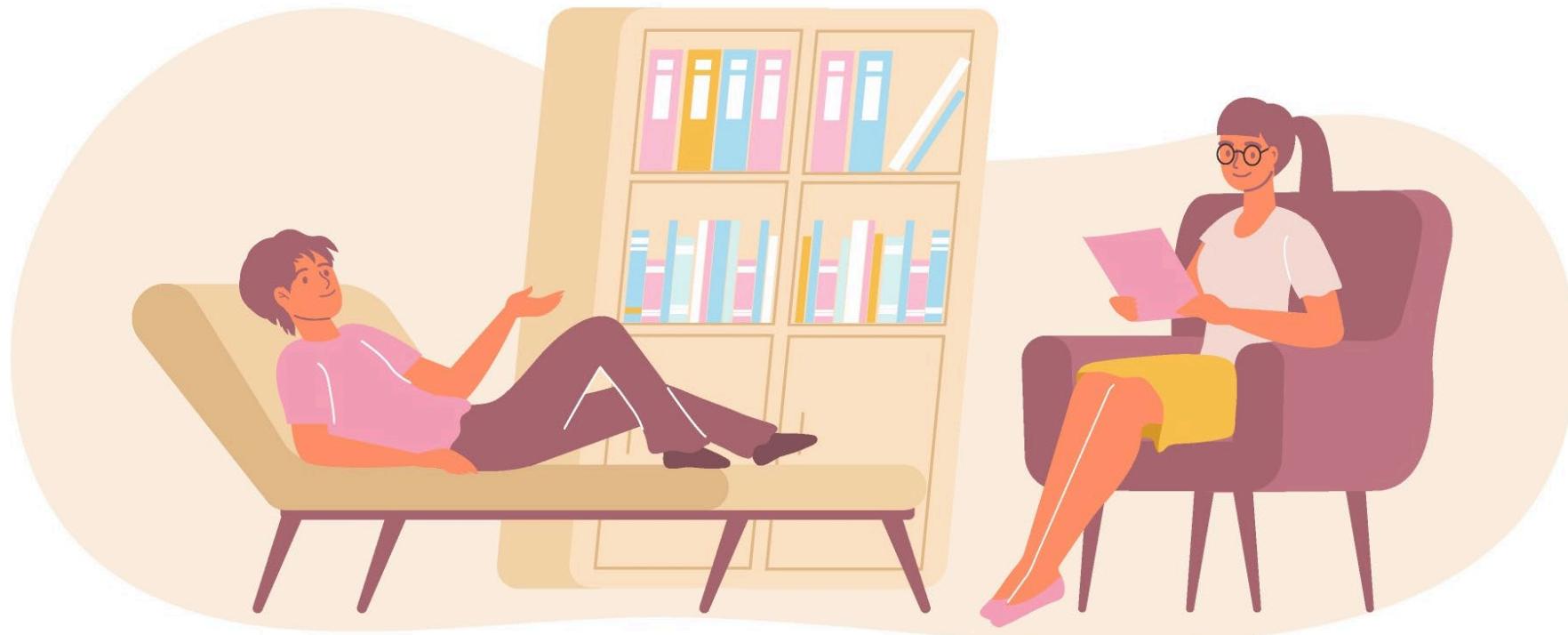


6

But essentially, a **consultant**



TODAY: The psychologist



You must understand and resonate with your audience



Who they are



What they care about



How to best serve their needs

Who are they?

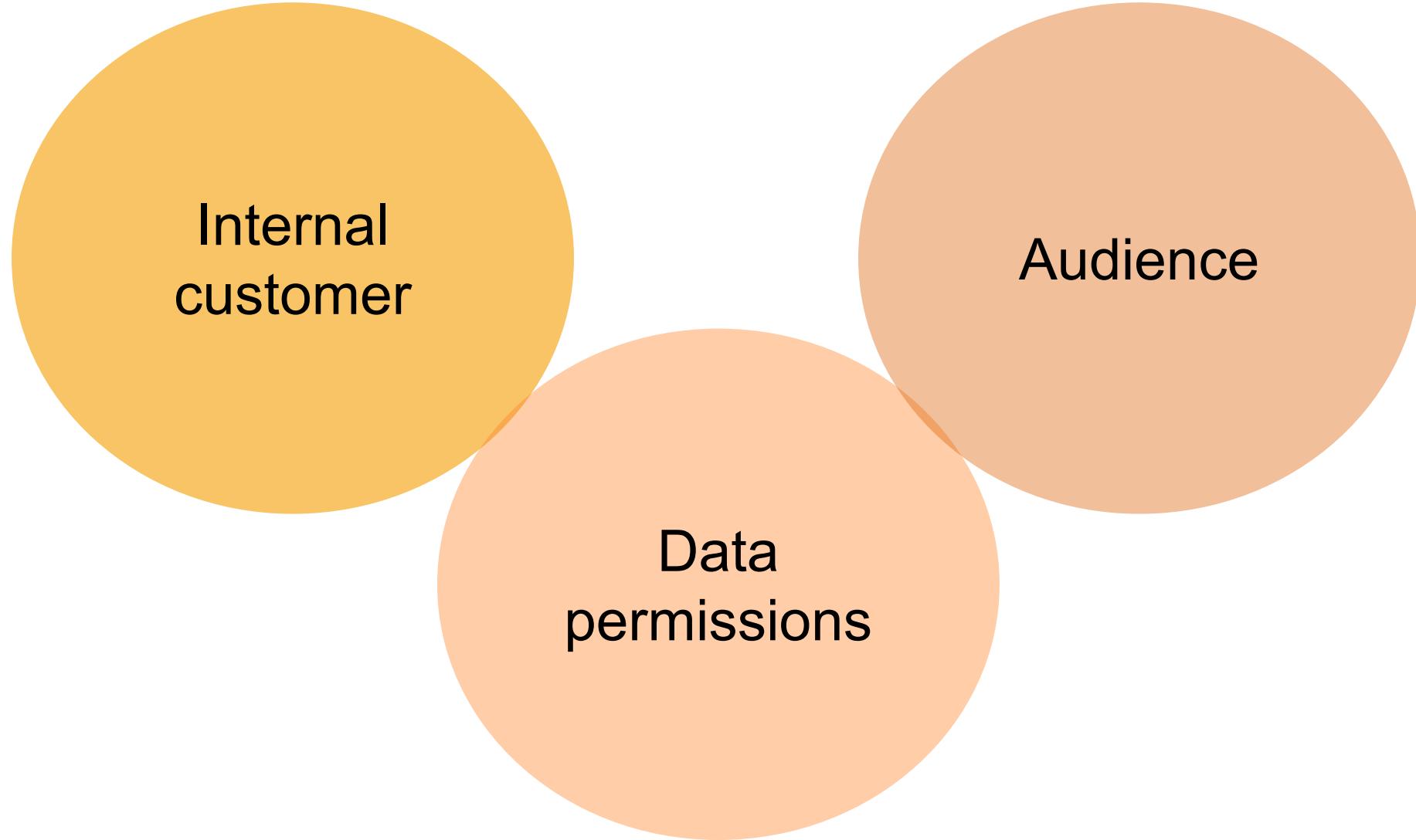
- 1 What are they like? Not just demographics, take a walk in their shoes
- 2 Why are they here? Situation analysis
- 3 What keeps them up at night? Know their pain points and offer solution
- 4 How can you solve their problem? What's in it for them
- 5 How can you best reach them?

Case study...



Fill in the answer sheets

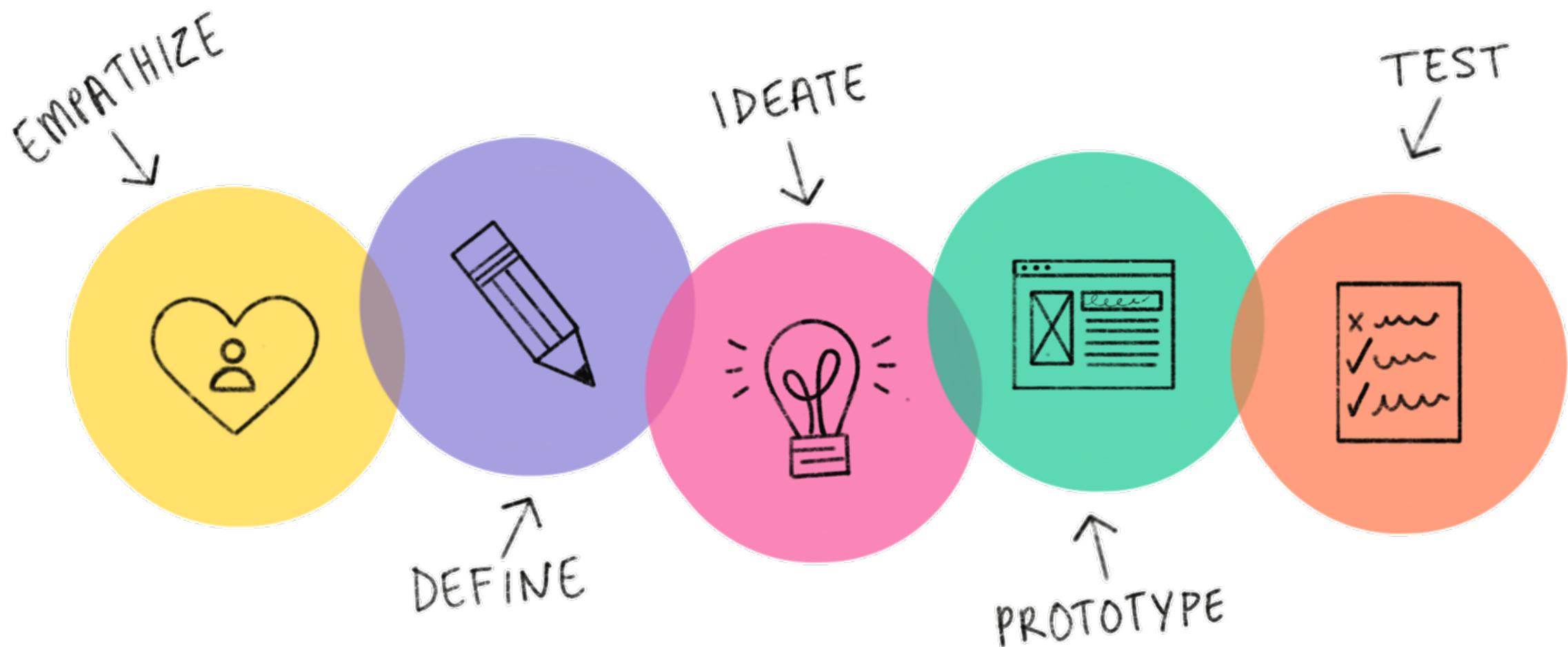
Things to consider: message

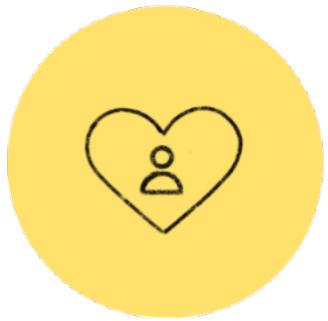


A close-up photograph of a fluffy white cat sleeping peacefully. The cat's head is turned slightly to the left, showing its closed eyes and pink nose. Its body is curled up, and its fur is soft and light-colored.

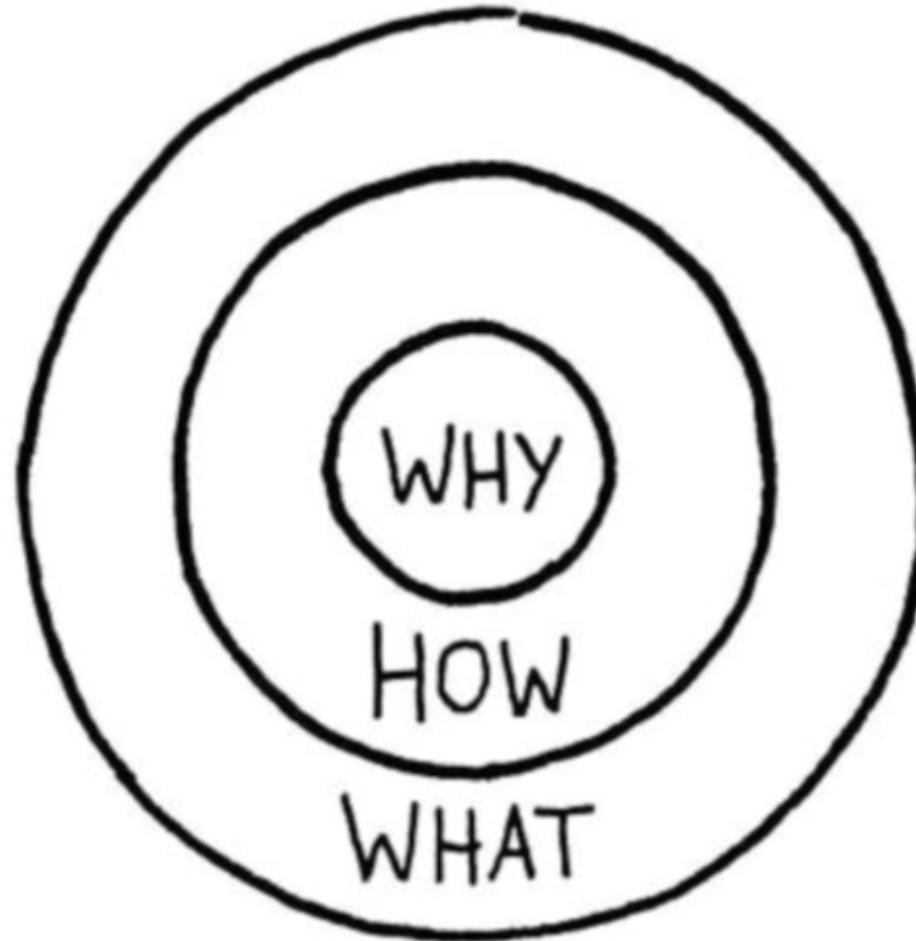
**Relax...
HCI
provides
me with
solutions**

Method: Design Thinking





Empathize: gain an understanding





Empathize: visualization as a bridge

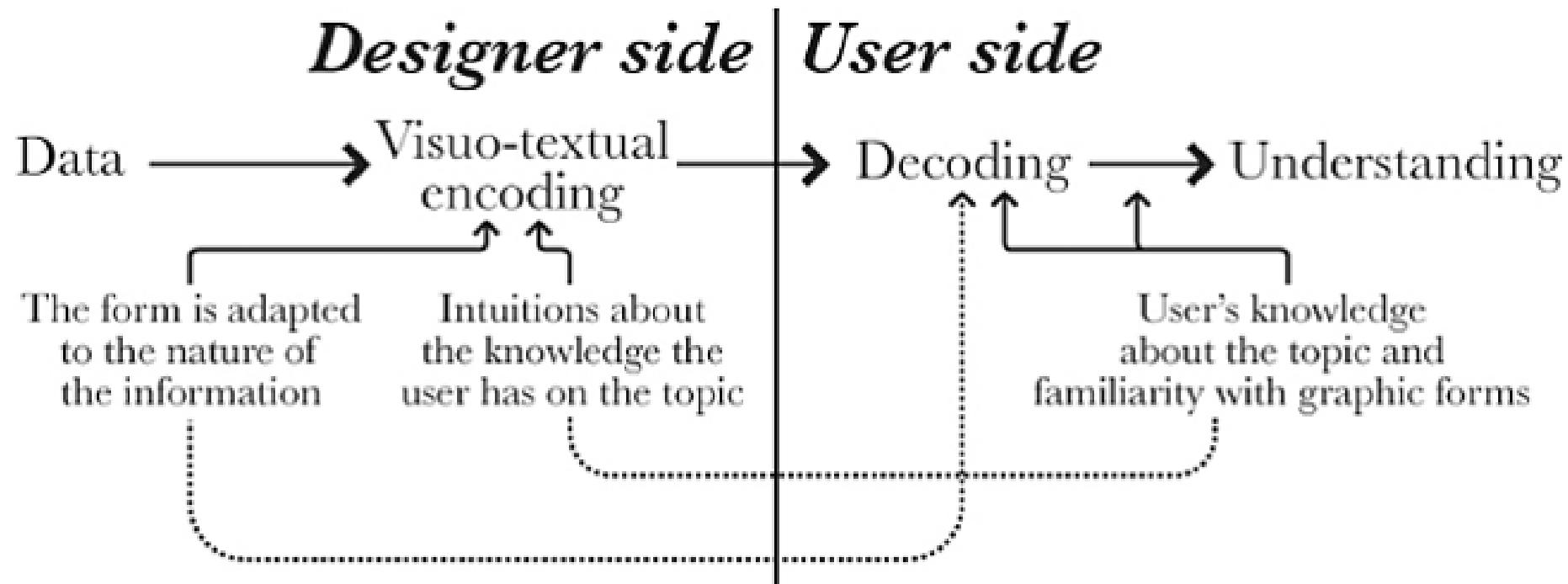
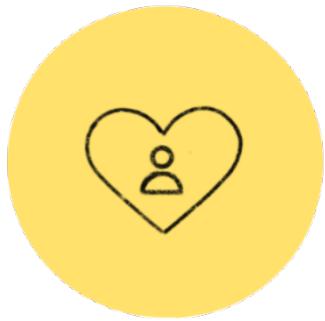
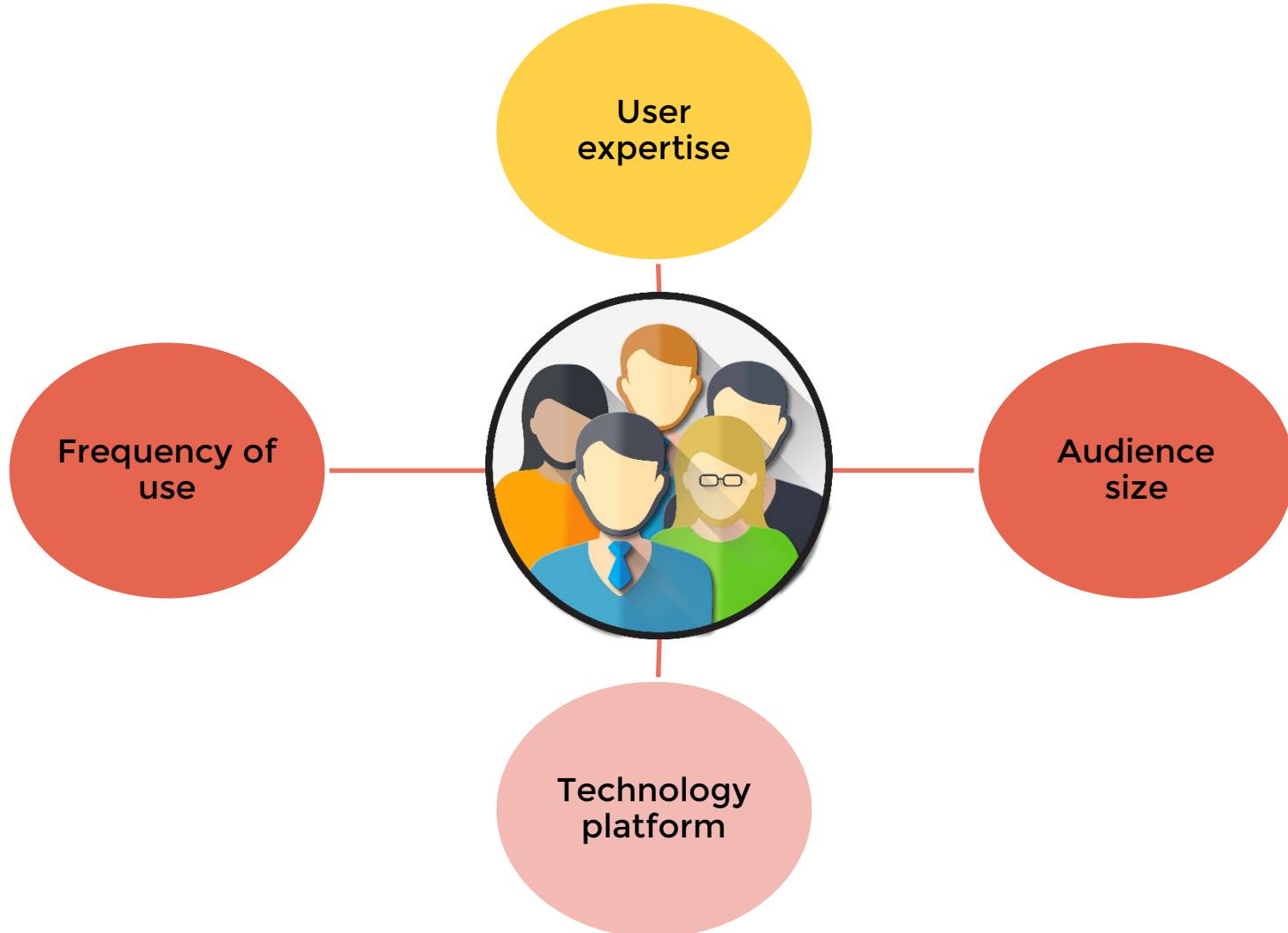


Figure 3.9. Designers encode, users decode.

Source:
Cairo, the functional art



Empathize: knowing the user





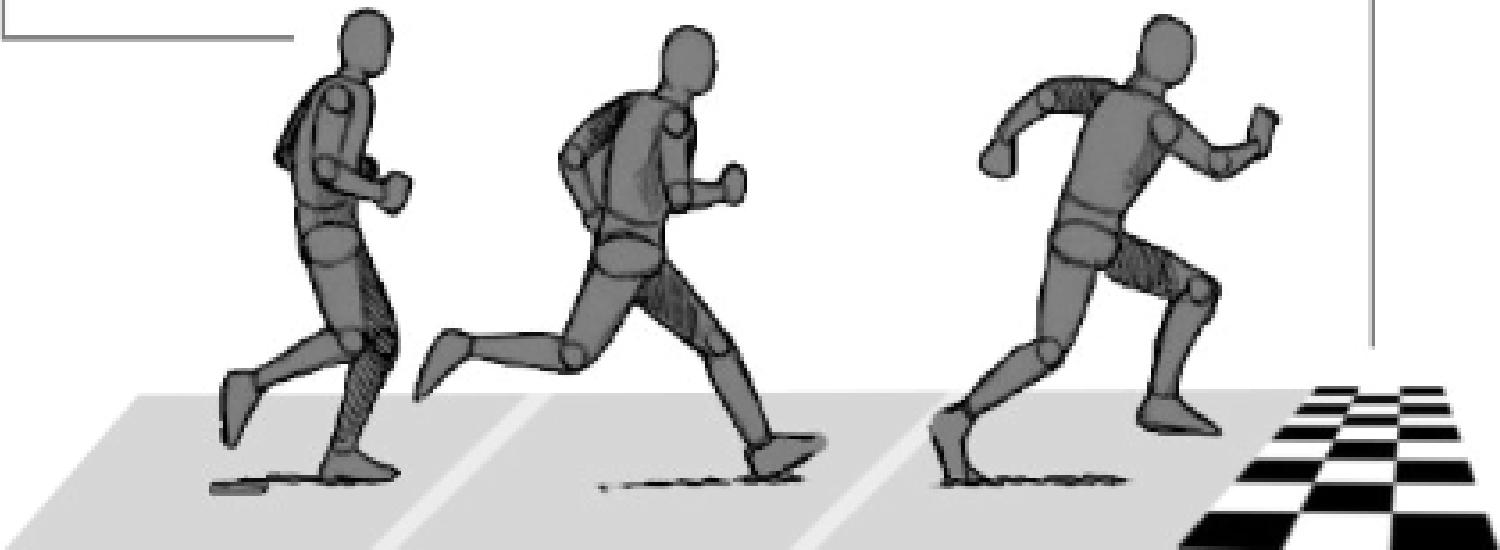
Empathize: personas

1. Persona

Defines who the story is about. This main character has attitudes, motivations, goals, and pain points, etc.

3. Goal

Defines what the persona wants or needs to fulfill. The goal is the motivation of why the persona is taking action. When that goal is reached, the scenario ends.



2. Scenario

Defines when, where, and how the story of the persona takes place. The scenario is the narrative that describes how the persona behaves as a sequence of events.



Empathize: persona example



Mercy
Pediatric Registered Nurse

Context

Registered Nurse Mercy works around 50-55 hours a week. At work, she spends a majority of her day writing reports on a computer, or transcribing written reports into a digital software. She finds this part of her job cumbersome at times, and gets frustrated with the amount of typing she must do on a daily basis, as she would much rather spend time with her patients.

Because of this reduced time with patients, and the inconsistency with reports and forms, Mercy finds that the communication between doctors and nurses and their patients is somewhat strained. She wishes there was a smoother way in which to relay information from the doctors to herself and her fellow nurses, and then to the patients, to ensure that there is no lost information or miscommunication between each party.

Characteristics

- Loves interacting with patients, especially kids

Technology

- Many hours doing menial typing for reports
- Not very confident with technology so tends to get confused with multiple software programs

Pains

- Poor communication between care providers and patients
- Loss of information when passed from person to person
- Developed carpal tunnel from excessive typing - wears wrist brace

Goals

- Better way to relay healthcare information between doctors, nurses, and patients

Desires

- Empower patients to get and understand necessary health information
- Conversion of all paper forms to digital forms



Empathize: persona example



Customers of The Daily Mirror

If The Daily Mirror from their comparison set | Sample size: 2868



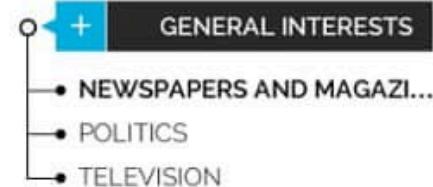
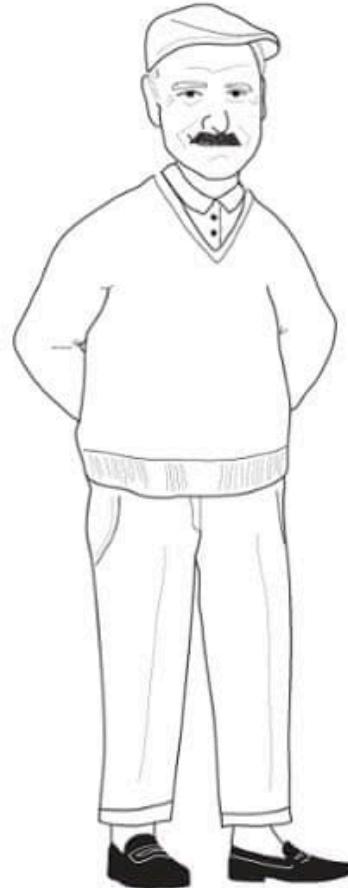
FAVOURITE DISHES +

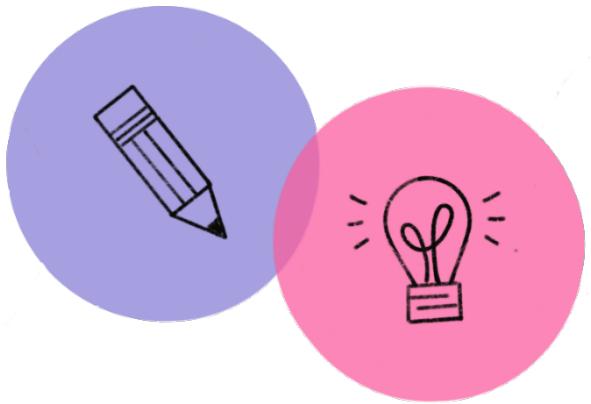
HOBBIES & ACTIVITIES +

- DIY
- SHOPPING
- GOING ON DAY TRIPS

FAVOURITE SPORTS +

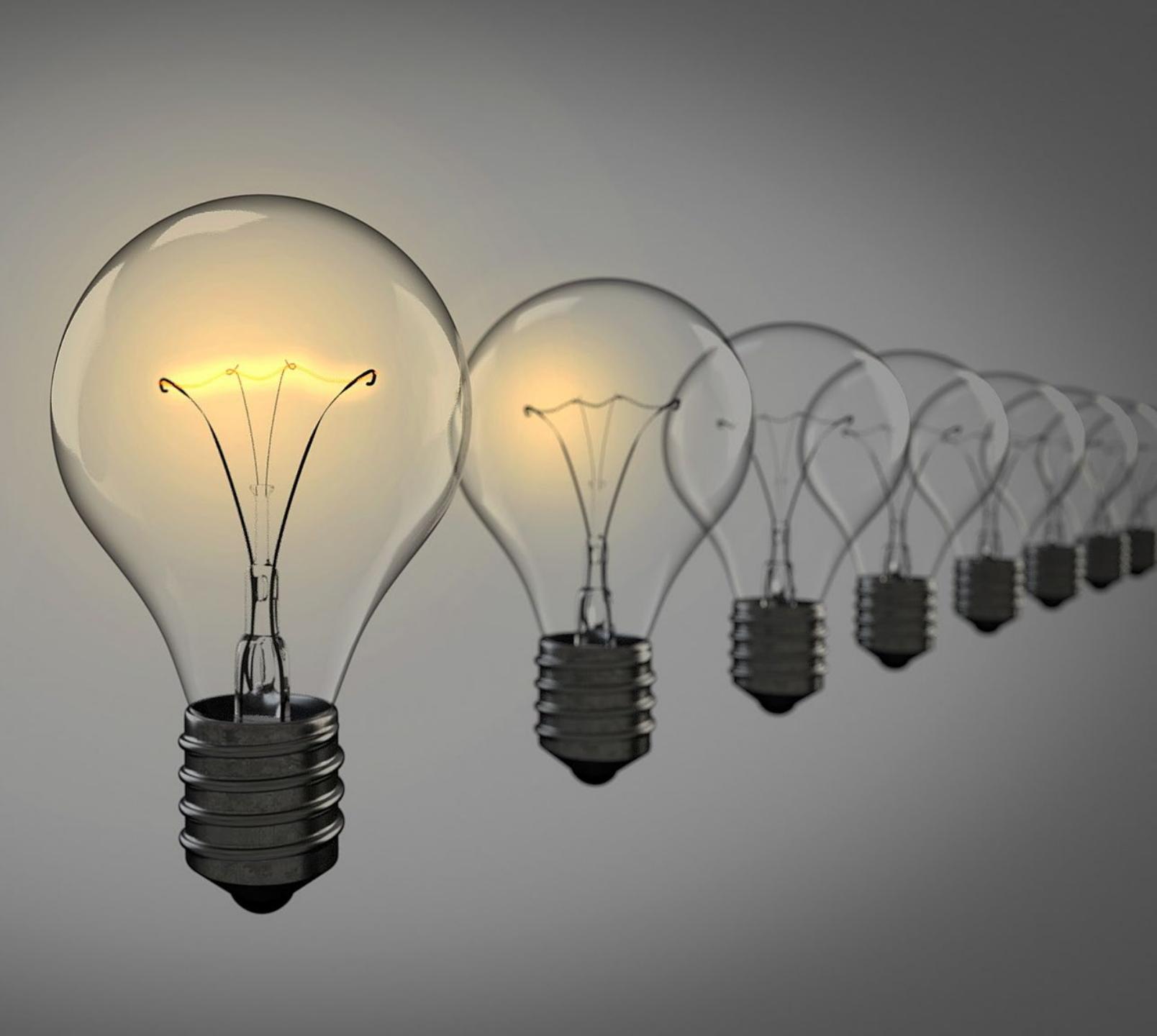
- FOOTBALL
- BOXING





Define, ideate

- State the problem
- Solutions from
alternative views

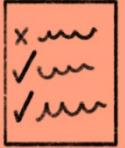




Prototype: techniques

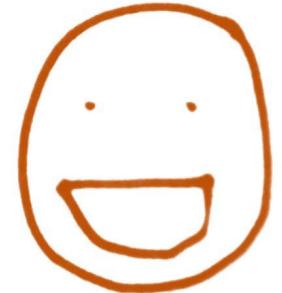
- Scenarios
- Questions
- Low fi prototypes
- High fi prototypes
- Implementation



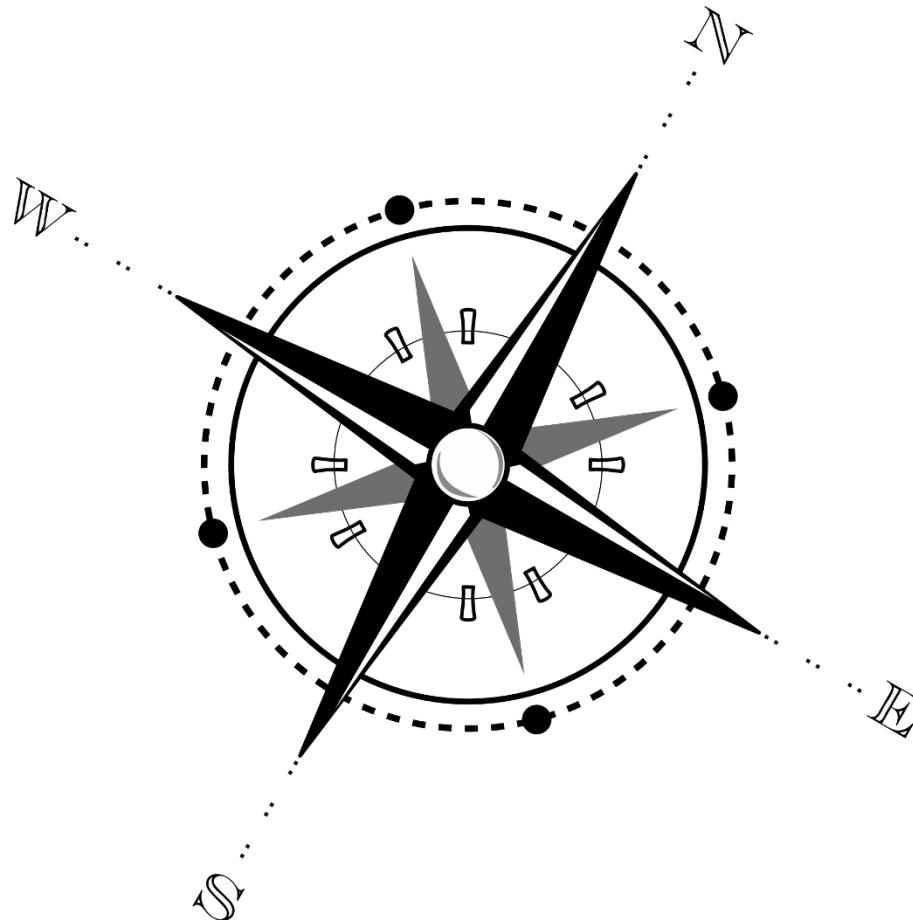


Test: evaluate

- Interviews, questionnaires
- Heuristic evaluation
- Usability testing



Guidance

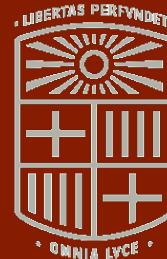


- [UK Research guidelines](#)
- [Fluid Project](#)
- [Interaction Design Foundation](#)

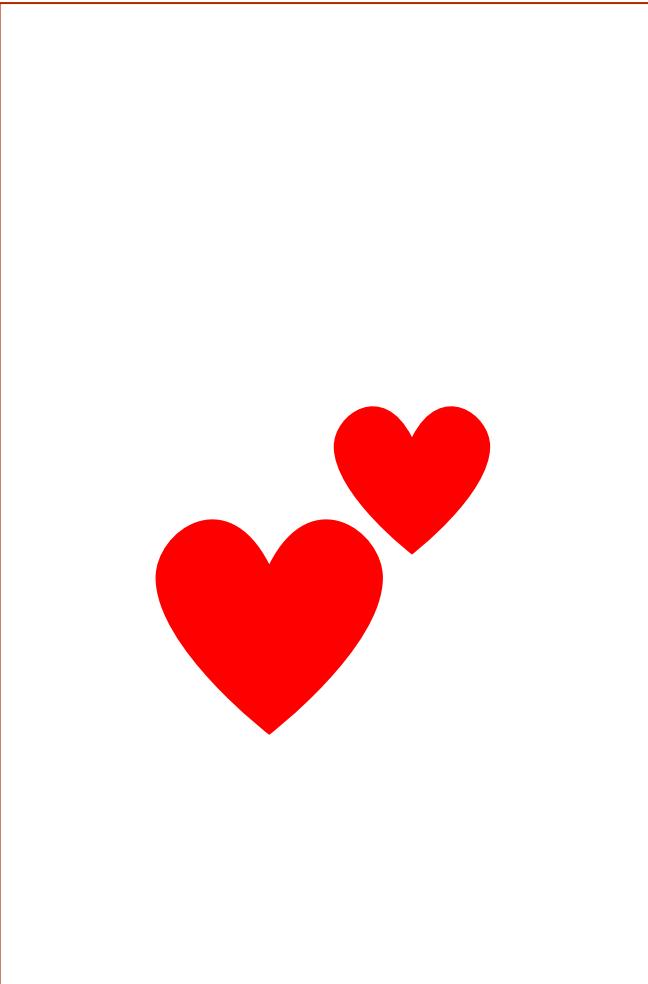
Thanks and Rewrap

m

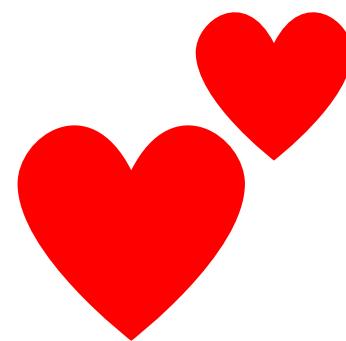
MIREIA RIBERA | ACCESSIBILITAT DIGITAL
| EXPERIÈNCIA D'USUARI
| VISUALITZACIÓ DE DADES



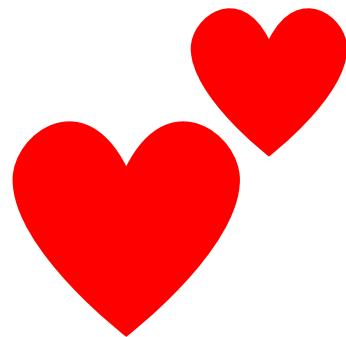
UNIVERSITAT DE
BARCELONA



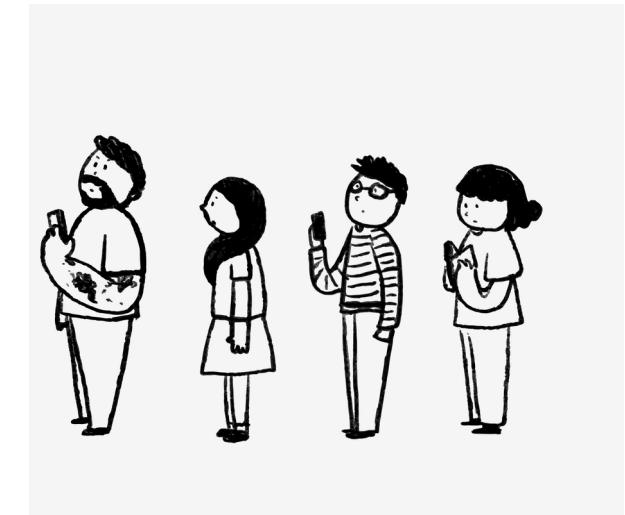
To whom it may concern



To whom it may concern



versus



Presentation and Visualization. Dashboard design



Mireia Ribera
ribera@ub.edu
Office: 206, near T1

Contents

- 1. Definition**
- 2. Design guidelines**
- 3. How to build a dashboard**

A dashboard is a **visual display** of the most important information needed **to achieve** one or more objectives that has been **consolidated** on a single screen so it can be **monitored** at a glance.

Few, 2013

Definition (b)

A dashboard **in business**

is a **tool** to manage

the most important business information

from a **single point of access.**

It helps managers and employees to **keep track** of company's **KPIs**.

(Key performance indicators)

It also utilizes **business intelligence** to help companies **make data-driven decisions**.

Design guidelines

- 1 Consider your end goal
- 2 Consider your audience.
- 3 Choose relevant KPIs
- 4 Provide context.
- 5 Simplicity over details
- 6 Display a focal point
- 7 Be consistent.
- 8 Layout and white space
- 9 One single screen.
- 10 Include interaction

1-2. Consider your end goal / audience: types of dashboards

Operational

Middle or lower level management

Immediate action

- Current performance
- Real time

Analytical

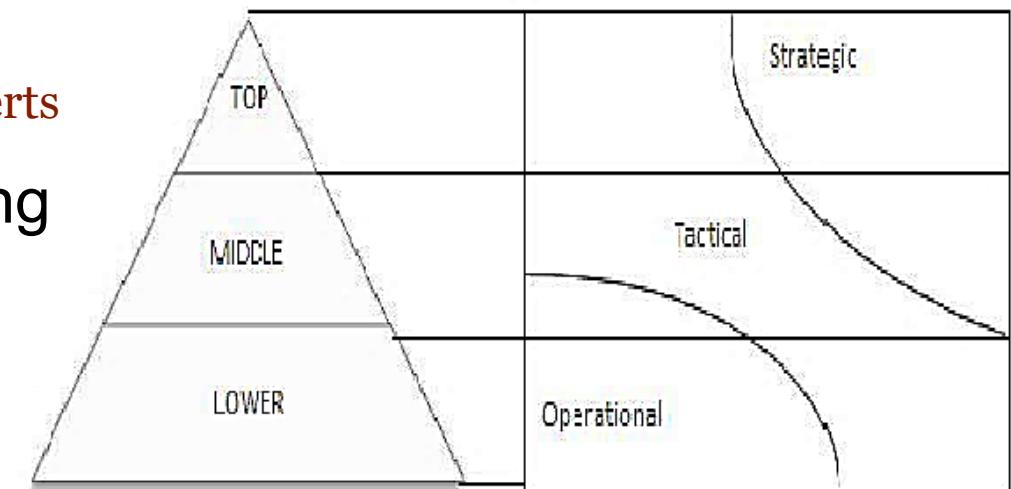
Top level managers or experts

Drive decision making

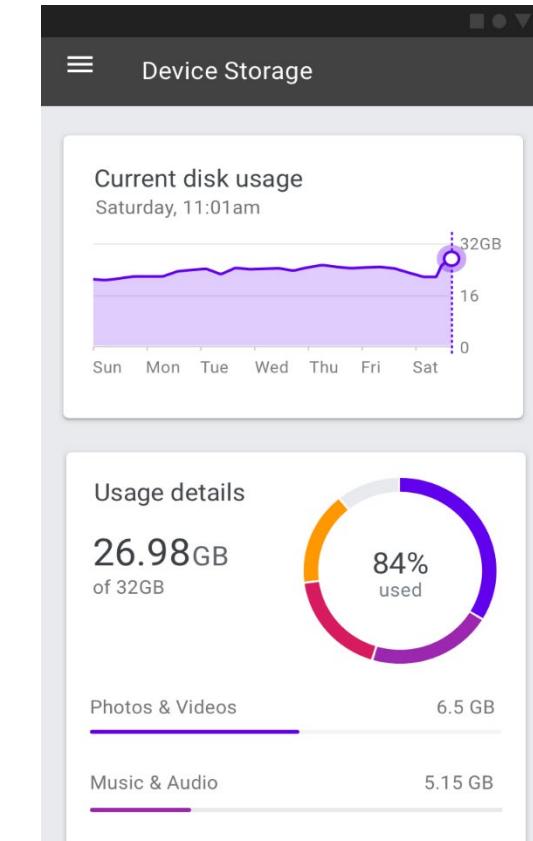
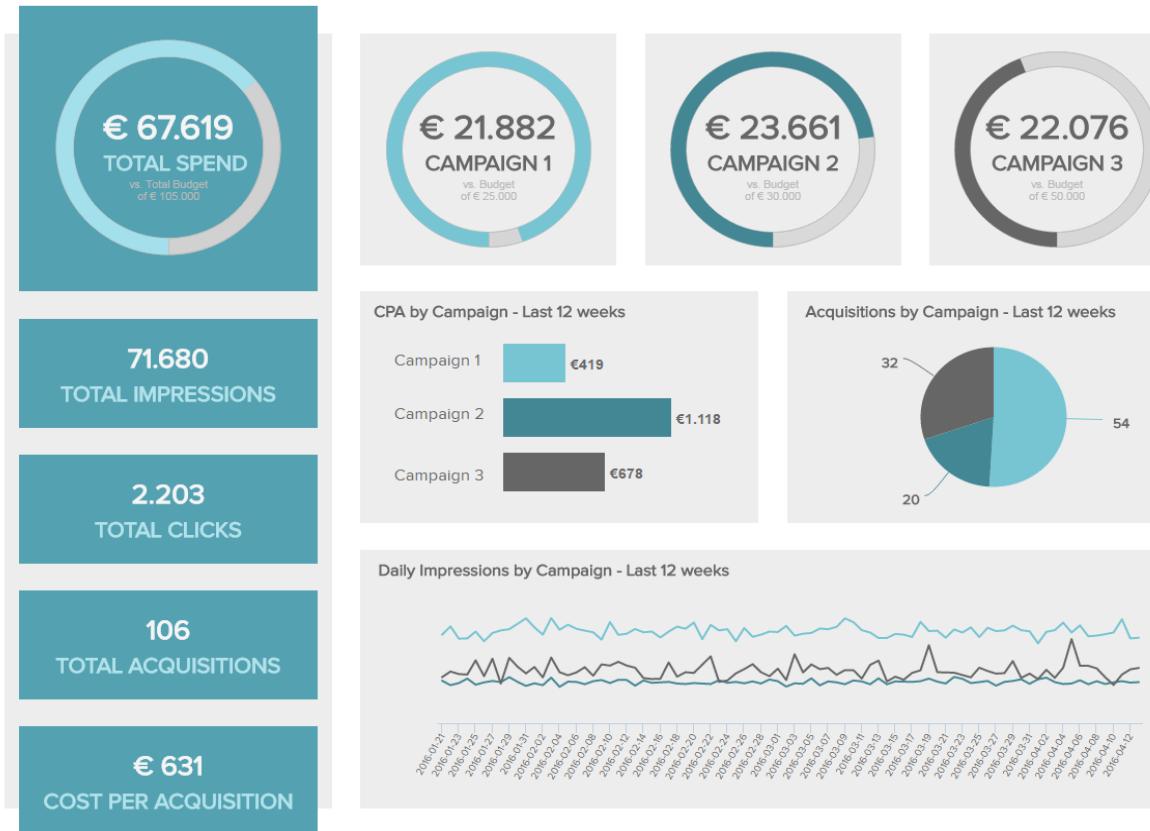
- Explore data
- Discover trends
- Establish targets

Presentation

A curated snapshot on a topic of interest



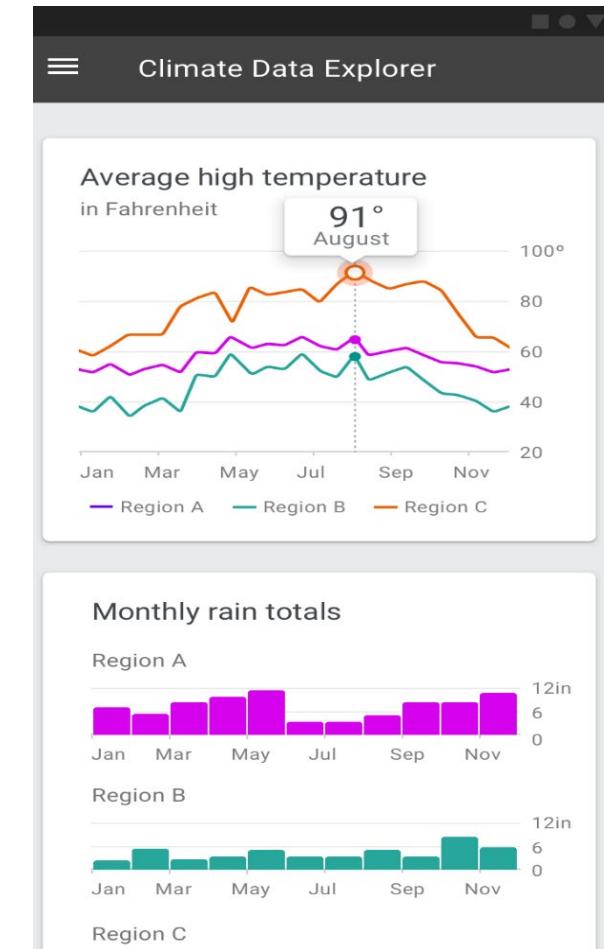
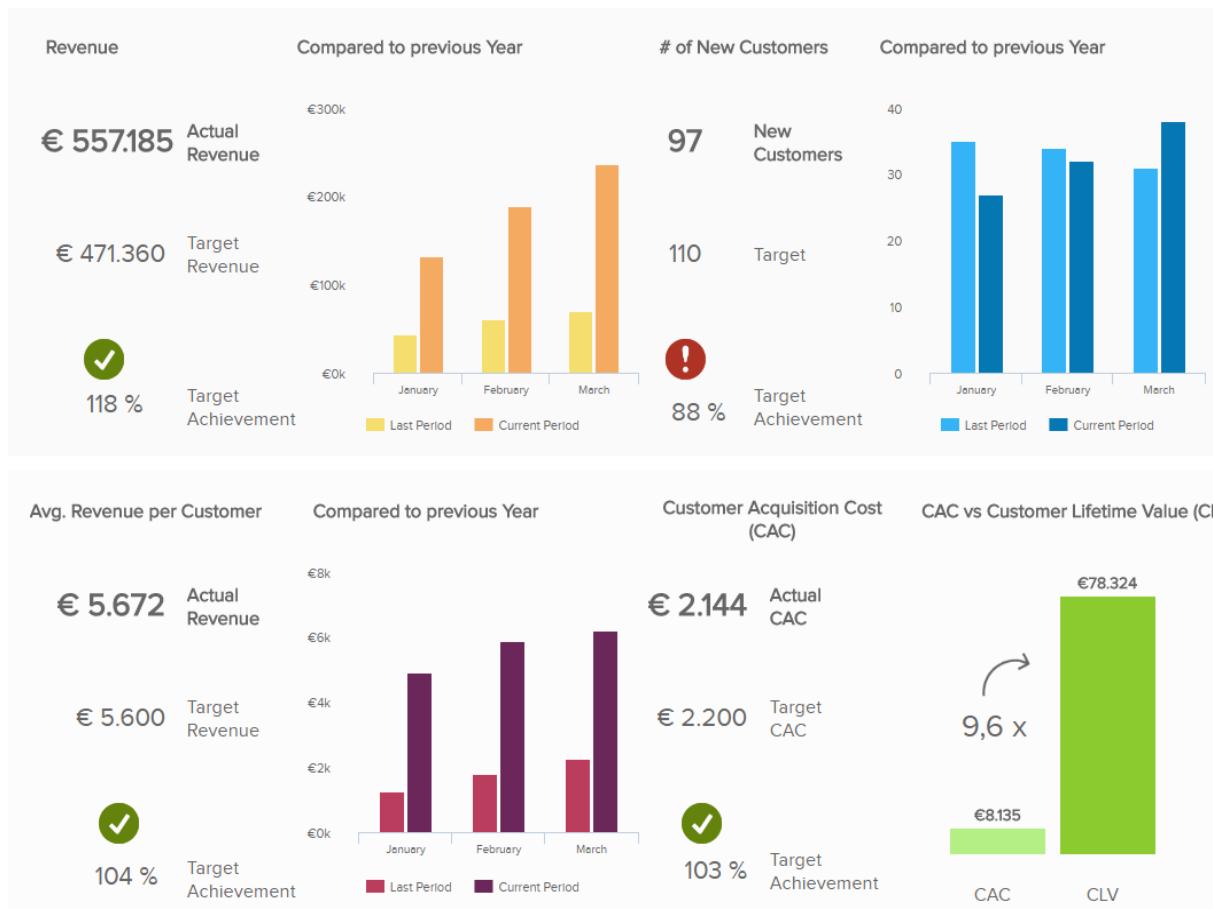
Operational dashboards: examples



Source: <https://www.datapine.com/blog/strategic-operational-analytical-tactical-dashboards/>; <https://material.io/design/communication/data-visualization.html#dashboards>

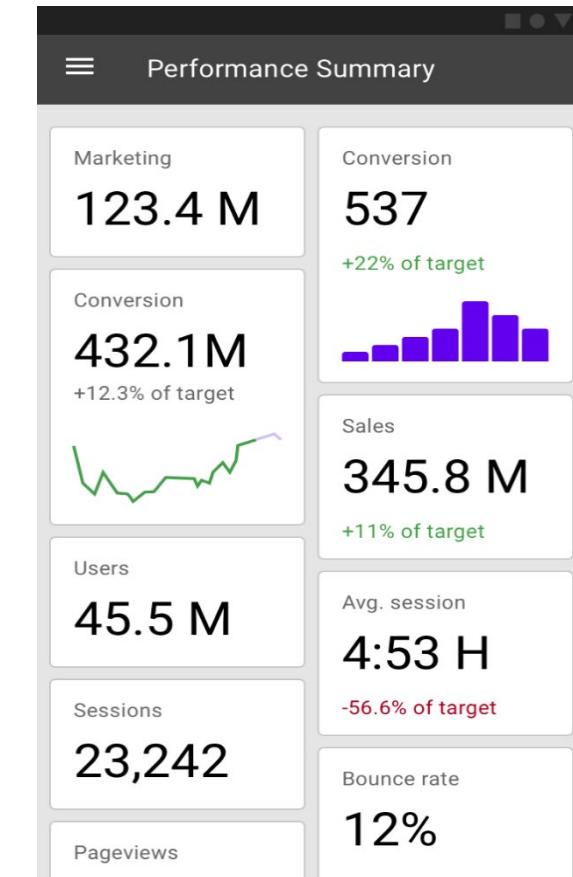
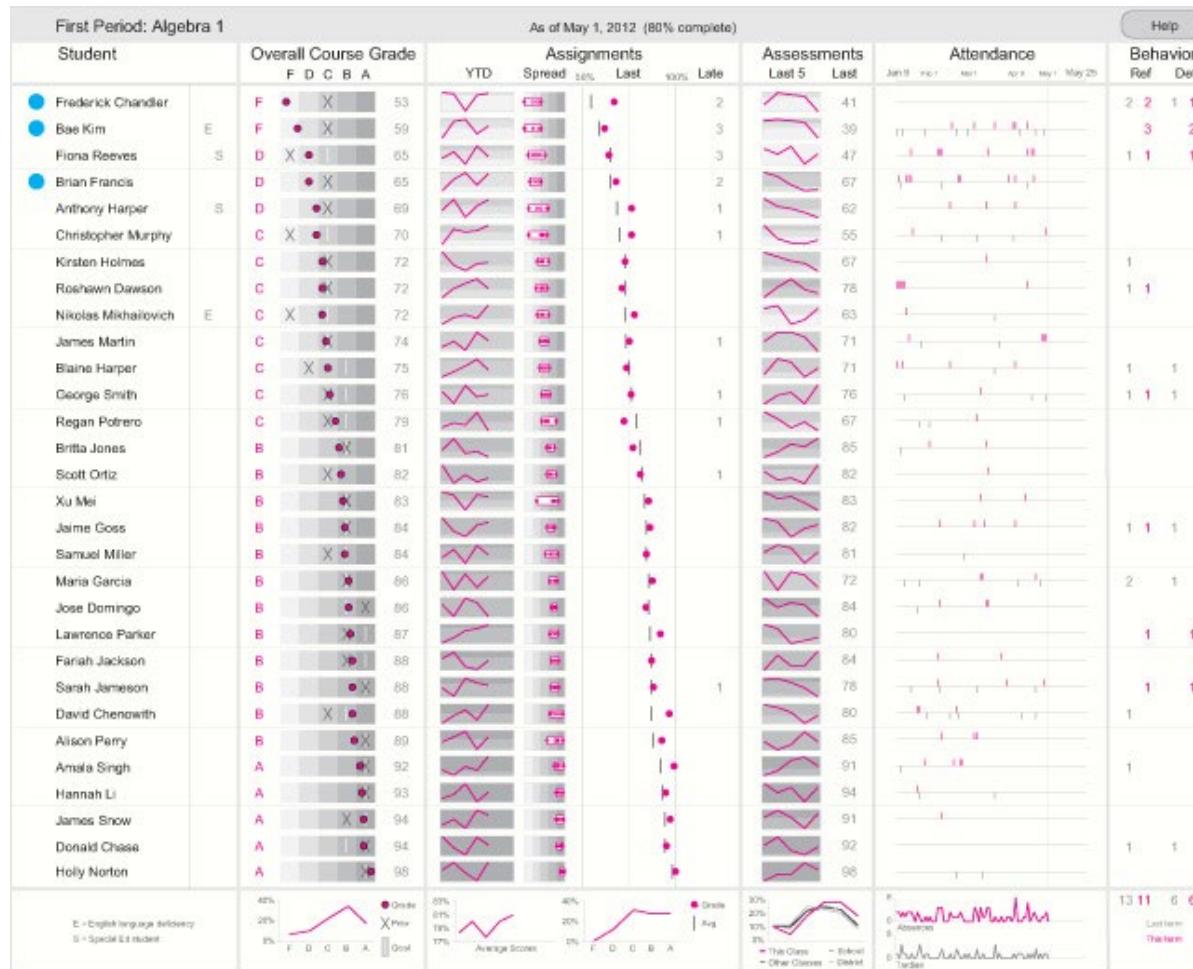
Analytical dashboards: examples

Revenue and Customer Overview - Q1 2016



Source: <https://www.datapine.com/blog/strategic-operational-analytical-tactical-dashboards/>; <https://material.io/design/communication/data-visualization.html#dashboards>

Presentation dashboards: examples

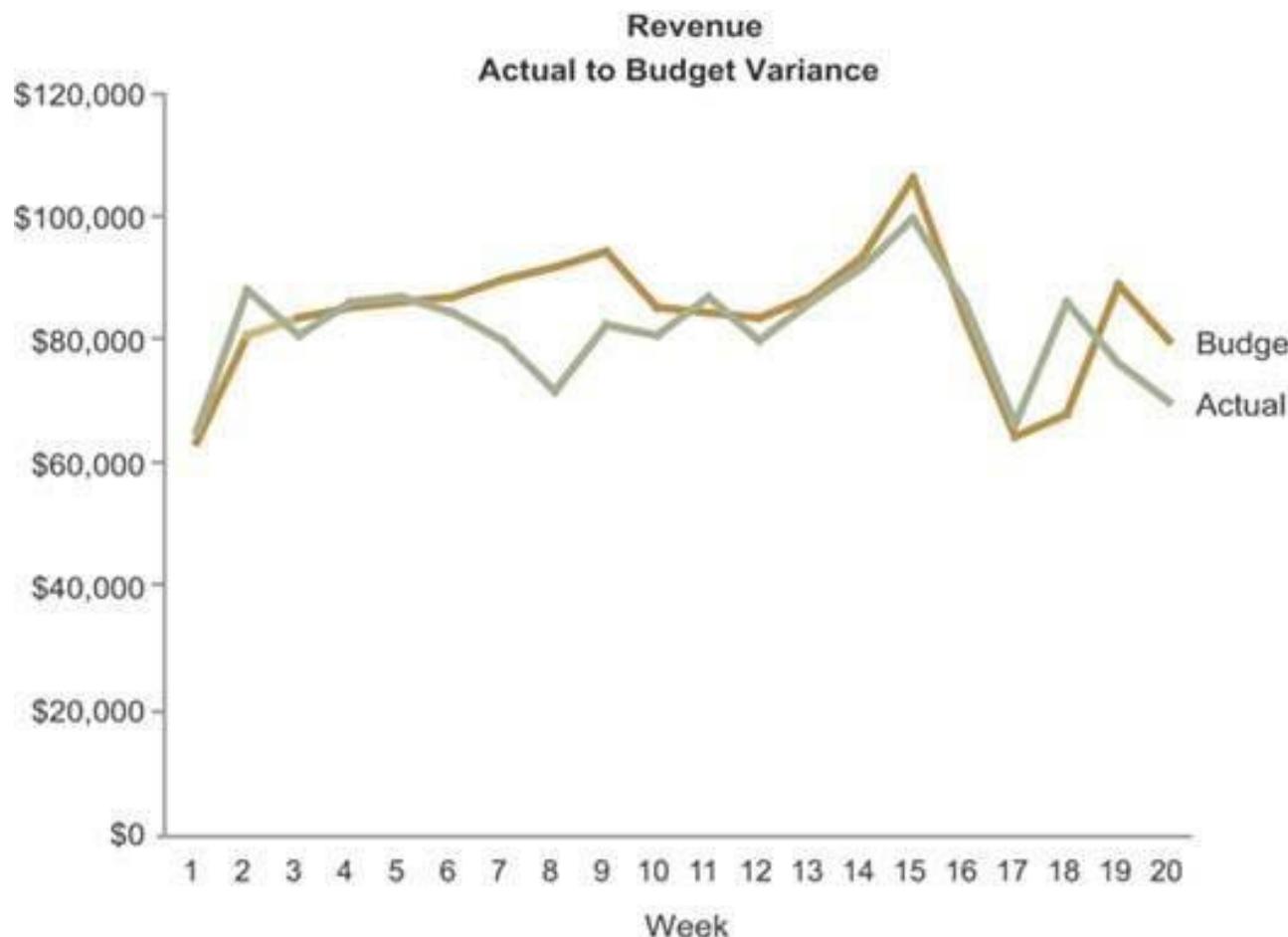


Source: Dashboard design competition by Stephen Few The [data](#) The author's [solution](#) The competition [winner's version](#)

Source: <https://www.datapine.com/blog/strategic-operational-analytical-tactical-dashboards/>; <https://material.io/design/communication/data-visualization.html#dashboards>

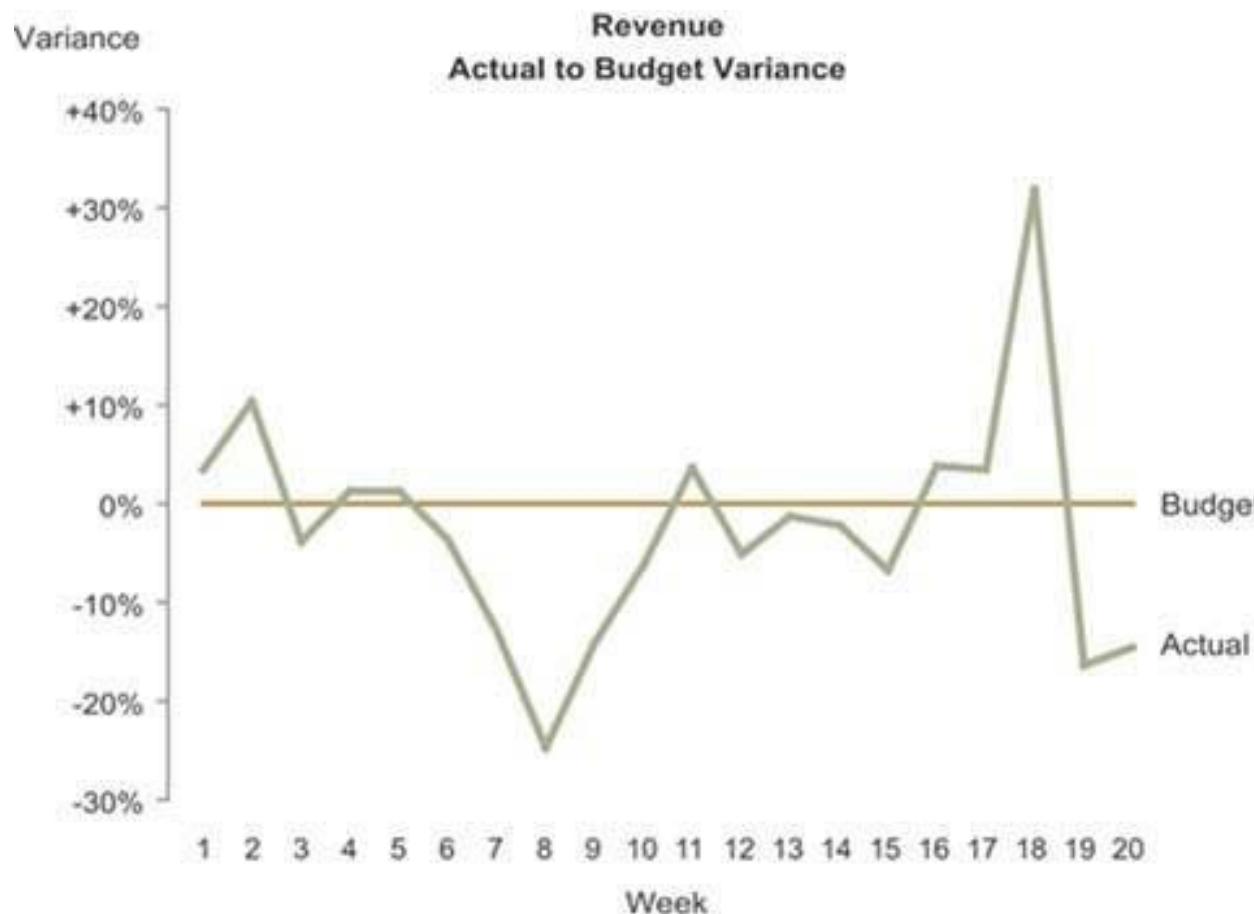
3. Relevant KPIs

Don't



3. Relevant KPIs

Do



4. Provide context

Don't



October Units



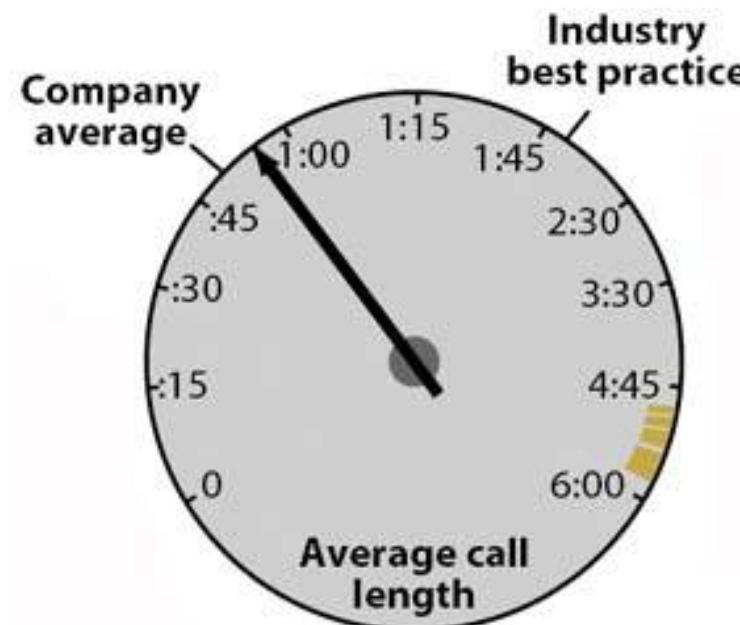
YTD Units



Returns Rate

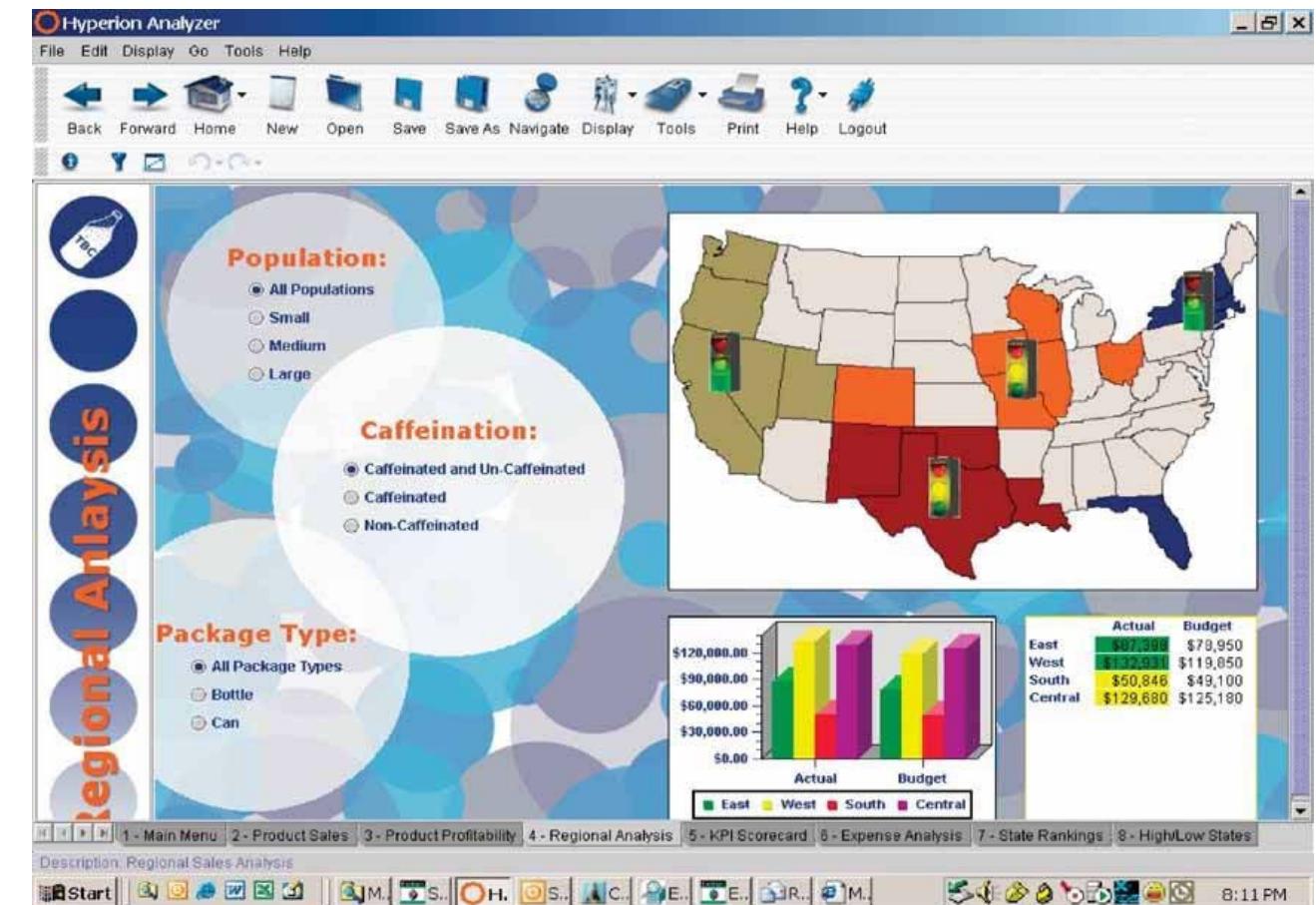
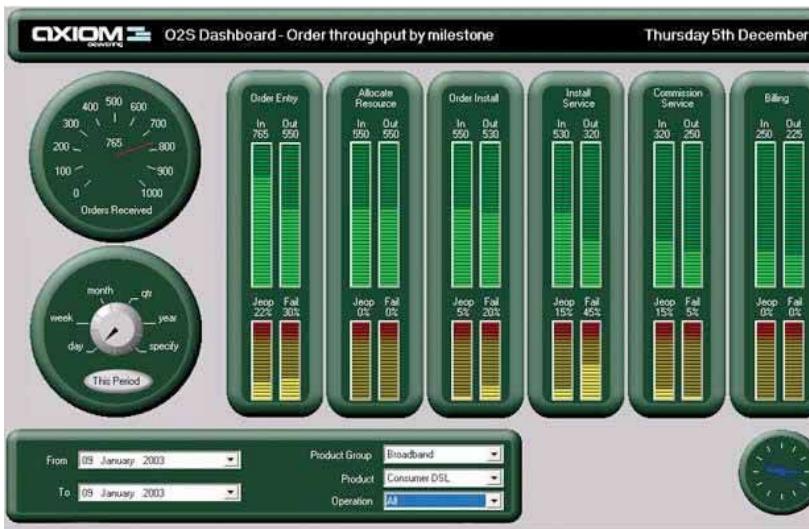
4. Provide context

Do



5. Simplicity

Don't



5. Simplicity

Do



Source: <https://www.codewall.co.uk/best-dashboard-examples-for-inspiration/>

5b. Simplicity: Be selective

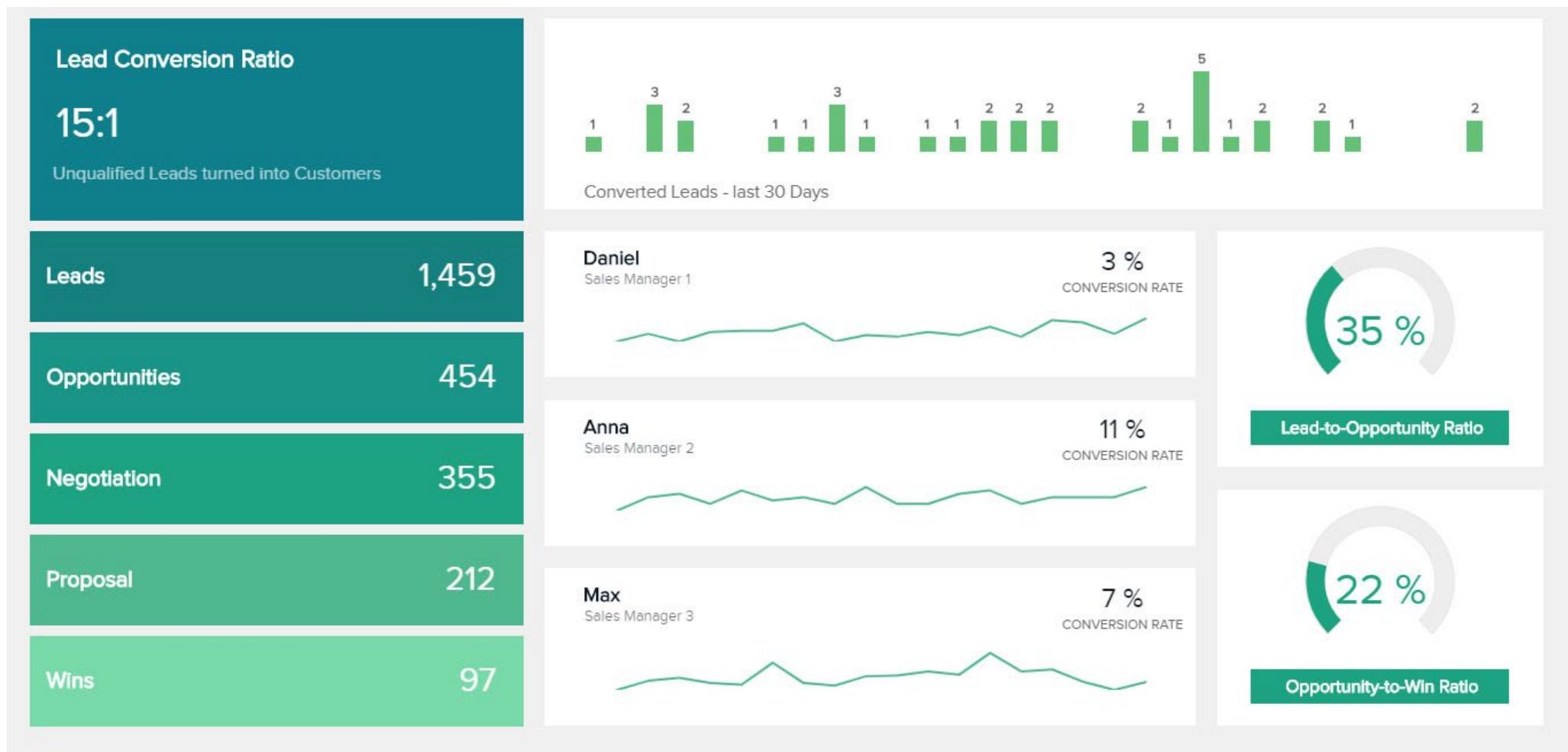
Don't

The screenshot shows a complex dashboard titled "CELEQUEST™" with a red header bar. The top navigation bar includes "Activity Server", "Account Setting", and "Help". The user is signed in as "zaphod". The left sidebar, titled "Navigation Tree", shows a "Dashboards" section with "All Dashboards" expanded, showing "Quality Yield Analysis" and other options like "Bookmarked Dashboards". The main content area has several sections:

- Active Alert Messages:** A table listing alerts with columns for Subject, Importance, and Alert Activated. One alert is highlighted with a red border: "8/1/2003 Yield Drop in ESS on 60-000..." with an activation time of "03/15/2004 17:10:46".
- Board Yield Barchart:** A bar chart showing yield values for different product numbers. The Y-axis ranges from 0 to 110. The X-axis lists product numbers: 40-0, 60-0, 60-0, 60-0, 60-0, 60-0, 60-0. The legend indicates four series: Yield_1Yr (blue), Yield_3Days (red), Yield_30Days (green), and Yield_Today (cyan).
- Board Yield Change Barchart:** A bar chart showing yield change values. The Y-axis ranges from -9 to 3. The X-axis lists product numbers: 40-0, 60-0, 60-0, 60-0, 60-0, 60-0. The legend indicates three series: Yield_Change_1Day (blue), Yield_Change_3Days (red), and Yield_Change_1Yr (green).
- Tests Breakdown Pie:** A pie chart showing the breakdown of tests. The legend indicates four categories: 40-000003 (0%), 60-000007 (17.2%), 60-00020 (49.4%), and 60-00016 (33%).
- Board Yield Table Summary:** A table showing board yield data. The columns include PRODUCT_NUM, PRODUCT_DESC, YIELD_TODAY, YIELD..., and others. One row is highlighted with a red border: "60-0001663-03 ASSY, INNER BOX W/MB, SW3600 100.0000000000 100.00000 99.1111 99.1111 0.8889 0.0000000000 0.8889".

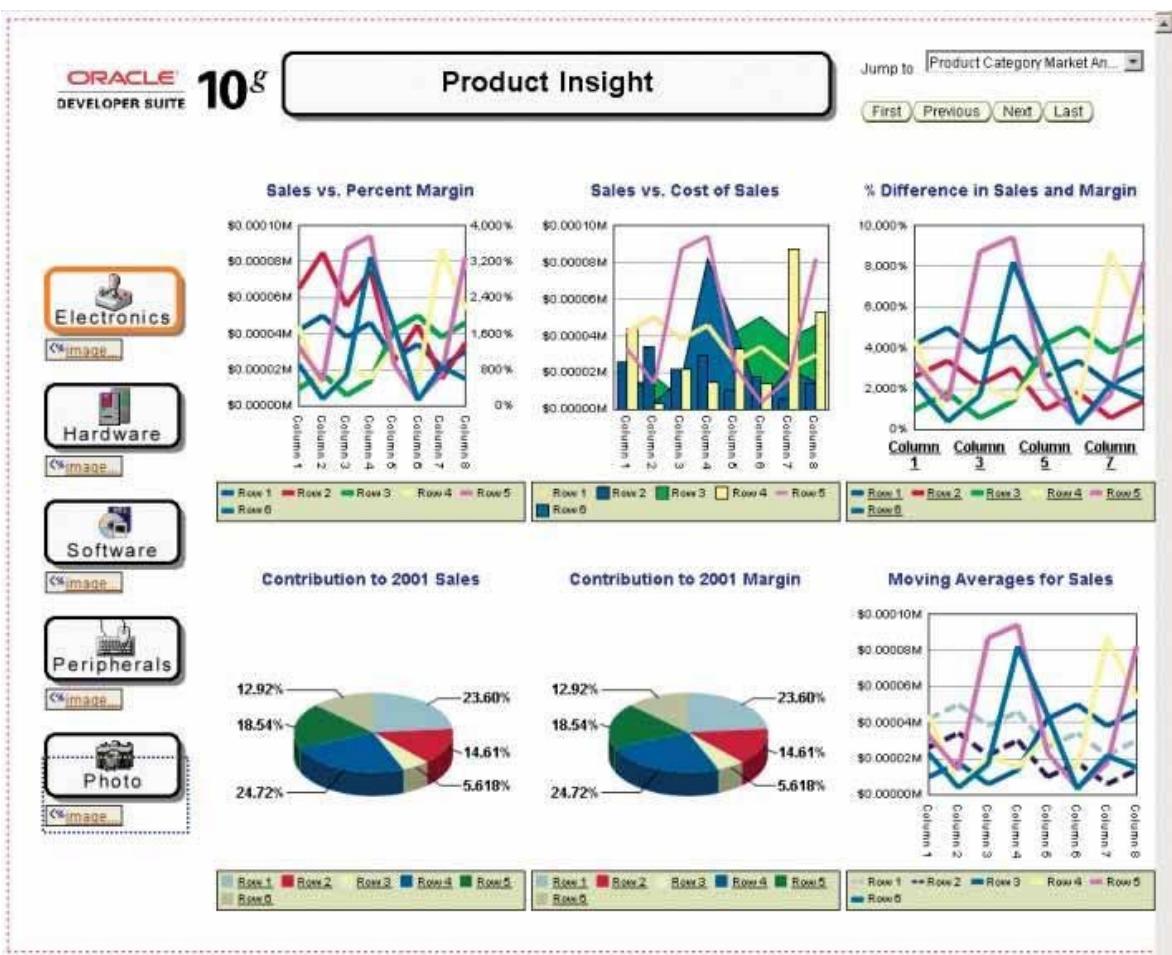
5b. Simplicity: Be selective

Do



6. Focal Point

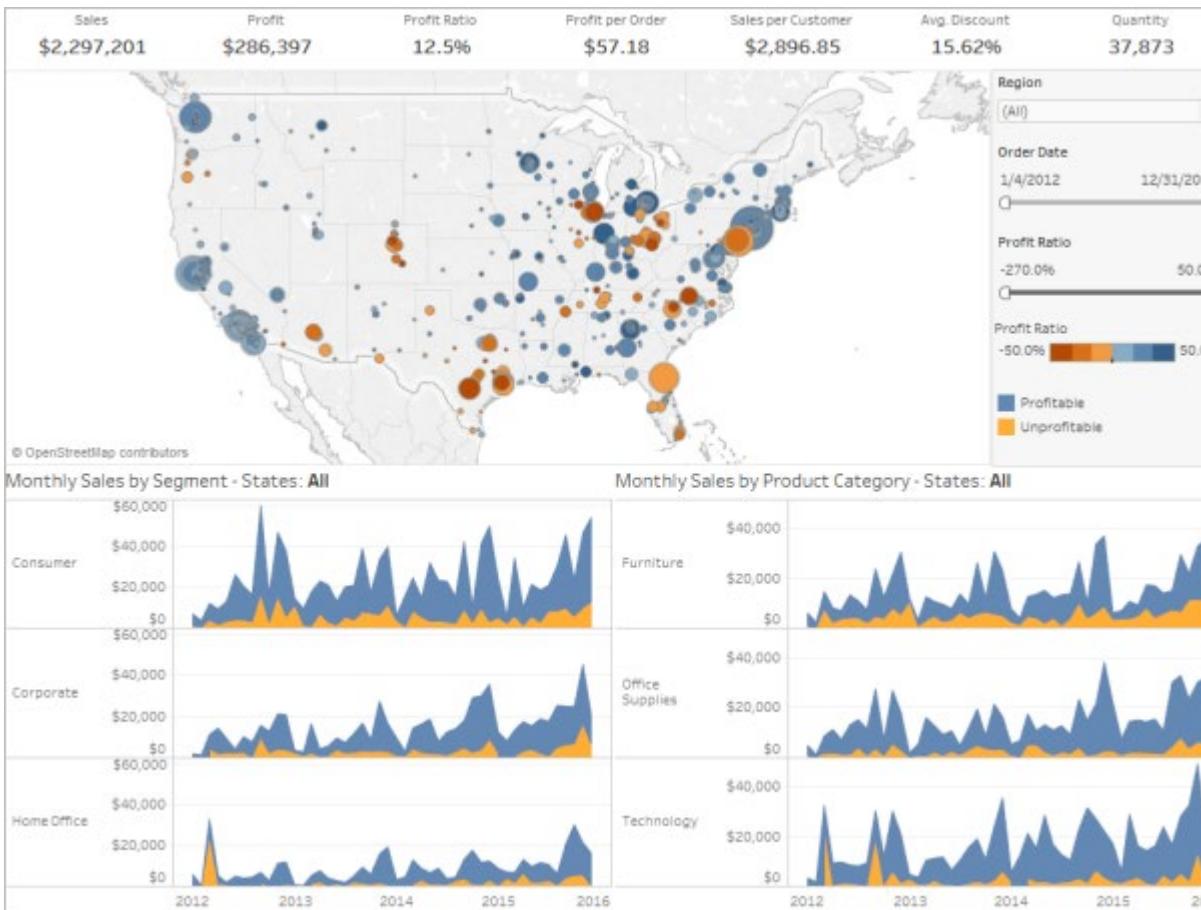
Don't



Source: Stephen Few *Information dashboard design* 2nd ed. California: Analytics Press, 2013

6. Focal Point

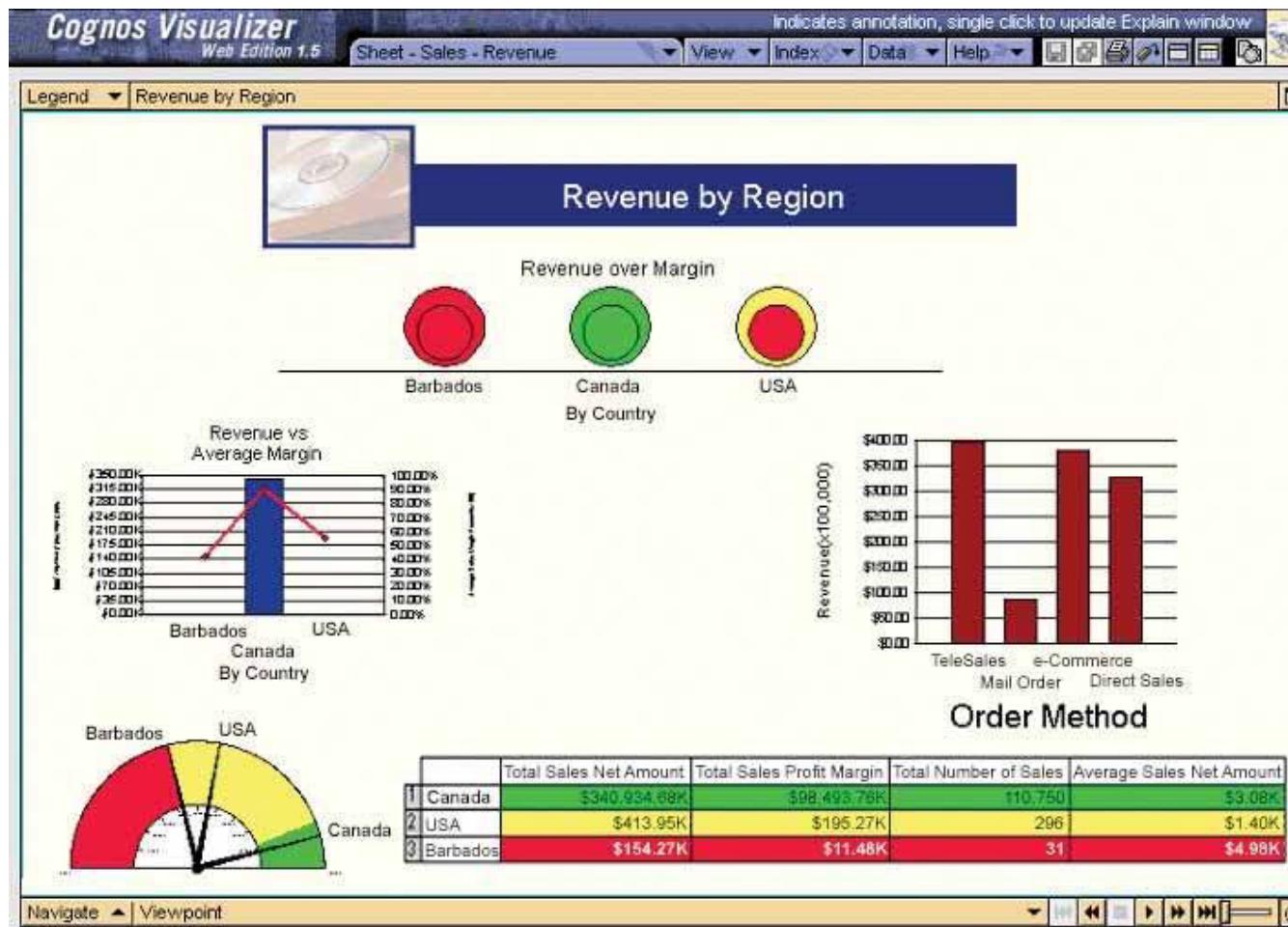
Do



Source: https://help.tableau.com/current/pro/desktop/en-us/dashboards_refine.htm

7. Be consistent

Don't



Source: Stephen Few *Information dashboard design* 2nd ed. California: Analytics Press, 2013

7. Be consistent

Do



Source: <https://www.codewall.co.uk/best-dashboard-examples-for-inspiration/>

8. Layout

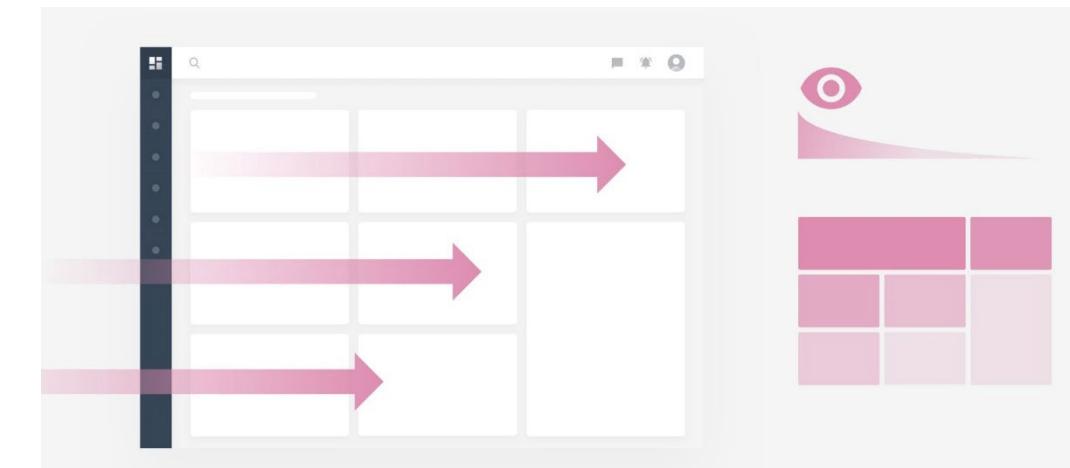
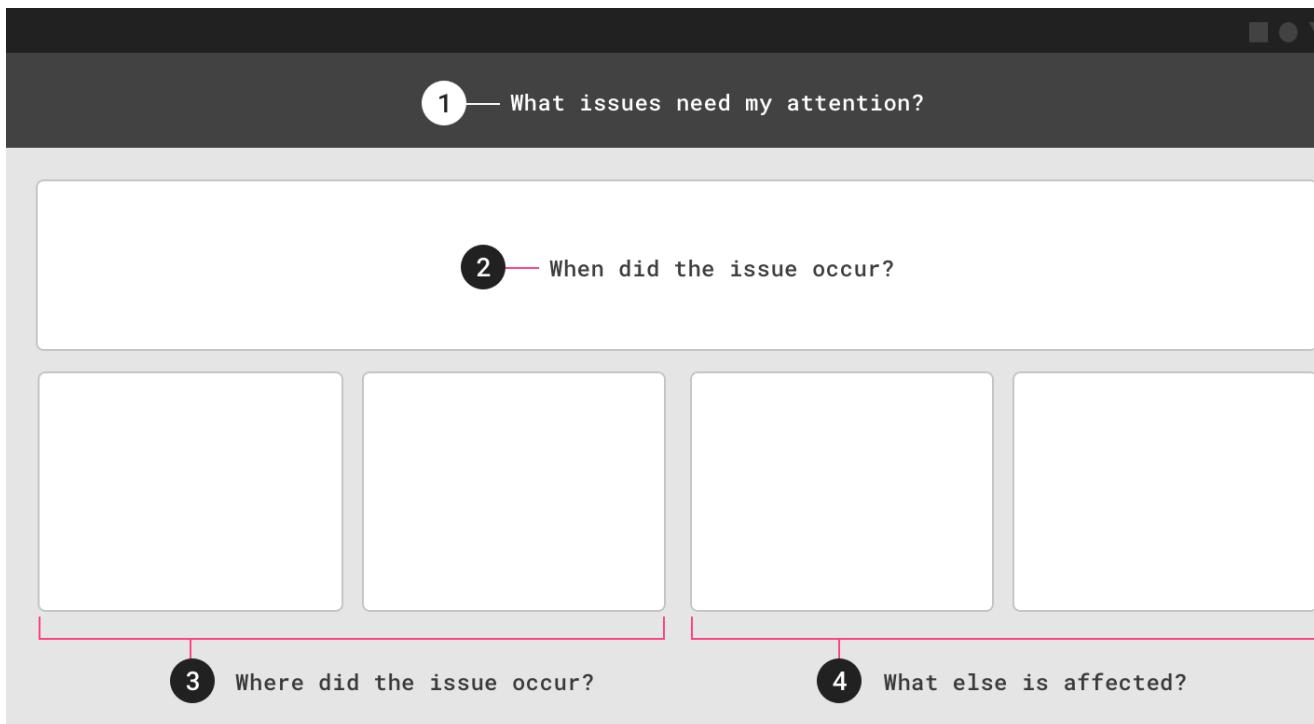
Don't



Source: Stephen Few *Information dashboard design* 2nd ed. California: Analytics Press, 2013

8. Layout

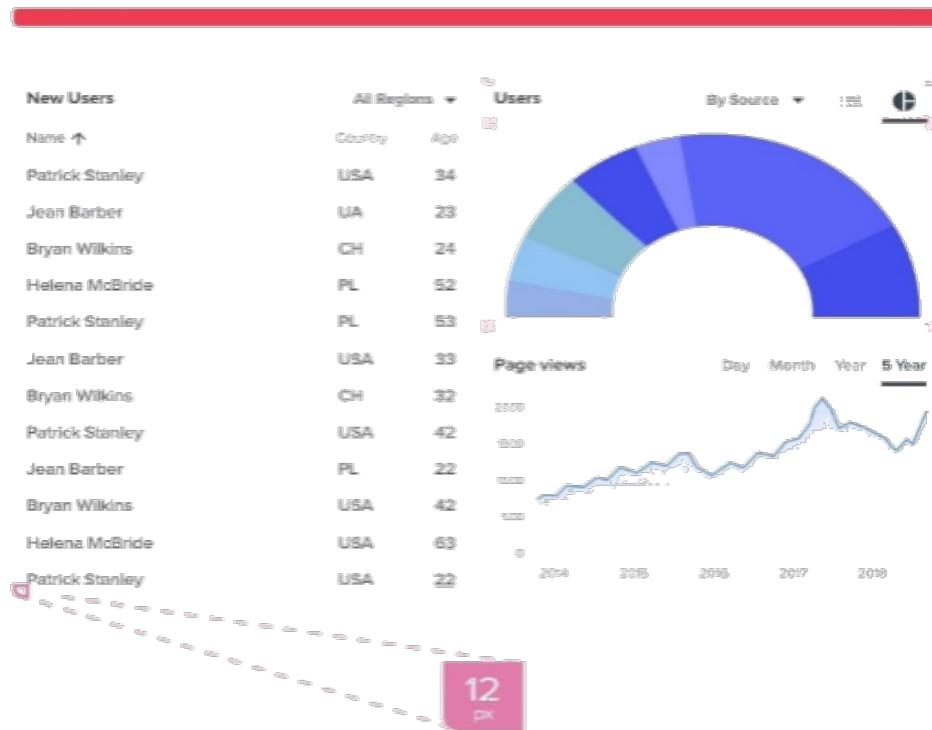
Do



Source: <https://uxplanet.org/10-rules-for-better-dashboard-design-ef68189d734c>

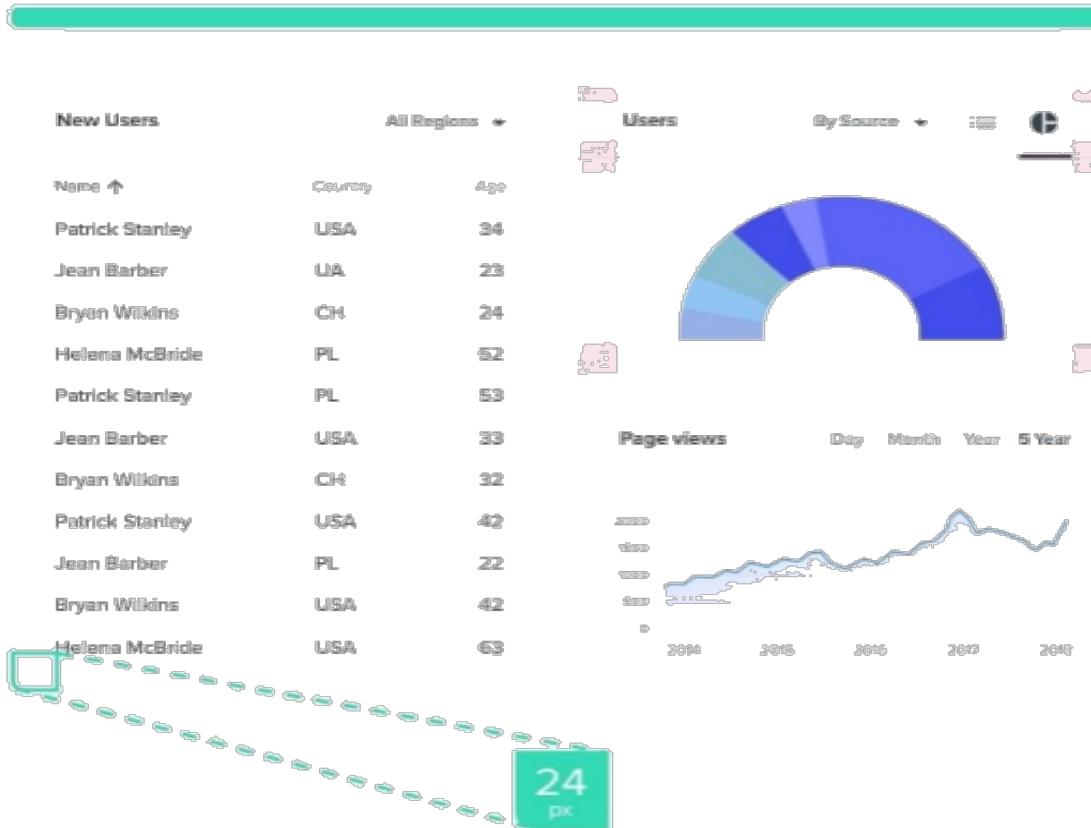
8. Layout / White space

Don't



8. Layout / White space

Do



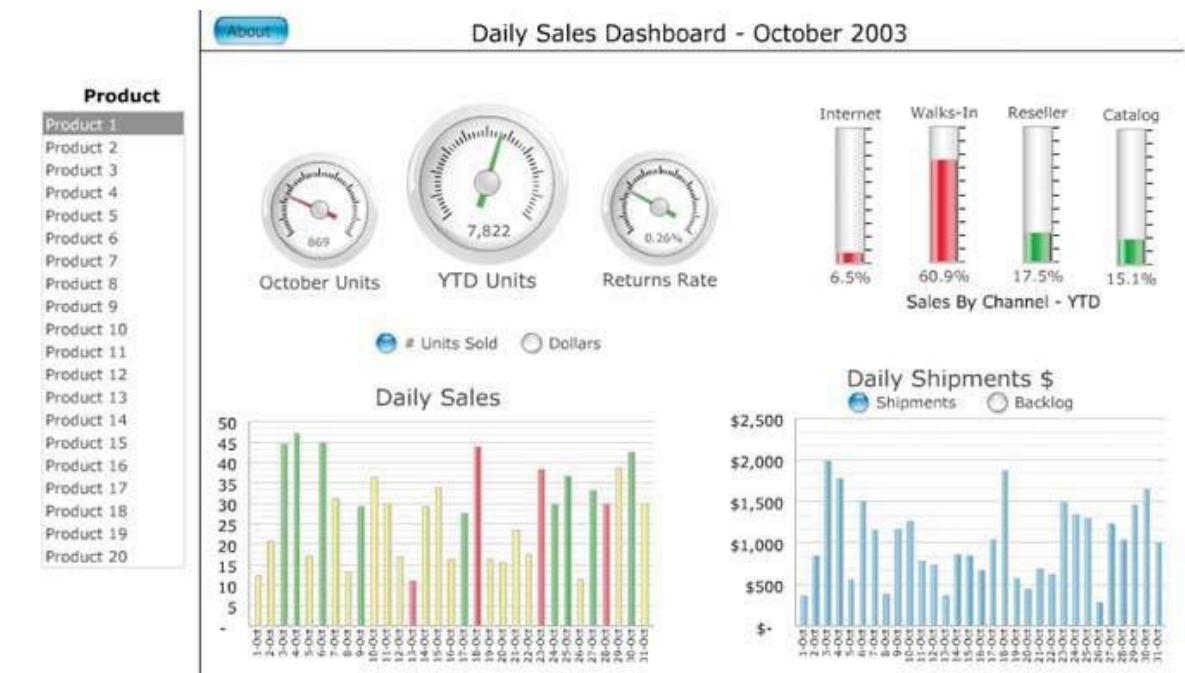
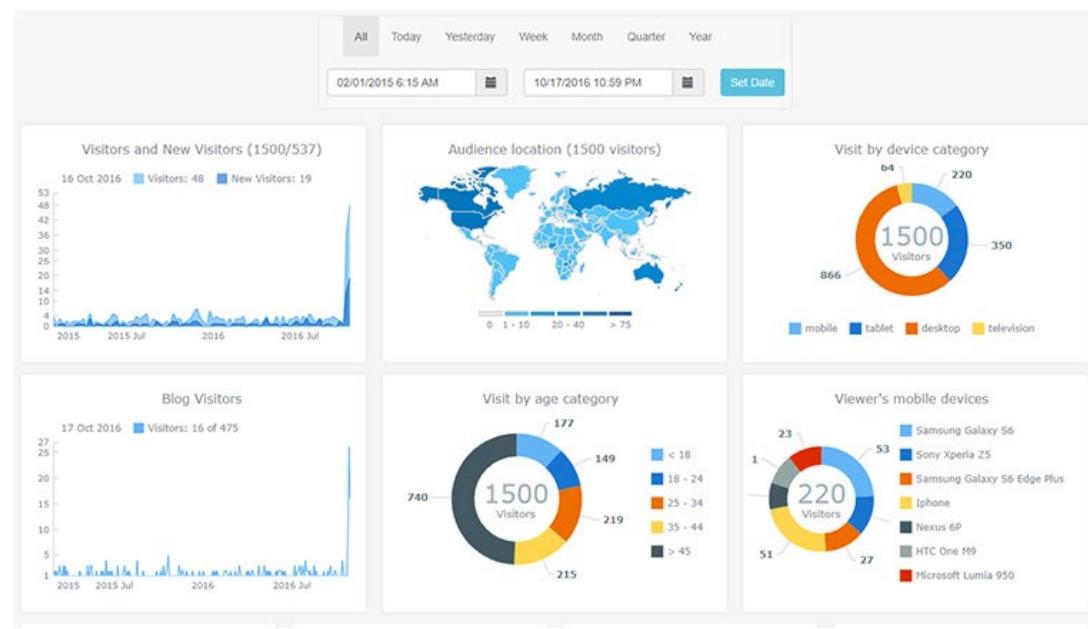
9. One single screen

Don't



9. One single screen

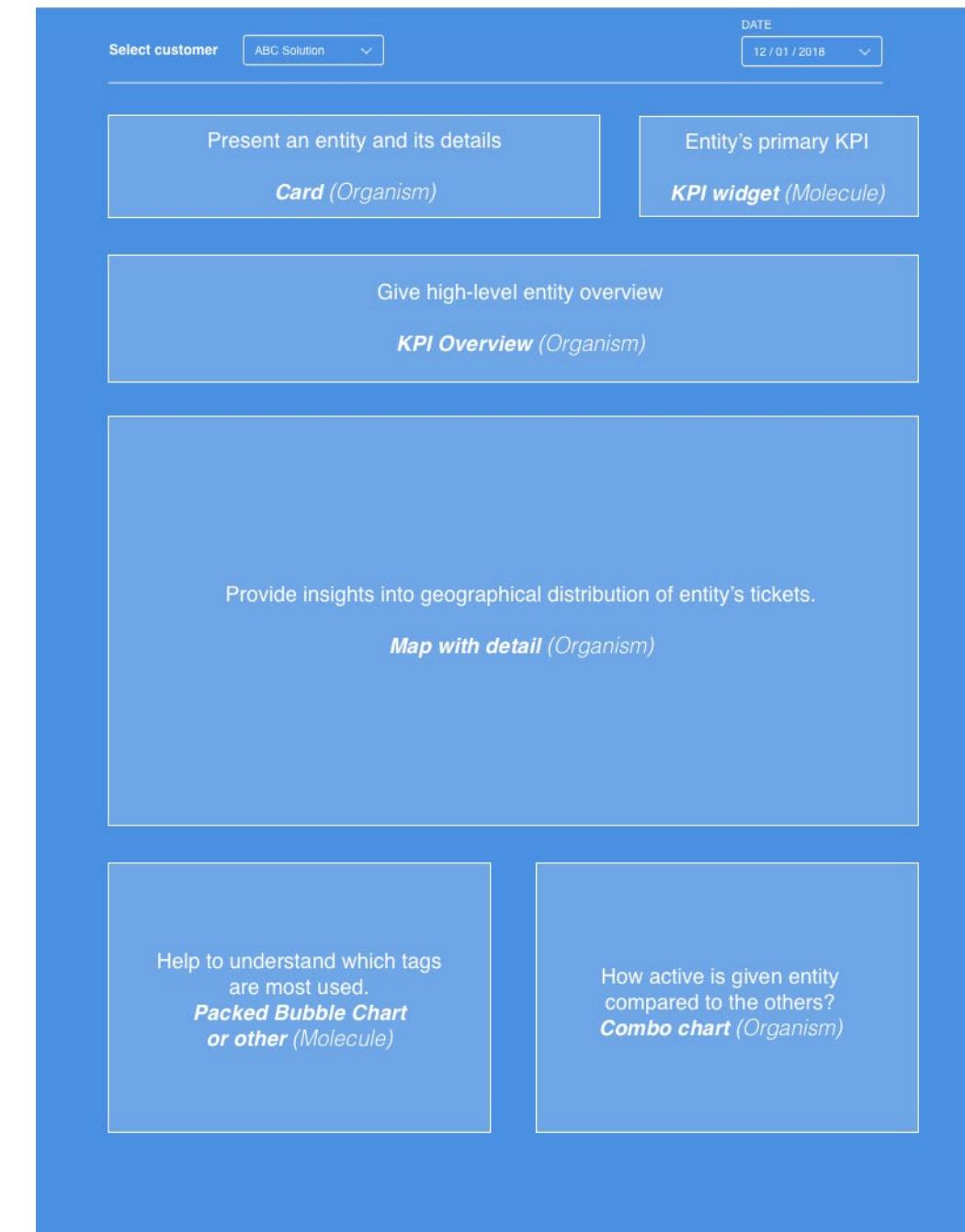
Do



<https://www.codewall.co.uk/best-dashboard-examples-for-inspiration/>

How to build a dashboard (I): High level

Dashboards are constructed
of **building blocks**,
the high level ones covering
a use-case or need.

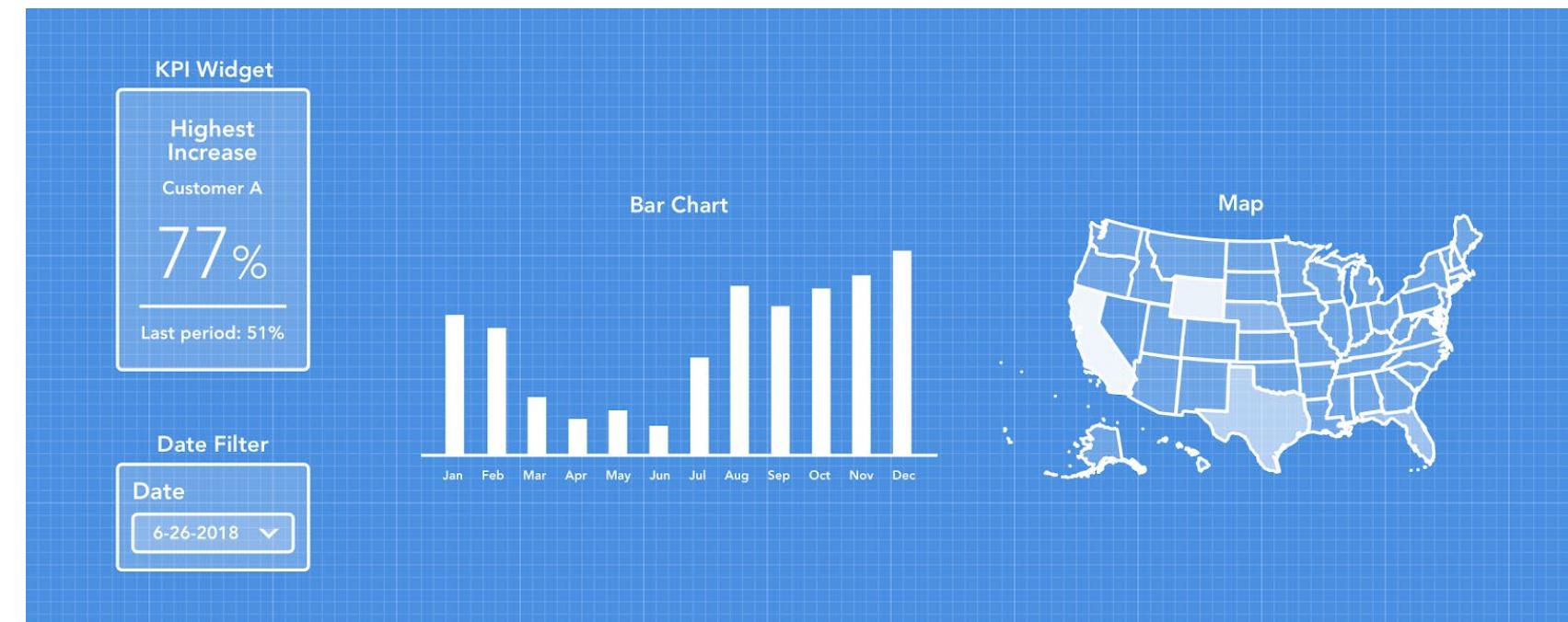


The diagram shows a dashboard interface with a blue header bar containing 'Select customer' (set to 'ABC Solution'), 'DATE' (set to '12 / 01 / 2018'), and a search bar. Below the header are six light-blue rectangular boxes arranged in a grid-like structure:

- Present an entity and its details**
Card (Organism)
- Entity's primary KPI**
KPI widget (Molecule)
- Give high-level entity overview**
KPI Overview (Organism)
- Provide insights into geographical distribution of entity's tickets.**
Map with detail (Organism)
- Help to understand which tags are most used.**
Packed Bubble Chart or other (Molecule)
- How active is given entity compared to the others?**
Combo chart (Organism)

How to build a dashboard (II): Components

Each high level component consist on individual charts and KPIs.



Source: Ondrej Langr UX Anatomy of Dashboards [<https://medium.com/gooddata-developers/ux-anatomy-of-dashboards-73dbf6515199>]

How to build a dashboard (III): Validation

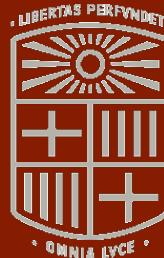
Go to users and ask them:

- What: What is, what should be represented
- Why: Why is it (is it not) useful?
- Control: what control would you like to have over this data?

Thanks you for your attention

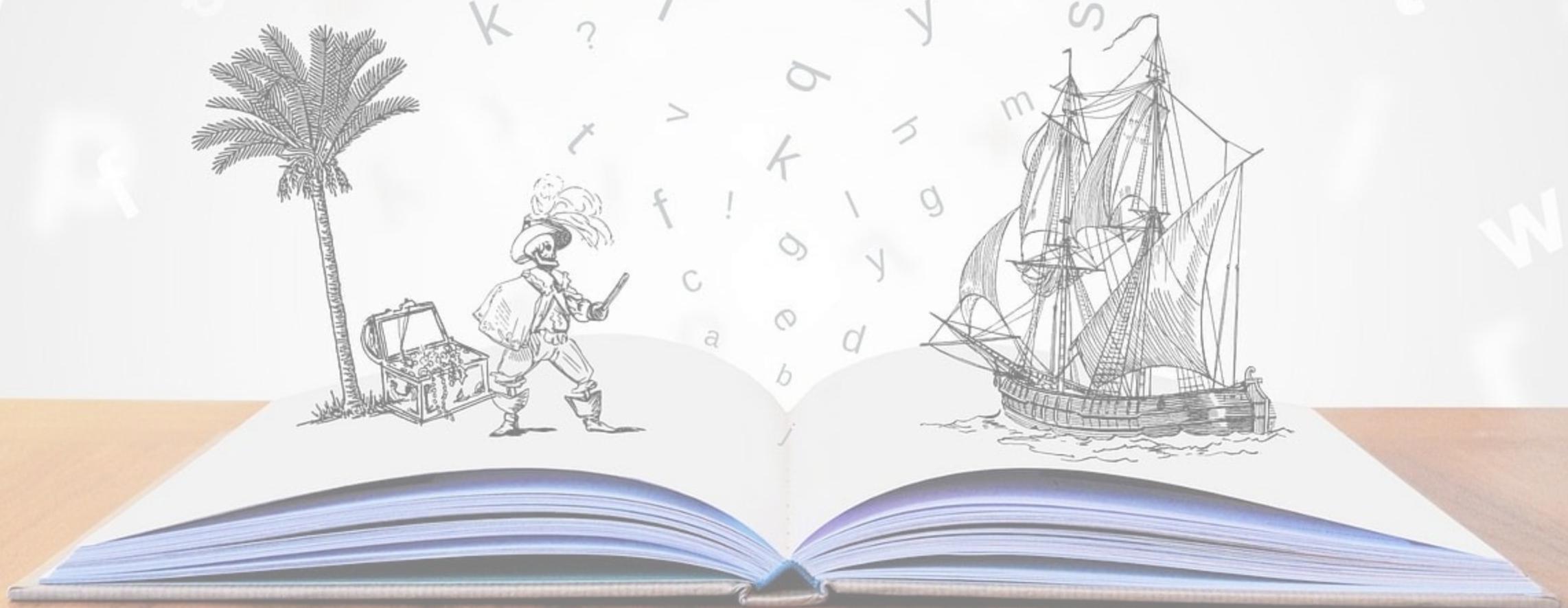


MIREIA RIBERA | ACCESSIBILITAT DIGITAL
| EXPERIÈNCIA D'USUARI | VISUALITZACIÓ DE DADES



UNIVERSITAT DE
BARCELONA

Presentation and Visualization – Story Telling

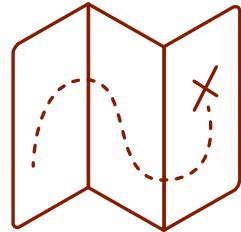


The storyteller

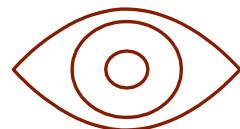


Types of visualizations

Analysis

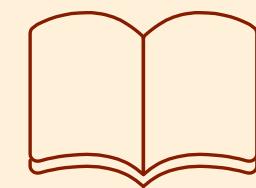


Exploration



Monitoring

Presentation

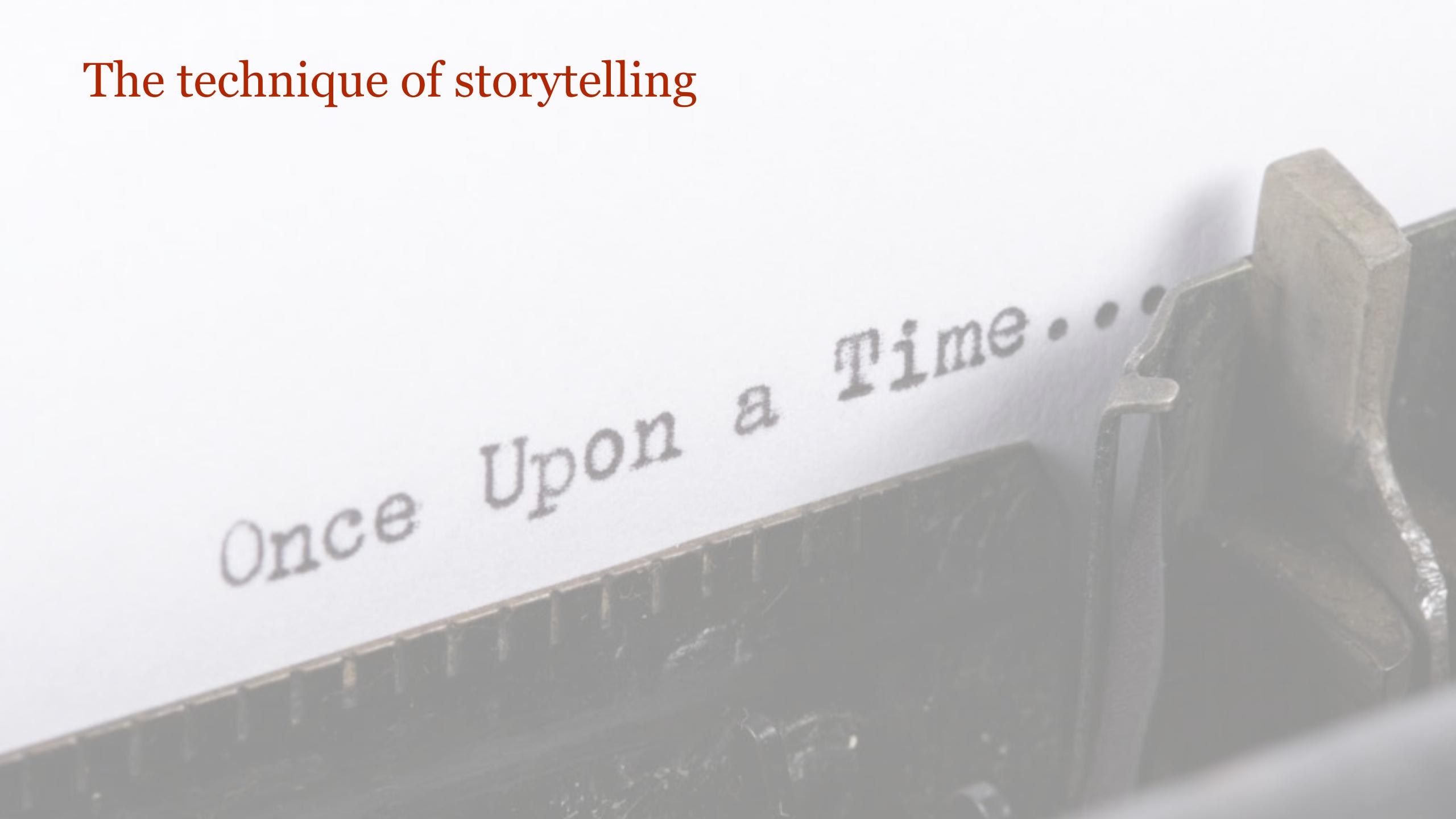


Storytelling



Infographic

The technique of storytelling



Once Upon a Time...



Benefits of the storytelling technique



Benefits of the storytelling technique

A photograph of a person's hands reaching upwards towards a bright, glowing orb of light. The hands are silhouetted against the light, and the background is a soft-focus sunset or sunrise sky with warm orange and yellow tones.

Emotional
connection

Benefits of the storytelling technique



A photograph of two hands reaching towards each other from opposite sides, set against a warm, glowing sunset or sunrise sky with orange and yellow hues. The hands are positioned as if they are about to touch or are deeply connected.

Engagement

Emotional
connection

Benefits of the storytelling technique

A photograph of a person's hands cupping a bright, glowing light source, possibly a candle or a small fire, against a backdrop of a sunset or sunrise with warm orange and yellow hues. The hands are positioned in the lower half of the frame, with the light source at the bottom center. The background is slightly blurred.

Emotional
connection

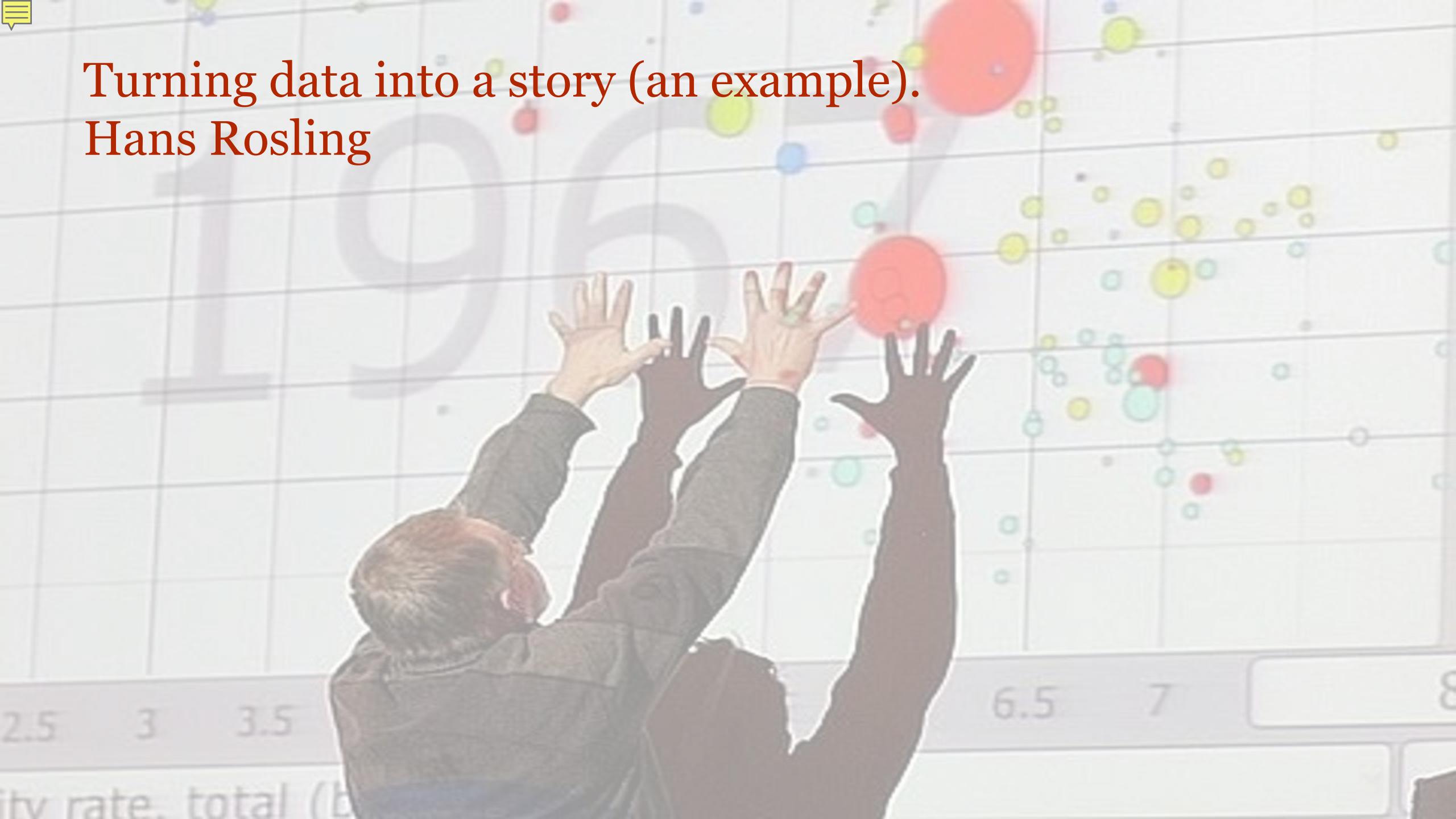
Engagement

Memorability



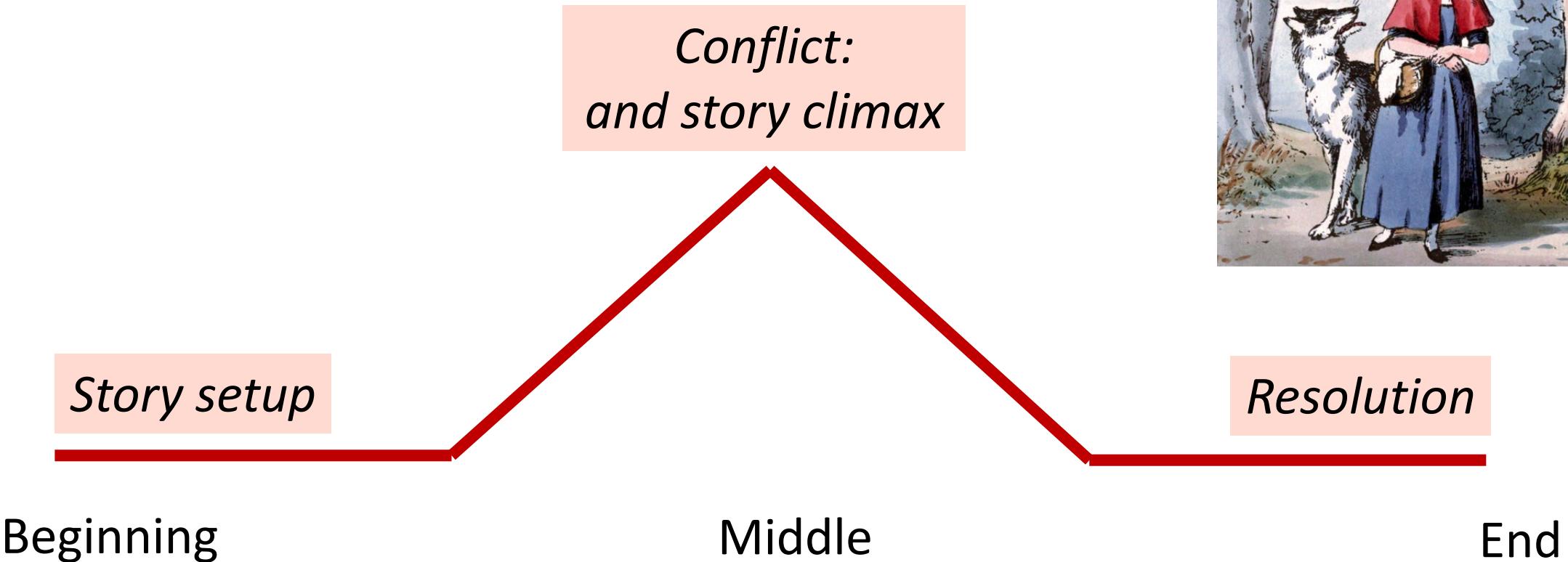
Turning data into a story (an example).

Hans Rosling





The narrative structure of stories



The Traditional Faëry Tales of Little Red Riding Hood,
Beauty and the Beast, & Jack and the Beanstalk, 1845



Beginning

- Slow pace,
- What is your context?,
- Essential elements.

Audience

- Why should I pay attention?
- What's in it for me?



The Traditional Faëry Tales of Little Red Riding Hood, Beauty and the Beast, & Jack and the Beanstalk, 1845

Conflict and tension

- The pace quickens
- Critical components of the story are introduced.
- An imbalance is created
- A problem to be solved emerges

Audience

- The problem is YOURS,
- the solution involves you.



The Traditional Faëry Tales of Little Red Riding Hood, Beauty and the Beast, & Jack and the Beanstalk, 1845



Middle part

- What if...?
- Examples, external context, comparisons.
- What if we do nothing?

Audience

- They must make a decision,
- Motivation and involvement.



The Traditional Faëry Tales of Little Red Riding Hood, Beauty and the Beast, & Jack and the Beanstalk, 1845

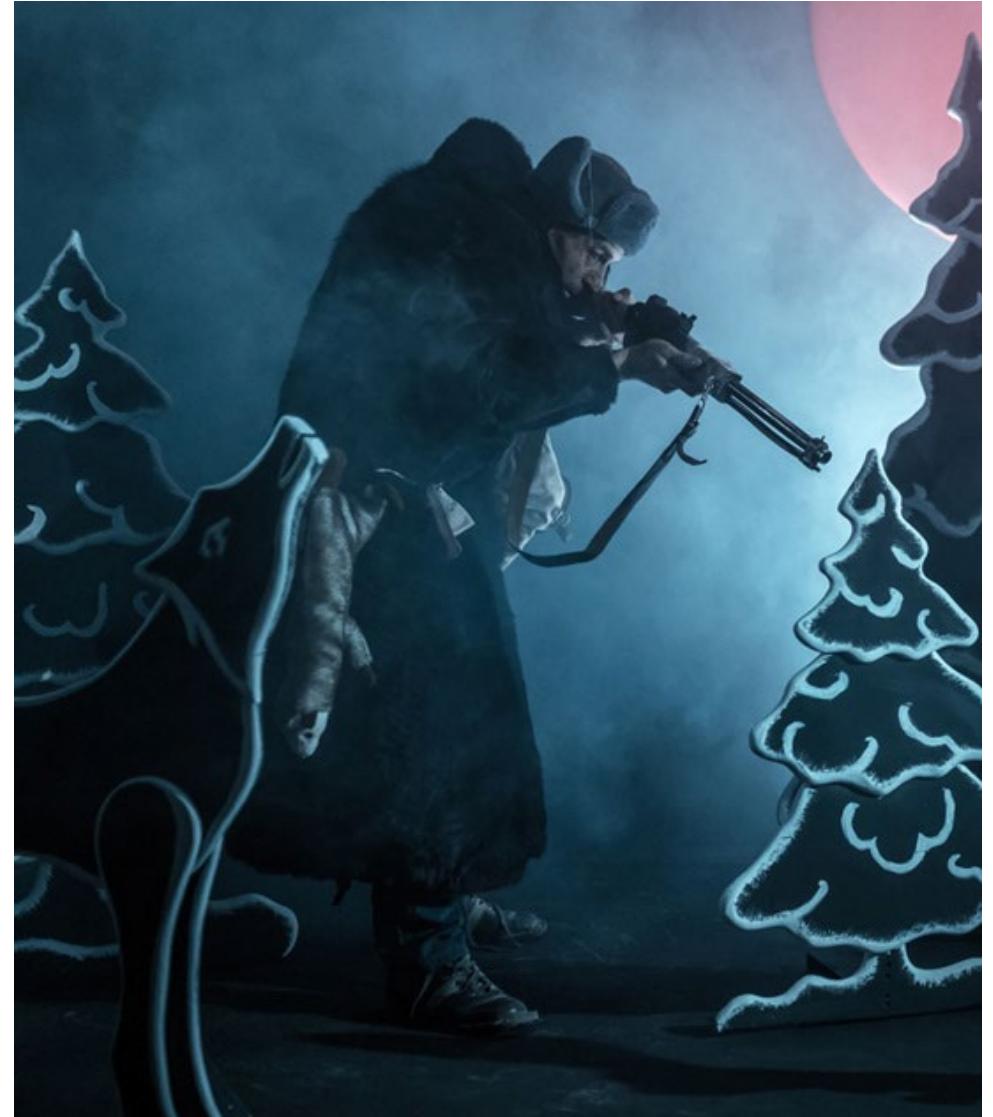


End

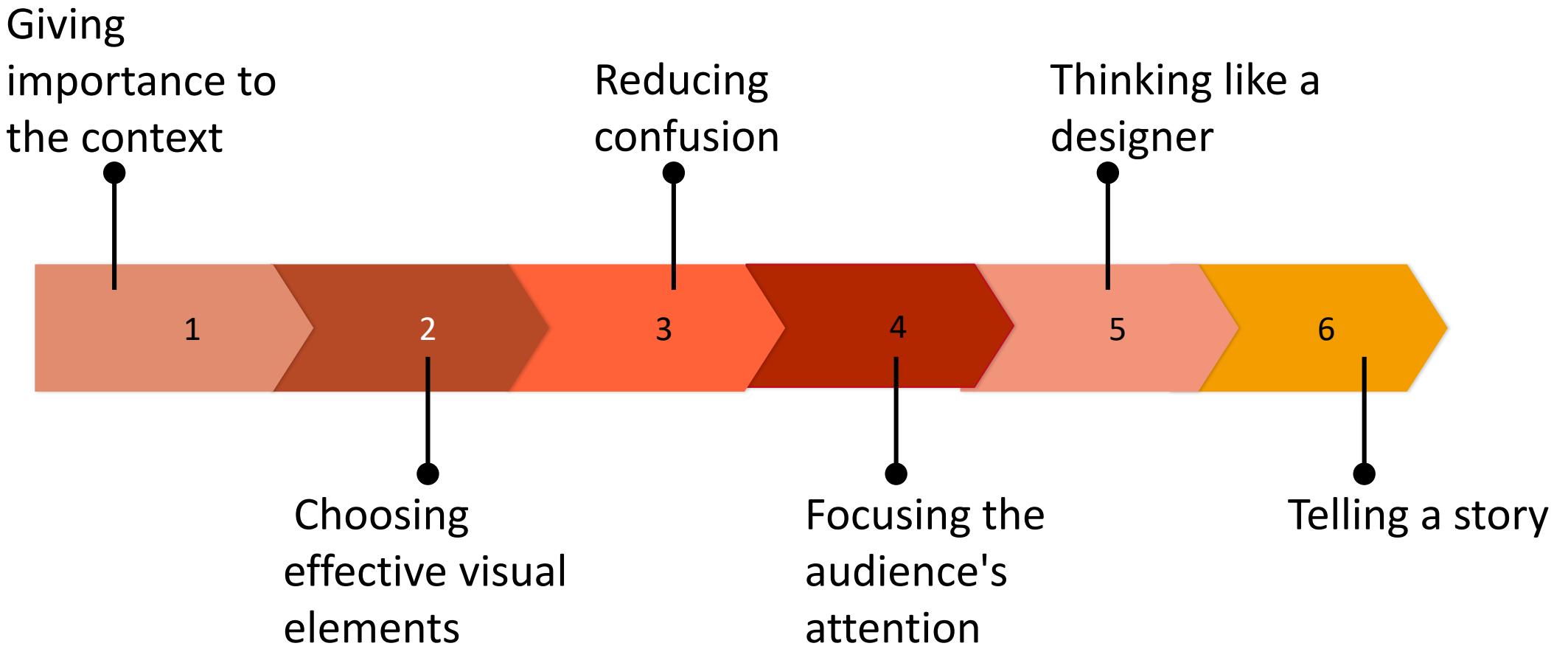
- The problem is resolved,
- connection with climax and tension,
- recapitulation, and closure.

Audience

- Call to action



How to approach data visualization: 6-step recipe by Cole Nussbaumer



Applying the 6-steps recipe. An example

A company wants to launch a new product and needs to decide on the pricing.

The evolution of prices of competitors' products is being studied.



Source: Nussbaumer, 2015



Step 1: Giving importance to the context

Product Manager

WHO

WHAT

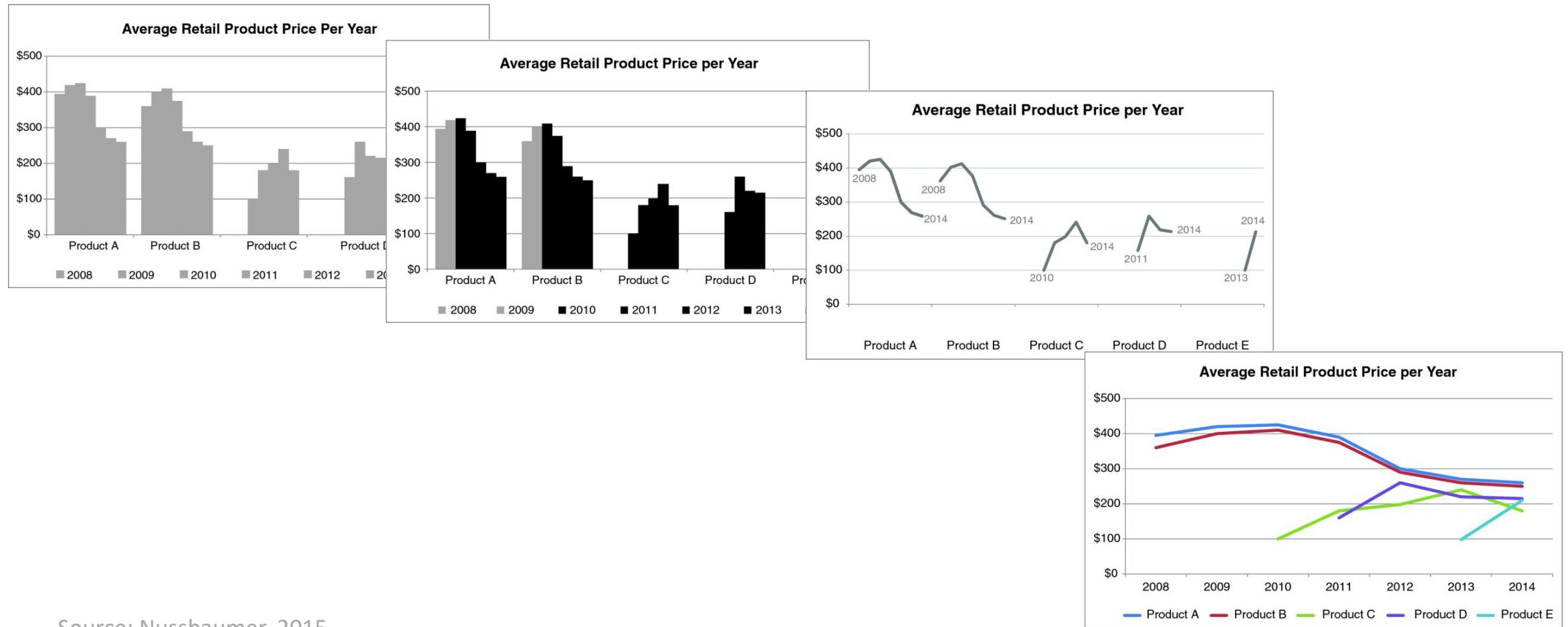
Understanding how prices of competitors have evolved.

Showing the average price over time for products A, B, C, D, and E.

HOW



Step 2: Choosing effective visual elements

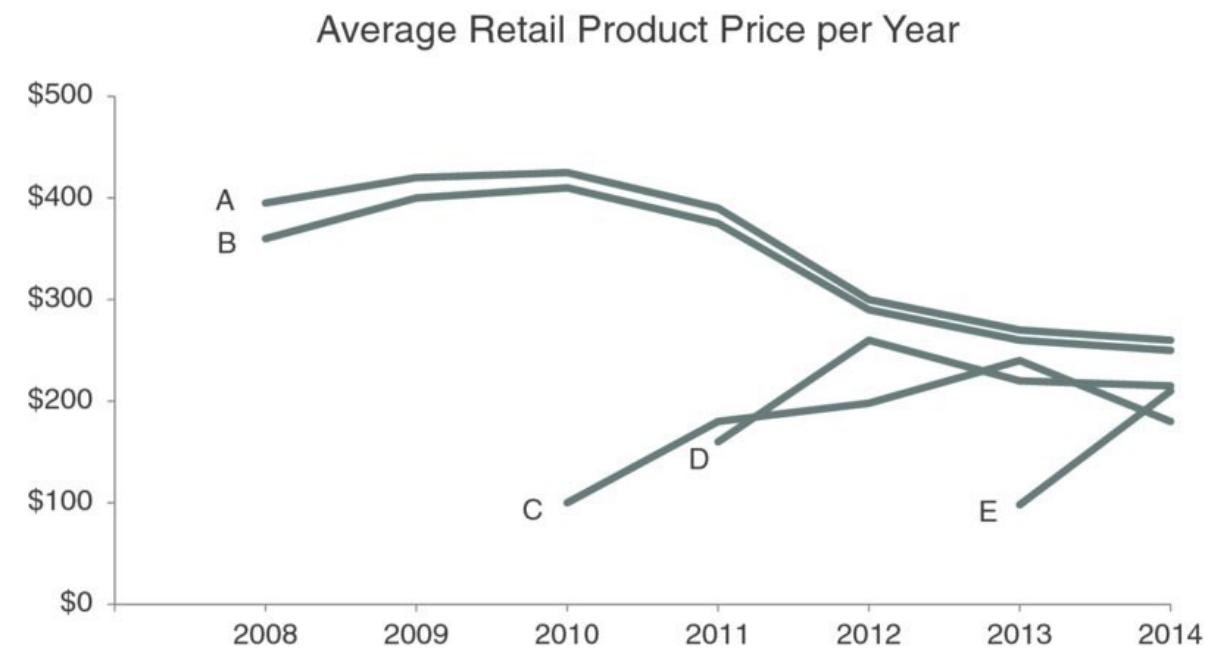


Source: Nussbaumer, 2015



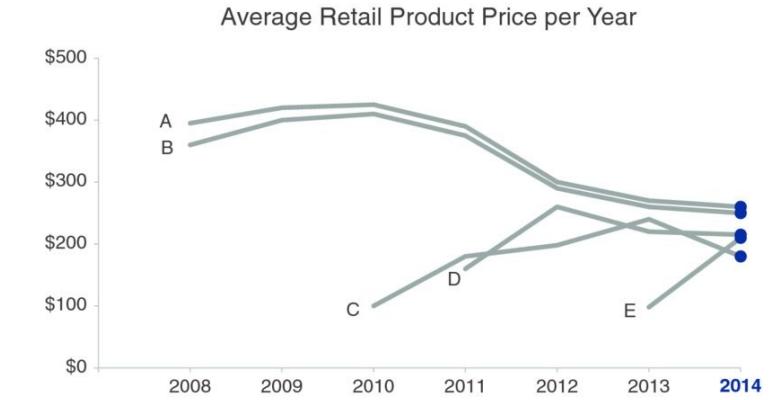
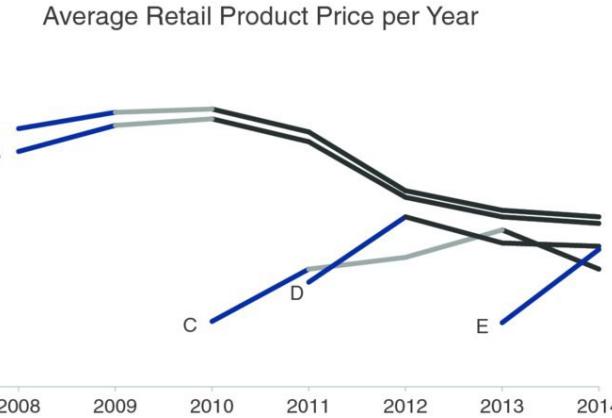
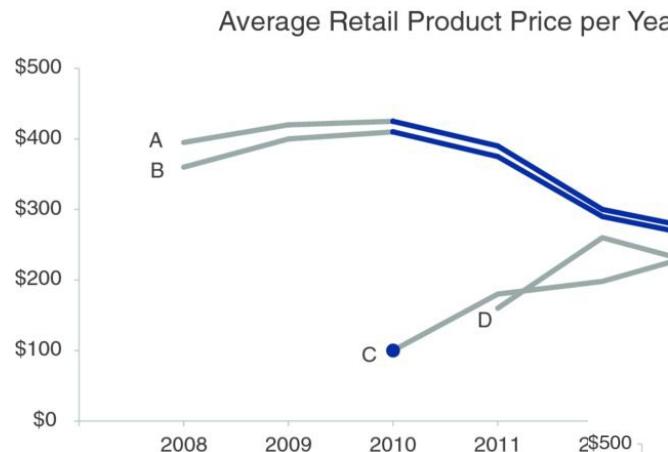
Step 3: Reducing confusion

- Title without emphasis
- Remove borders and gridlines
- Background placement for axes and labels
- Eliminate excessive use of color
- Place labels on separate lines



Source: Nussbaumer, 2015

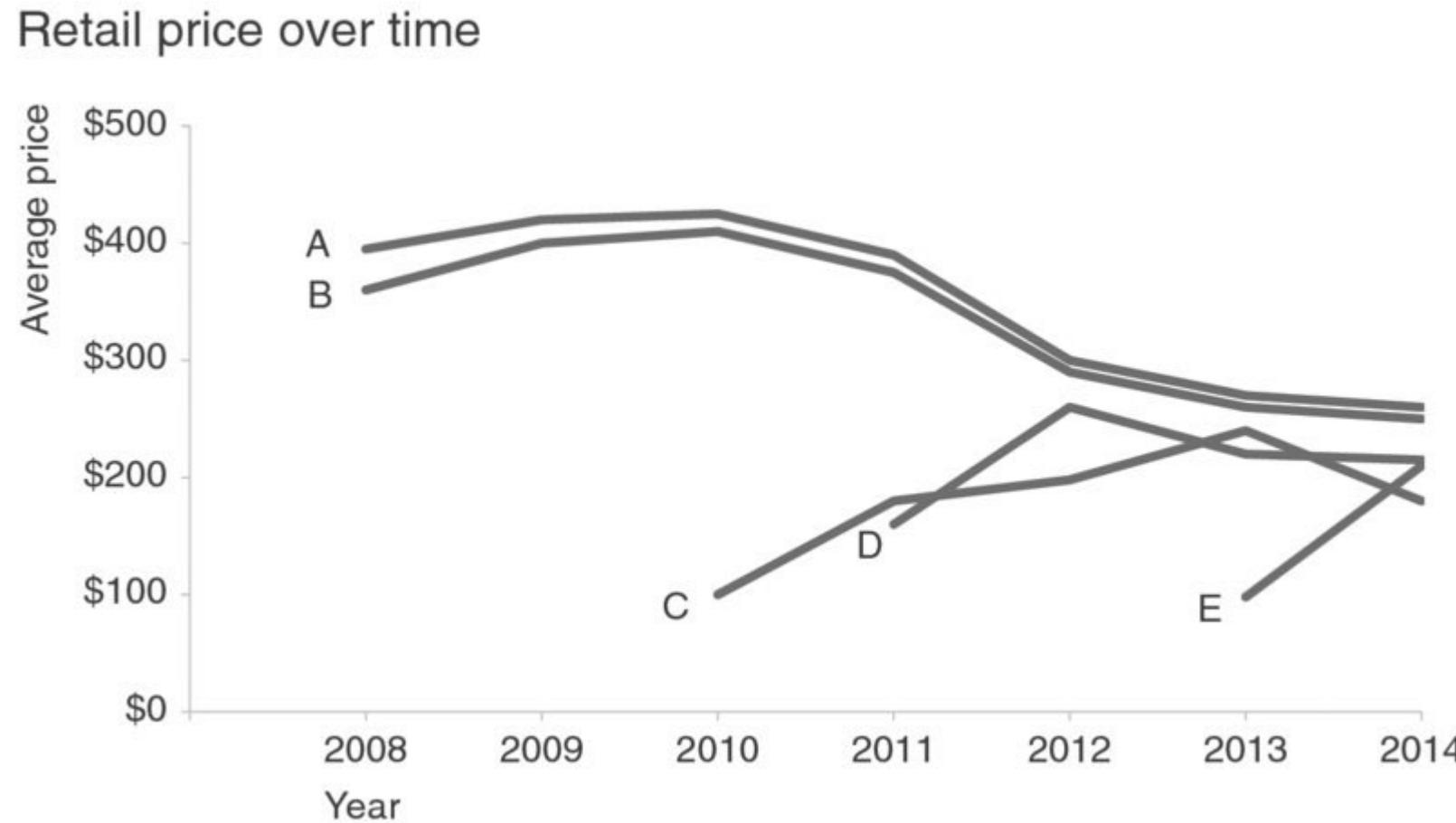
Step 4: Focusing the audience's attention



Source: Nussbaumer, 2015



Step 5: Thinking like a designer



Source: Nussbaumer, 2015



Step 6: Telling a story

Reporting the price of the new product based on competitors' prices.

PROBLEM

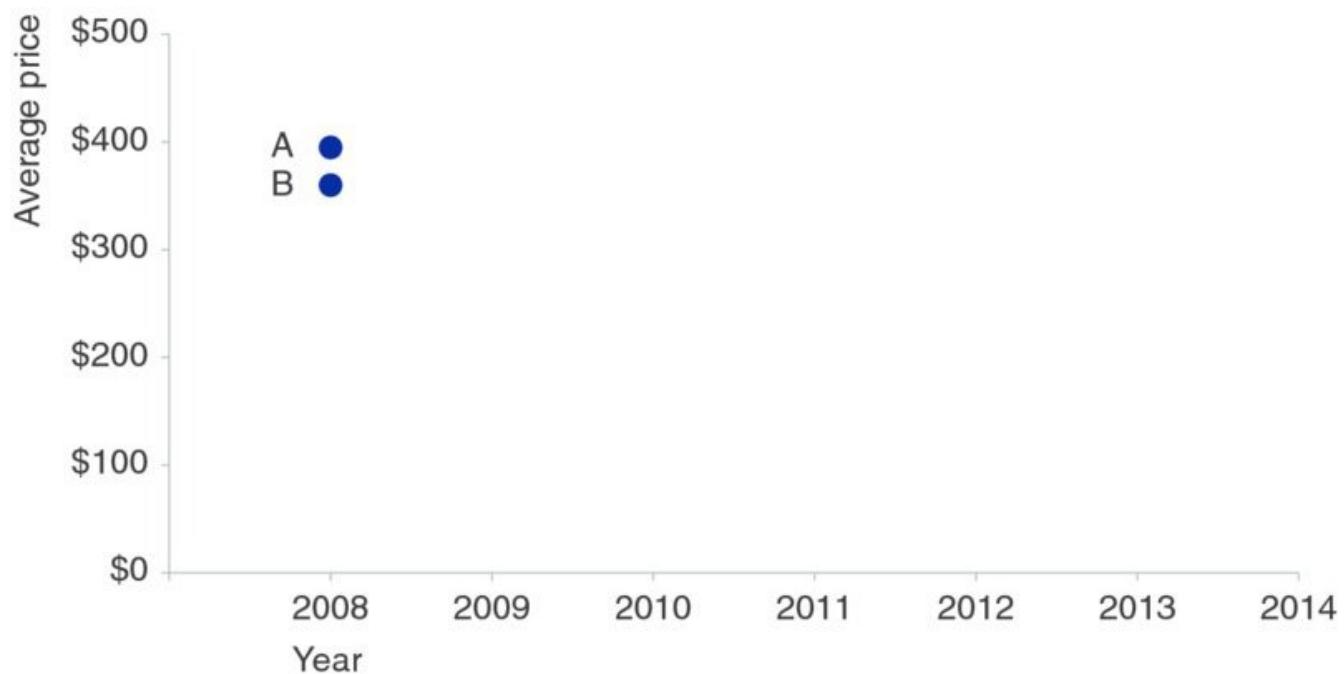
RESOLUTION

Recommendation for a price.



The story (1)

Retail price over time

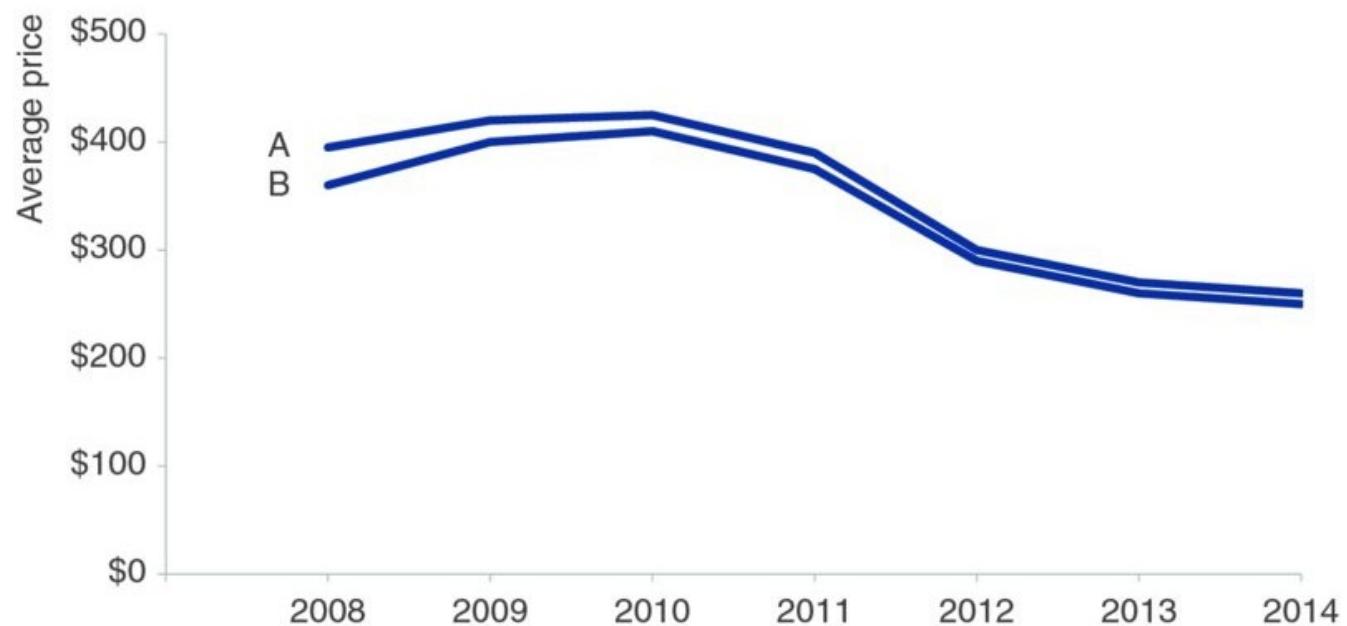


Source: Nussbaumer, 2015



The story (2)

Retail price over time

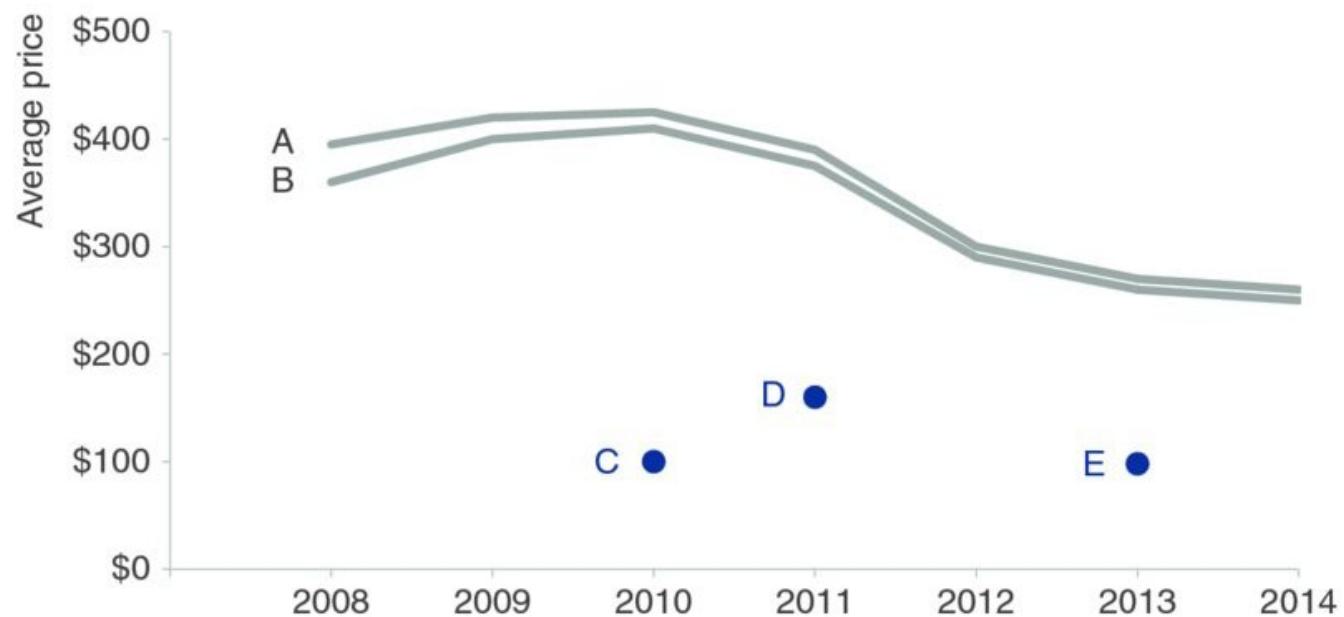


Source: Nussbaumer, 2015



The story (3)

Retail price over time

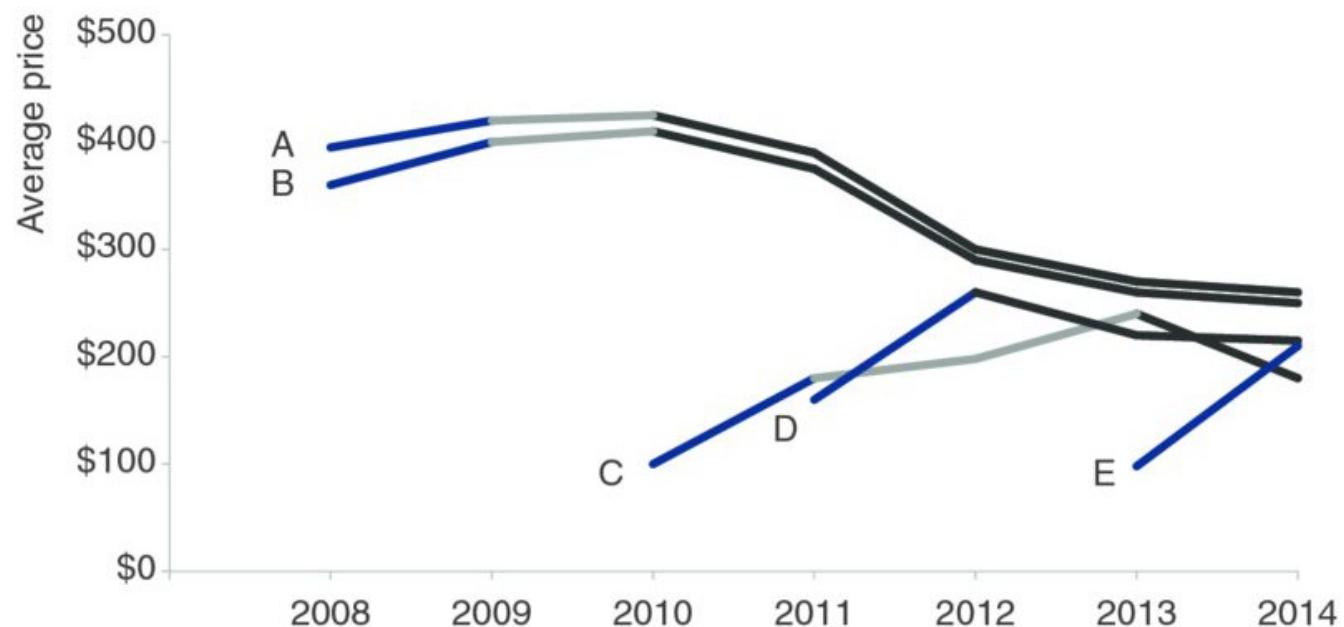


Source: Nussbaumer, 2015



The story (4)

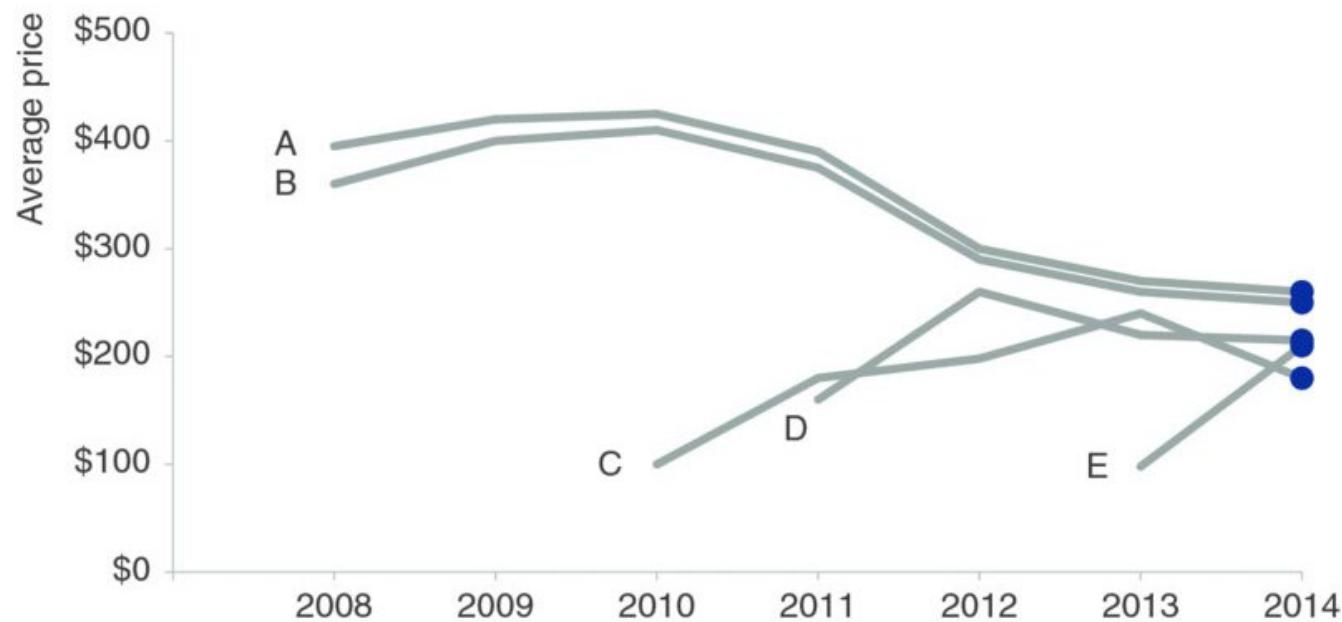
Retail price over time





The story (5)

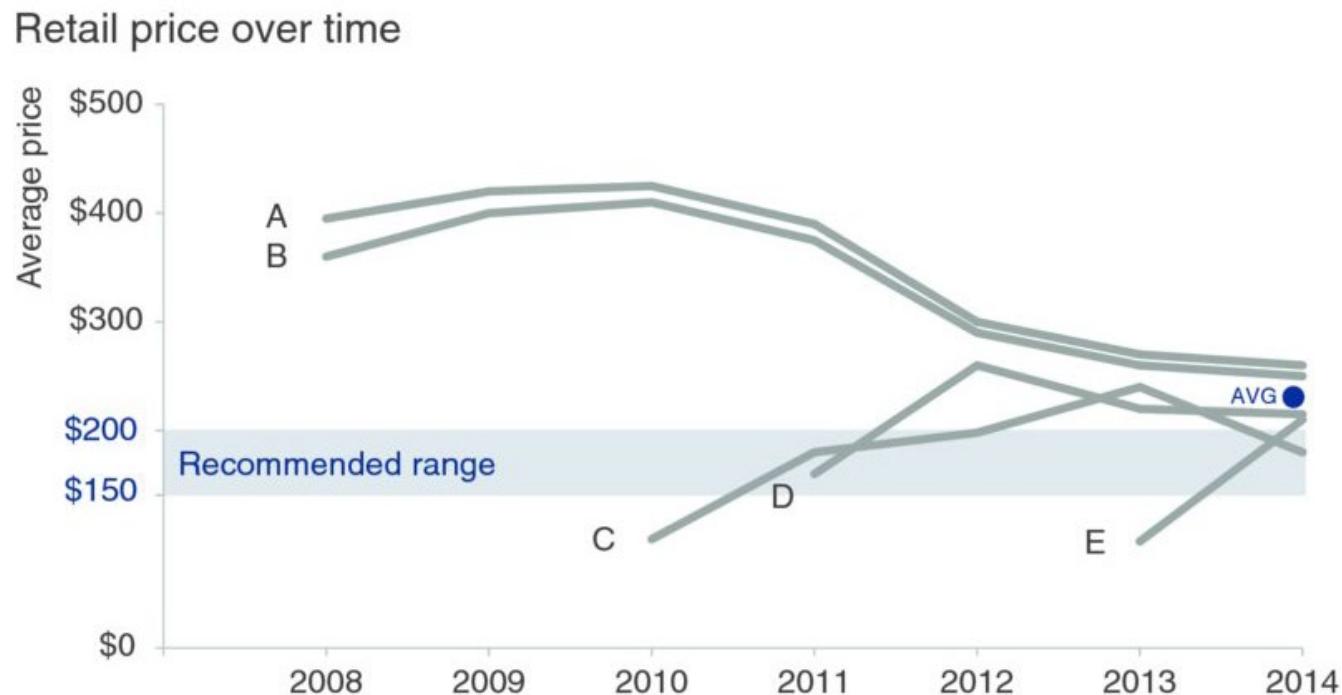
Retail price over time



Source: Nussbaumer, 2015



The story (6)



Thanks and Rewrap



MIREIA RIBERA | ACCESSIBILITAT DIGITAL
| EXPERIÈNCIA D'USUARI | VISUALITZACIÓ DE DADES



UNIVERSITAT DE
BARCELONA

Rewrap

1. Engagement:

- ❑ Use impactful language and visuals.
- ❑ Focus the user's attention.
- ❑ Identify elements for emotional connection.

2. Understanding:

- ❑ Lack of background: Provide detailed context.
- ❑ Complex visual encoding: Explain piecemeal.
- ❑ Overwhelming: Smooth start.

Rewrap

1. Memorability

- ❑ Connect symbols to reality
- ❑ Tell a story

2. Emotional connection

- ❑ Humanize the stories
- ❑ Authenticity: real stories, details, genuine photos

The graphic designer

Presentation and visualization



What should
we pay
attention to?

Message

Visual design

Delivery

Message



Message: Goal



INFORMATIVE



ENTERTAINING



INSPIRING



PERSUASIVE

MAKE IT SIMPLE
PLEASE

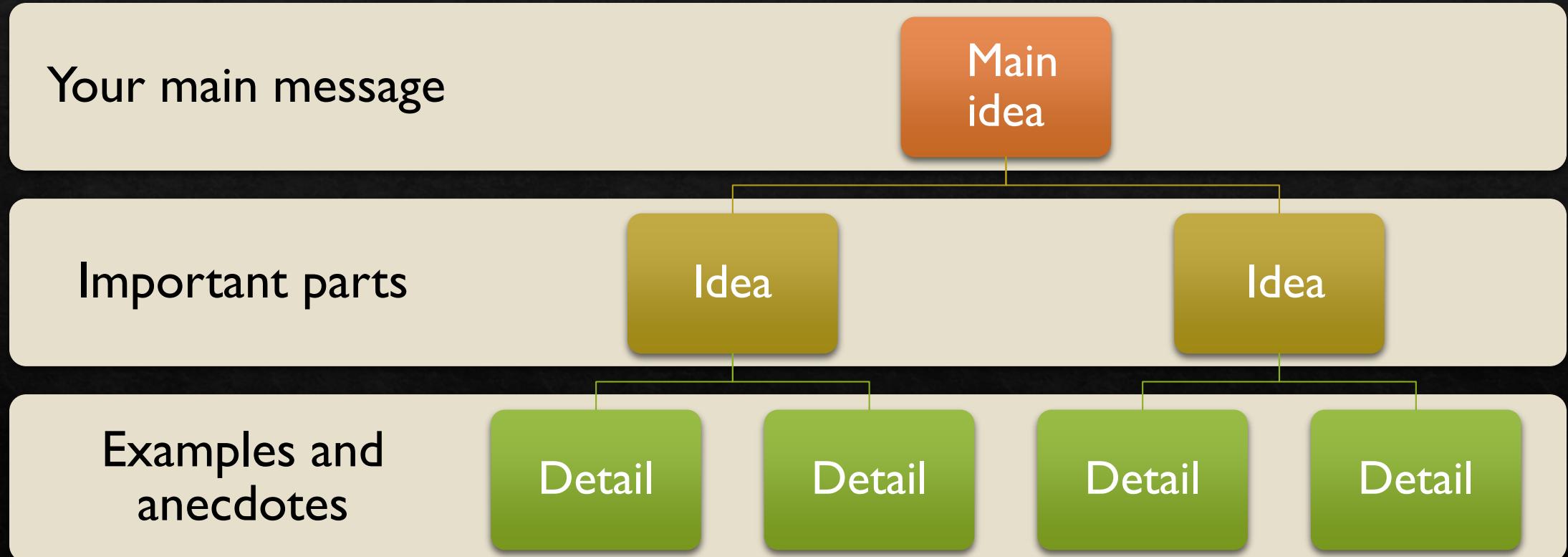
Few words and lots of ideas

Space is important

Less is more

SUPPRESS THE OBVIOUS,
HIGHLIGHT THE SIGNIFICANT

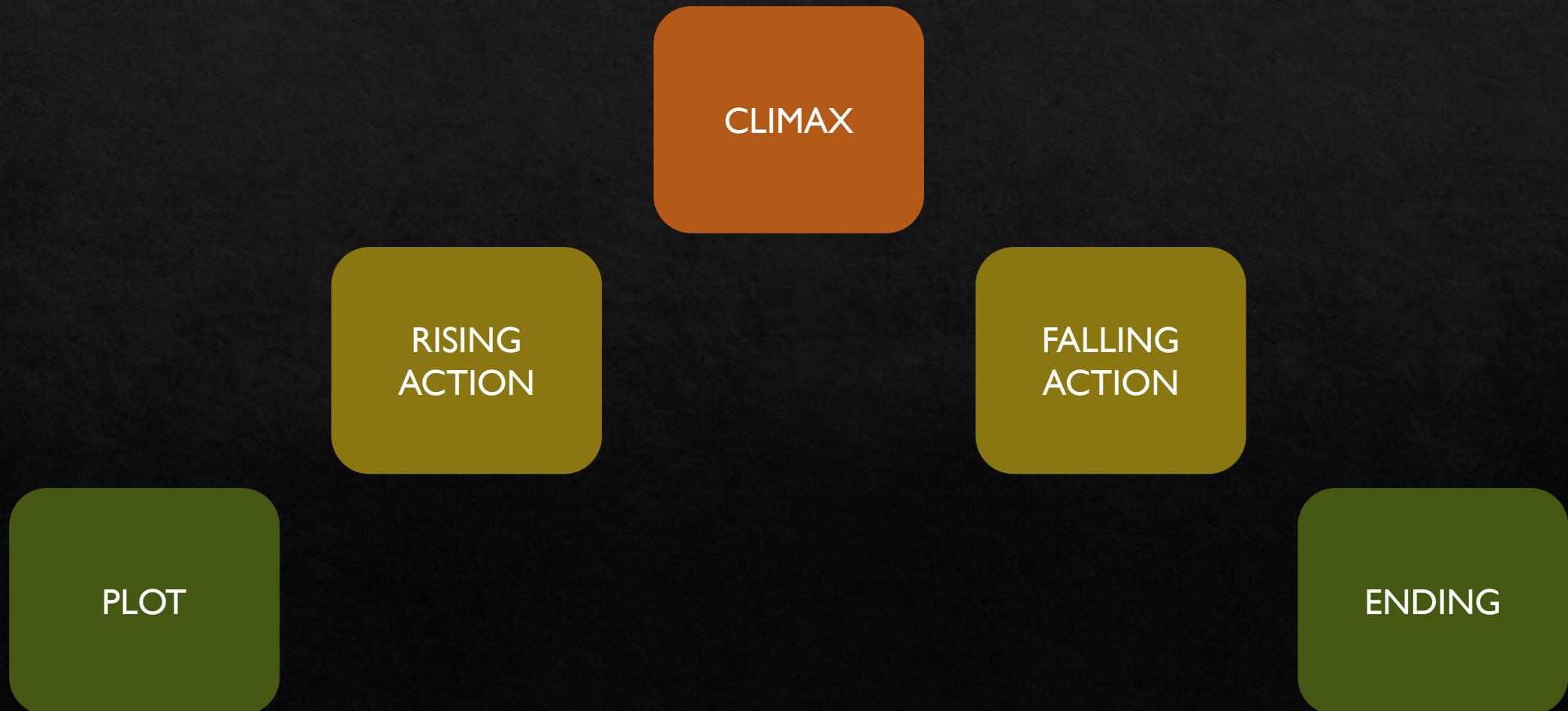
Message: The structure



Message, storytelling



The narrative arc



Visual design

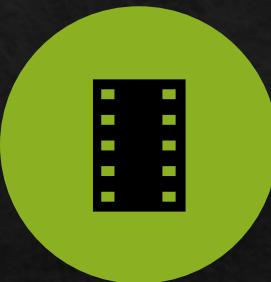
Colour, layout, typography and images



Images and videos as background



Full screen image



Partial bleed image



Background with
transparency



Video background with
subtle movement

Full screen image



Partial bleed
image





Transparent background image



Background video with subtle movement

The background of the slide features a scenic landscape of a waterfall cascading down a rocky cliff into a shallow pool of water. In the foreground, there is a dense field of large, smooth, greyish-brown stones. The upper portion of the image shows a grassy hillside with some stone walls and a small wooden structure. The sky is overcast.

30 to 60
seconds

Always
full screen

Authentic
videos

Background video, recommendations

COLOUR

power
sophistication
mystery
death

hope
simplicity
cleanliness
goodness
purity

love
passion
romance
danger
energy

intellect
friendliness
warmth
caution
cowardice

peace
sincerity
confidence
integrity
tranquility

authority
maturity
security
stability

life
growth
nature
money
freshness

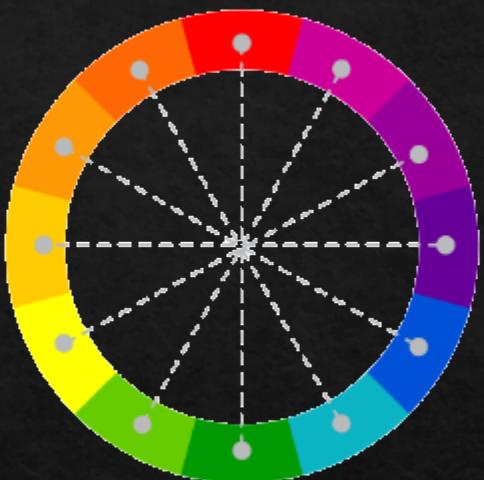
innovation
creativity
thinking
ideas

royalty
luxury
wisdom
dignity

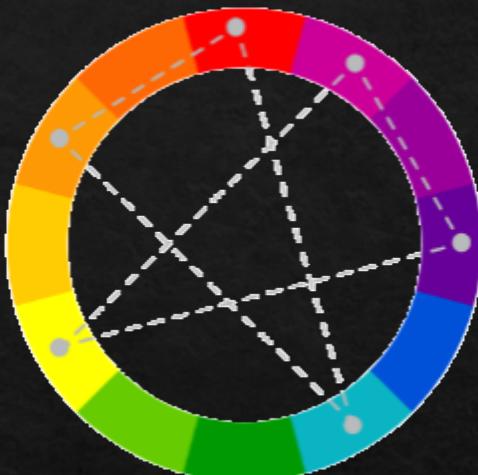
Colour combinations



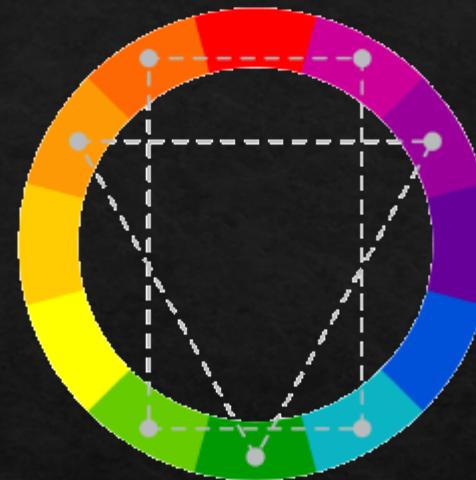
60-30-10



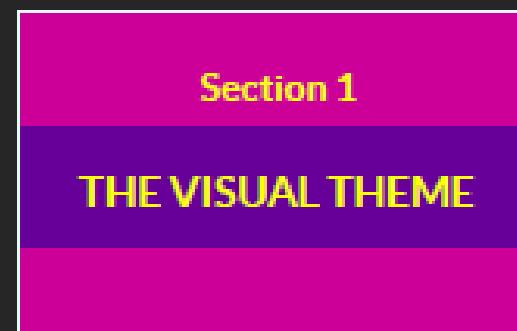
COMPLEMENTARY



SPLIT
COMPLEMENTARY



TRIADS AND
TETRADIC





ANALOGOUS
COLOURS



MONOCHROMATIC

The Visual Theme

- 1 Choose Colors
- 2 Create a Metaphor
- 3 Select Fonts

The Visual Theme

- 1 Choose Colors
- 2 Create a Metaphor
- 3 Select Fonts

Colour scheme tools



<https://coolors.co>



<https://color.adobe.com>



<http://paletton.com>

Layout: page setup

Standard, 4:3

Widescreen, 16:9

Layout: Composition

Title subtitle



Text text text
text text text
text text

Text text text
text text text
text text

Text text text
text text text
text text

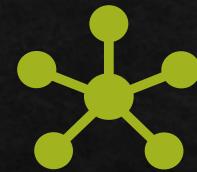
Layout



**Balance vs
Dynamism**



**Visual
hierarchy**



**Coherent
design**



Animations

Layout: some tips



Combine text and image



Harmonious design, consistent feel, implied movement



Layered effect

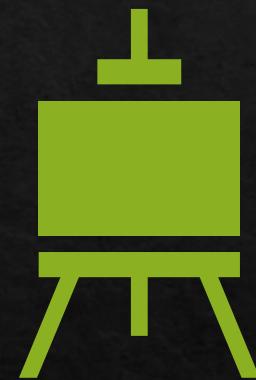


Overlays and shapes

Images within slides



1 Image per slide



Well framed collage

Images: some tips



Always high resolution (landscape slides 1366 x 768 px)

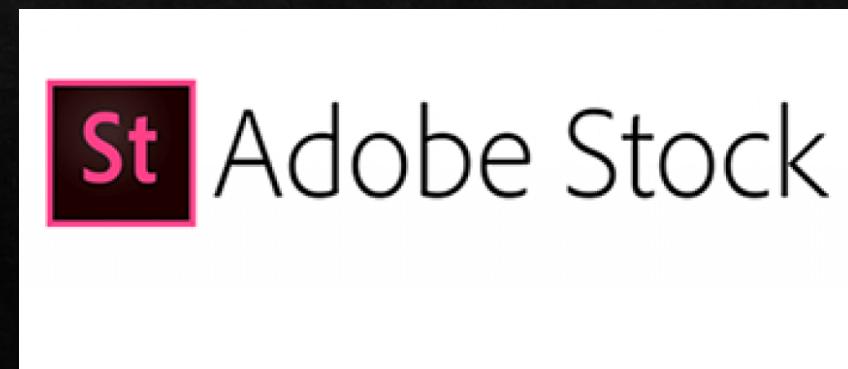


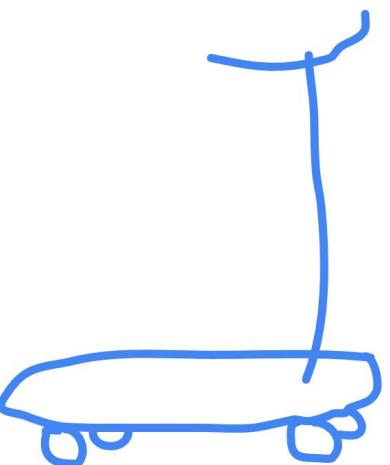
Crop to keep focus



Never distort

Image sources





Autodraw

Image types



Thematic



Real life



Abstract



Illustrating
concepts



Humorous



Evocative

Image type: Thematic images

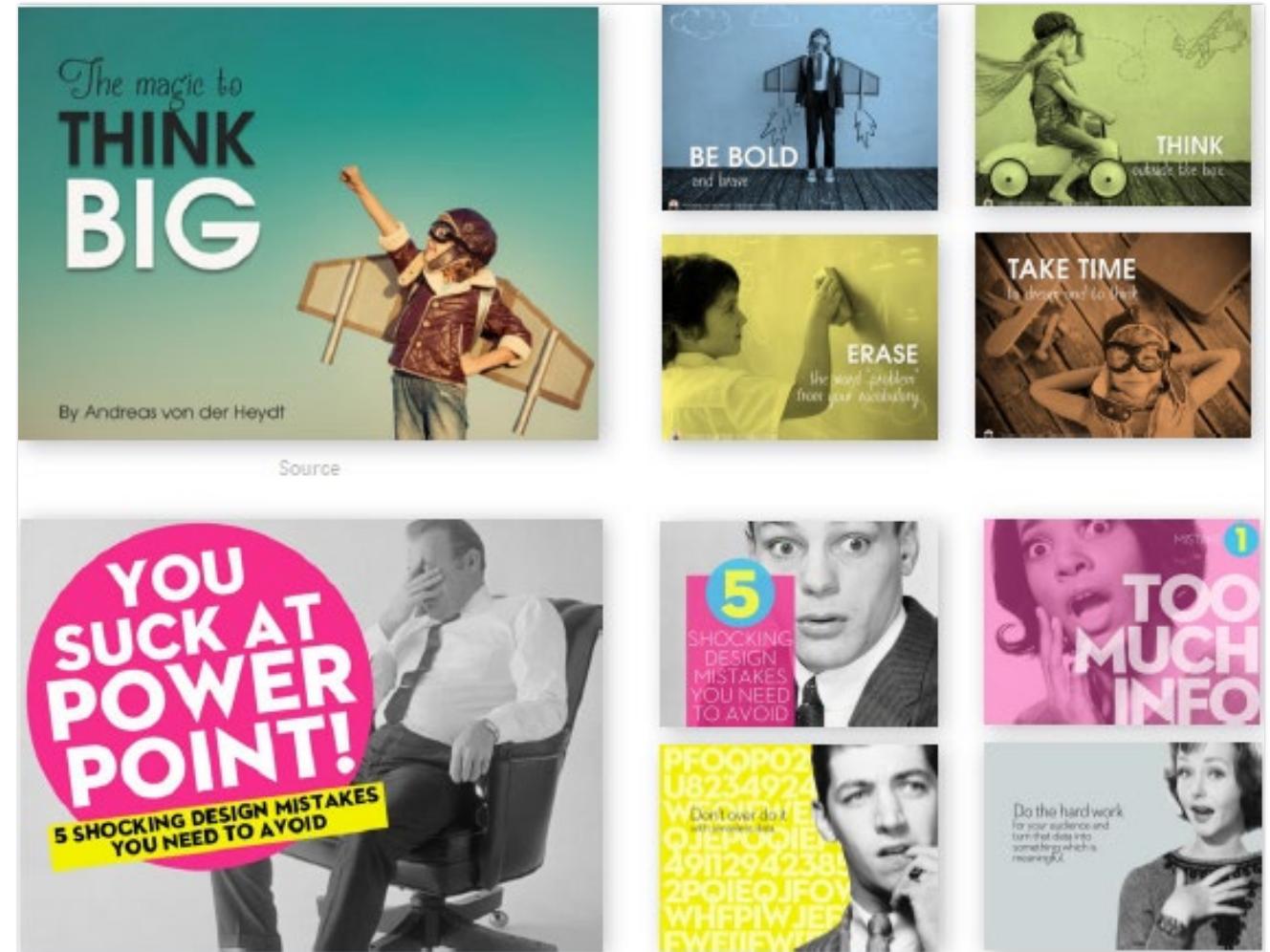


Image type: Real life



Source:
[instagram.com/visitaustralia](https://www.instagram.com/visitaustralia)



Image type:
Abstract
images



Source



Source

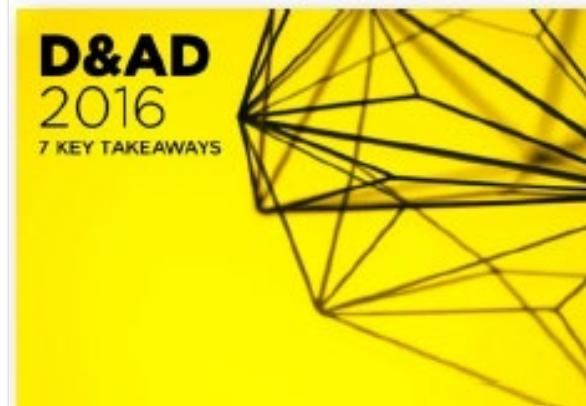


Image type: Illustrating concepts



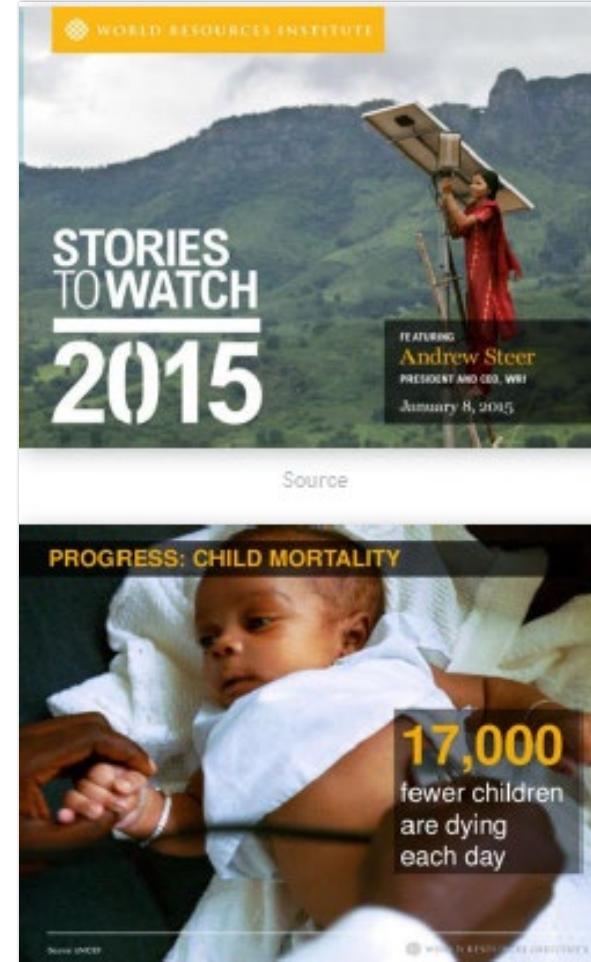
Source



Image type:
Humorous



Image type:
Evocative



Typography: Personality and mood

Friendly

MONTSERRAT

Fancy

CYGNET ROUND

Serious

GARAMOND

Silly

KLEIN SLAB
SERIF

Typography: Font pairing



Typography: font size

A 72
A 48
A 28
A 18

Typography: Leading

Positive Impacts of Smart Phones



- You can easily communicate with others as it is portable.
- Not only use for talking but also for shopping, taking pictures, etc.
- Made it easy to plan and schedule your daily routine.

Too little leading

Positive Impacts of Smart Phones



- You can easily communicate with others as it is portable.
- Not only use for talking but also for shopping, taking pictures, etc.
- Made it easy to plan and schedule your daily routine.

Too much leading

Positive Impacts of Smart Phones



- You can easily communicate with others as it is portable.
- Not only use for talking but also for shopping, taking pictures, etc.
- Made it easy to plan and schedule your daily routine.

Just right

Delivery

Attitude, techniques



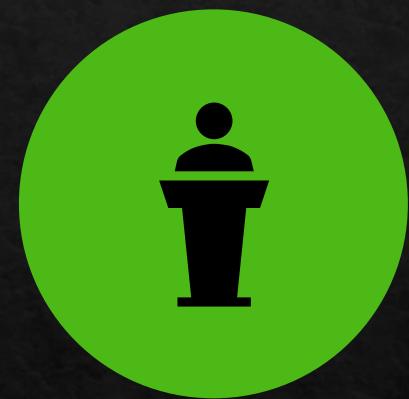
Delivery: attitude



SELF-CONFIDENCE



INNER-CALM



POISE

Delivery: techniques



VISUAL CONTACT



VOICE



BODY LANGUAGE

Delivery: voice



Intonation



Volume



Speed



Pauses

Preparation work

Process, audience, structure



Preparation process



Know our audience



Sort the contents



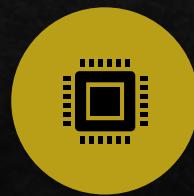
Key moments design



Draft slides



Plan interaction



Open the computer

Draft slides

Prepare on paper

Brainstorm

Storyboard

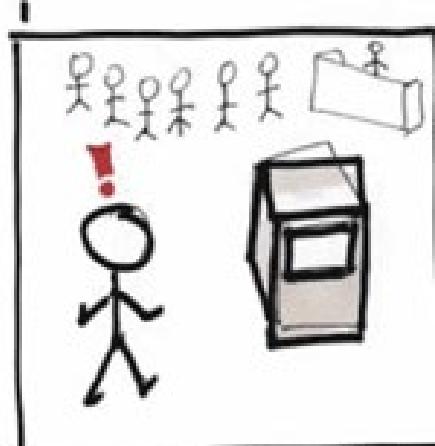


Prepare on paper

Brainstorm



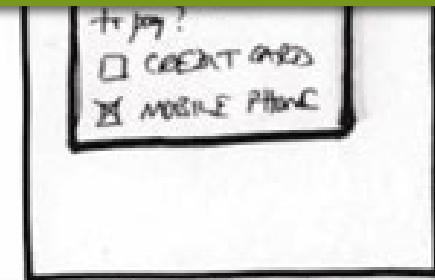
Storyboard



User arrives at station, sees task and logs queue for the ticket office



User goes toioskiosk



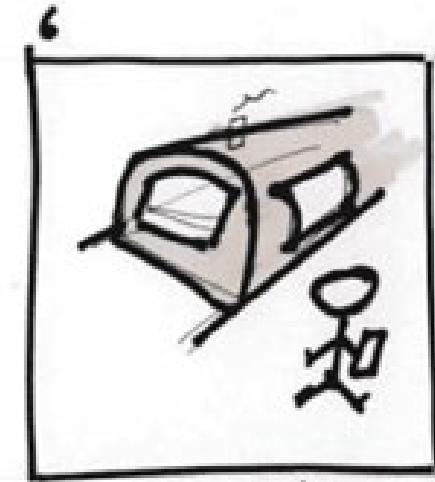
on BoardScan, he chooses mobile phone



He scans the QR code



Follow instructions to pay, and his ticket delivered



Get a fare with ticket delivered to his phone. Goody!

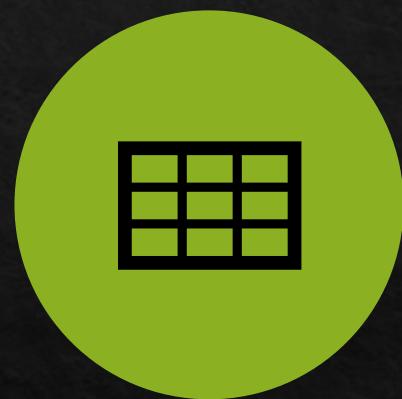
BE OBSESSED
WITH THE DETAILS



Simplify



REDUCE



ORGANIZE



INSPIRE

Your audience is
more exigent than
you may think



Audience

Who are they?

How are they?

Why are they there?

Goals

Key ideas

Expectations

You

Goals

Key ideas

Expectations

Slides

Content for goals

Content for key ideas

Content for expectations

WOW

GIFT

Wrap-Up

WOW

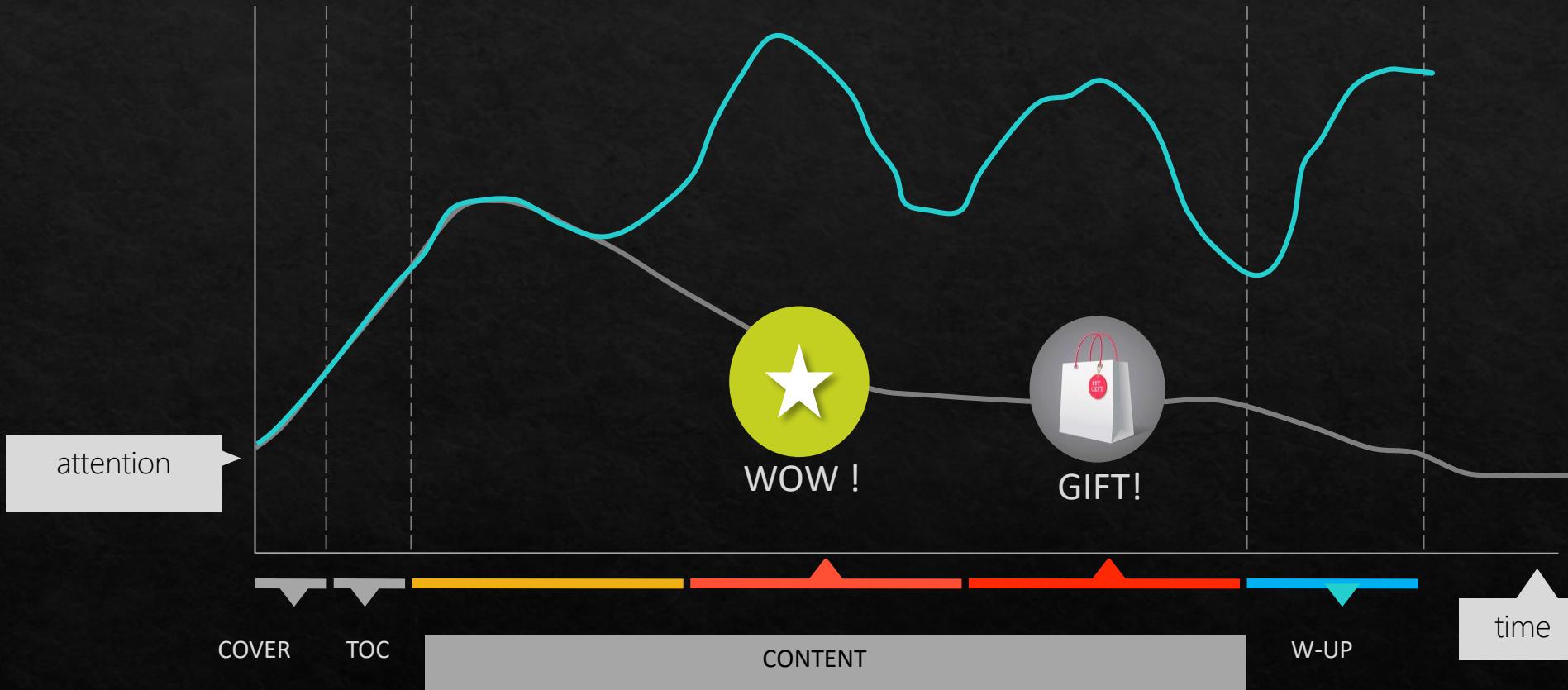


GIFT



WRAP-UP





What have we
paid attention
to?

Message



Visual design



Delivery



RULES MAY BE BROKEN
BUT NEVER IGNORED

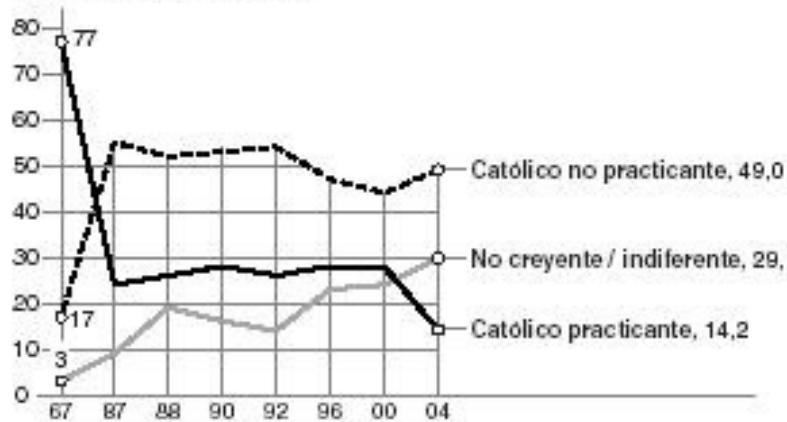
Detect the bad practices

1)

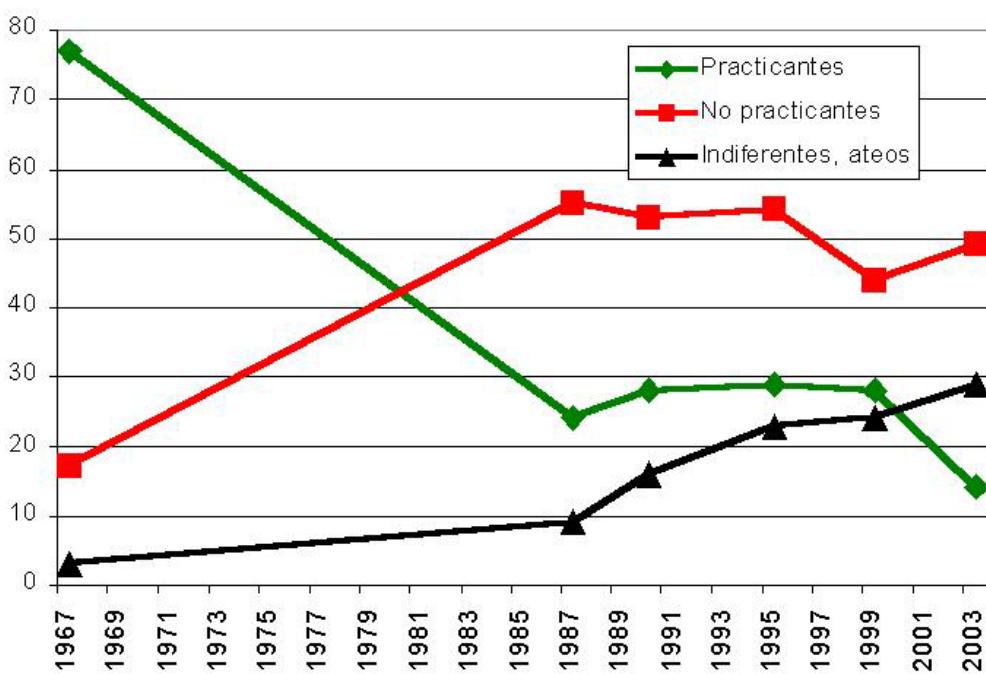
Encuesta a los jóvenes españoles

En porcentaje.

■ Evolución de la identificación religiosa de los jóvenes
Población entre 15 y 29 años.

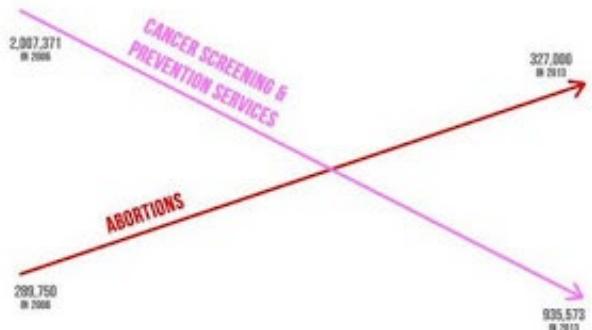


With regular scales



2)

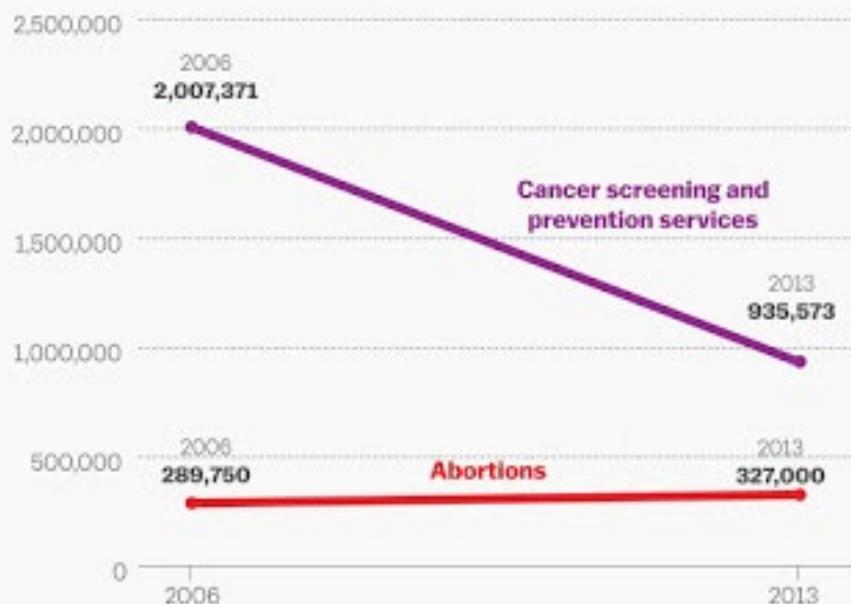
PLANNED PARENTHOOD FEDERATION OF AMERICA:
ABORTIONS UP – LIFE-SAVING PROCEDURES DOWN



SOURCE: AMERICANS UNITED FOR LIFE

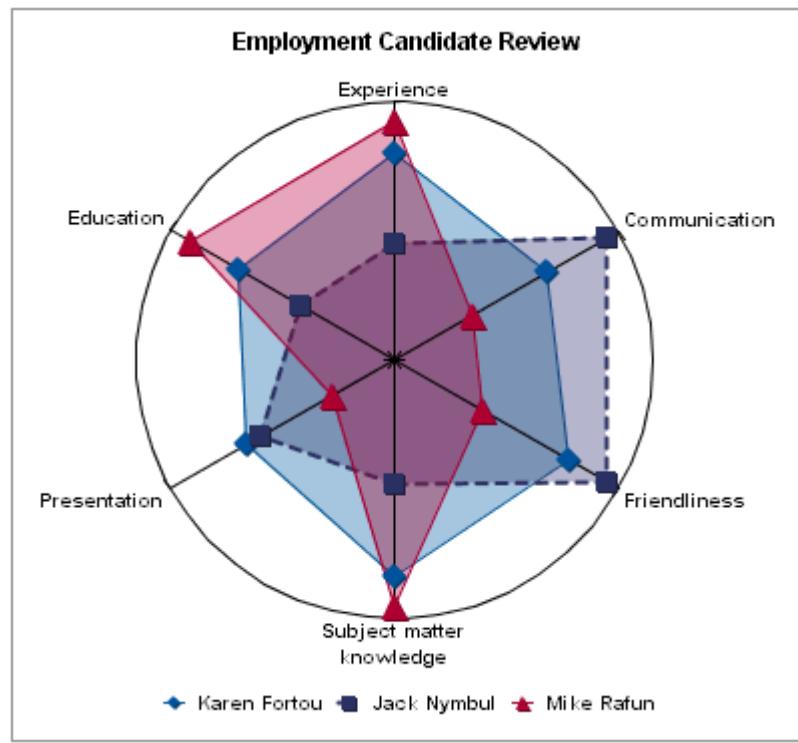
With normalized axes

Services provided by Planned Parenthood



SOURCE: Planned Parenthood

Vox



3)

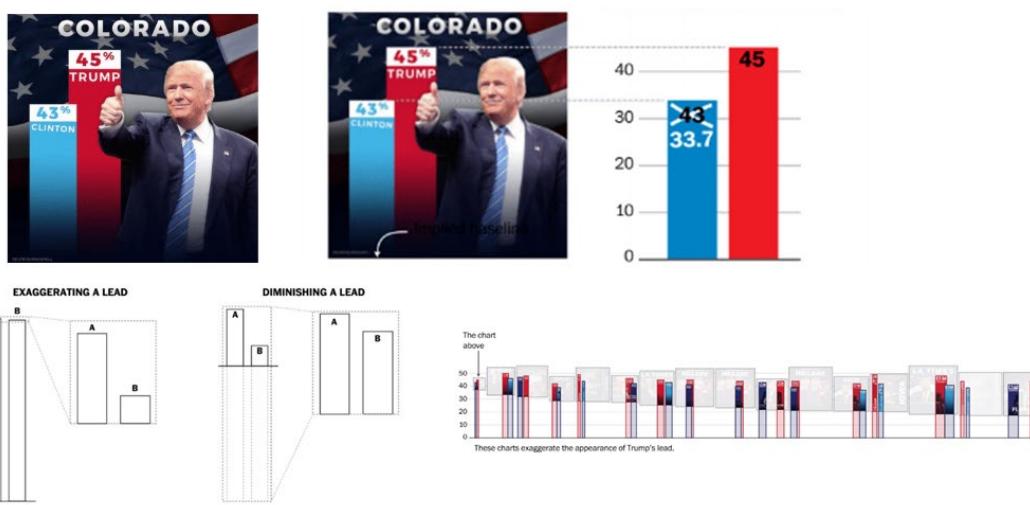
Bar charts may be more clear



4)



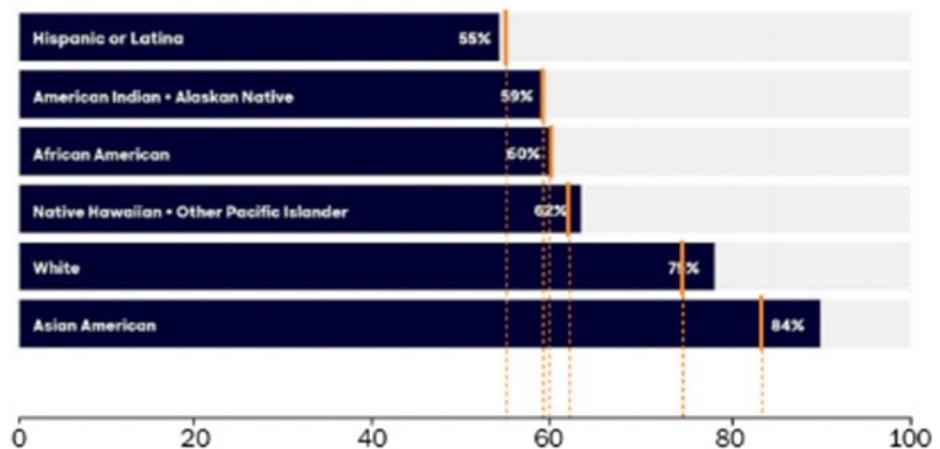
Bar charts must always start at 0



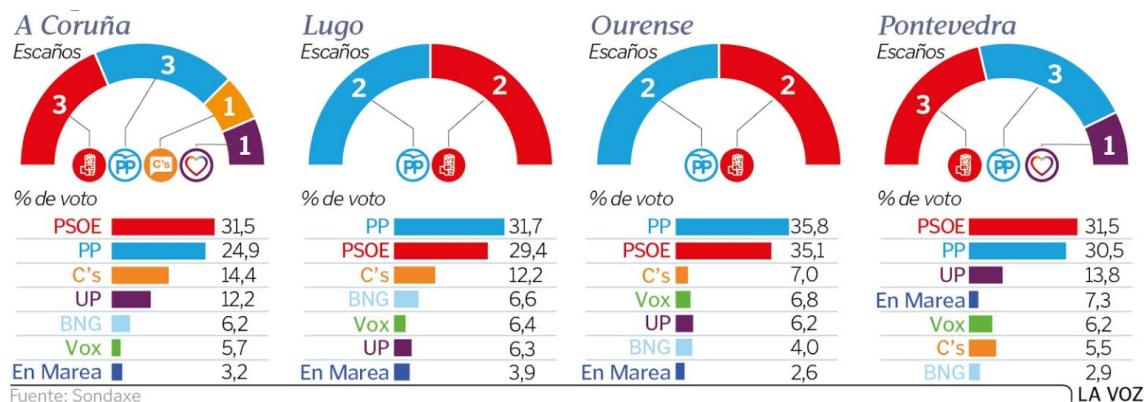
5)



Use scales wisely



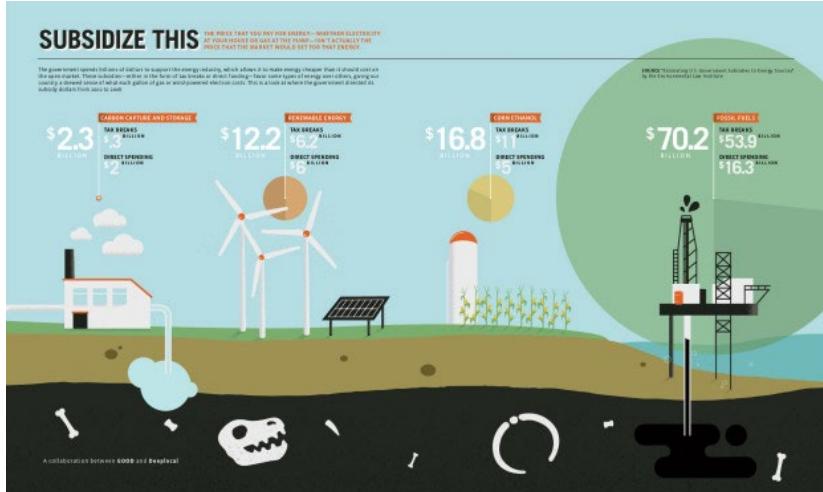
6)



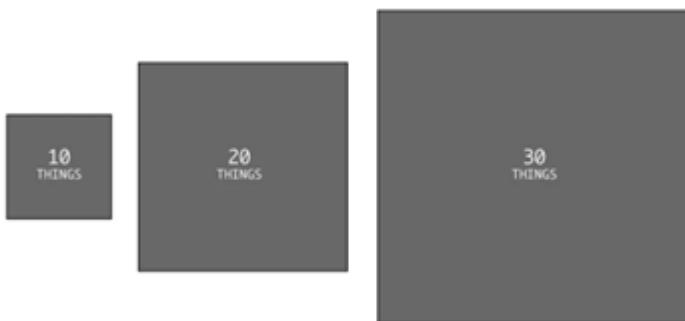
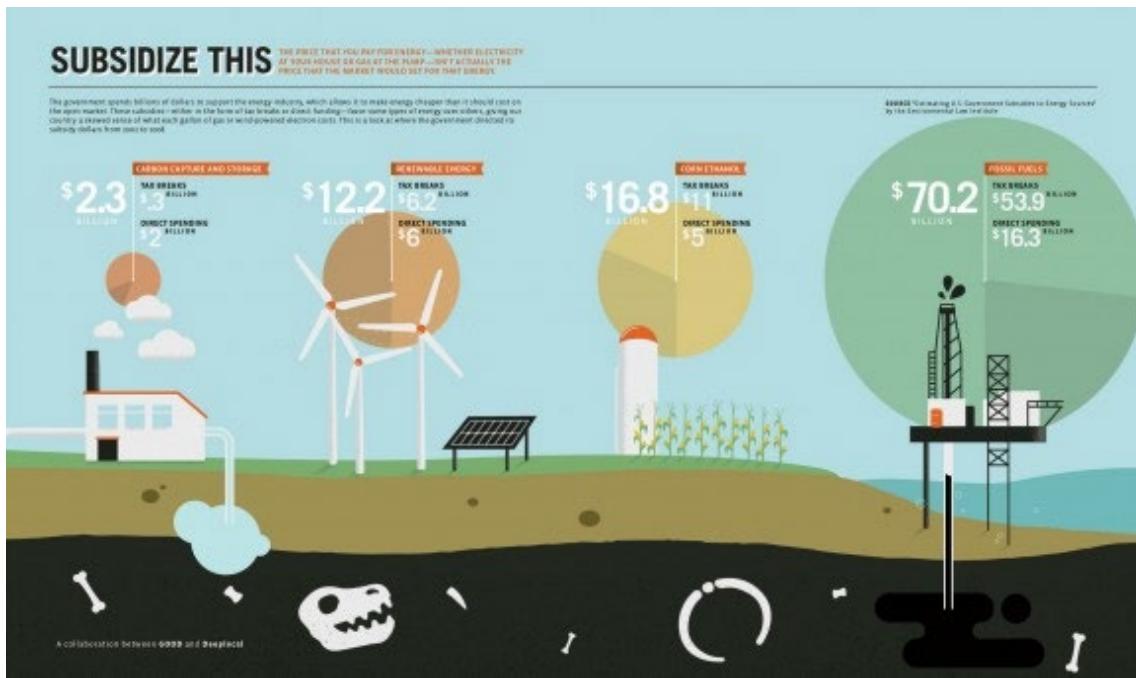
With corrected scales



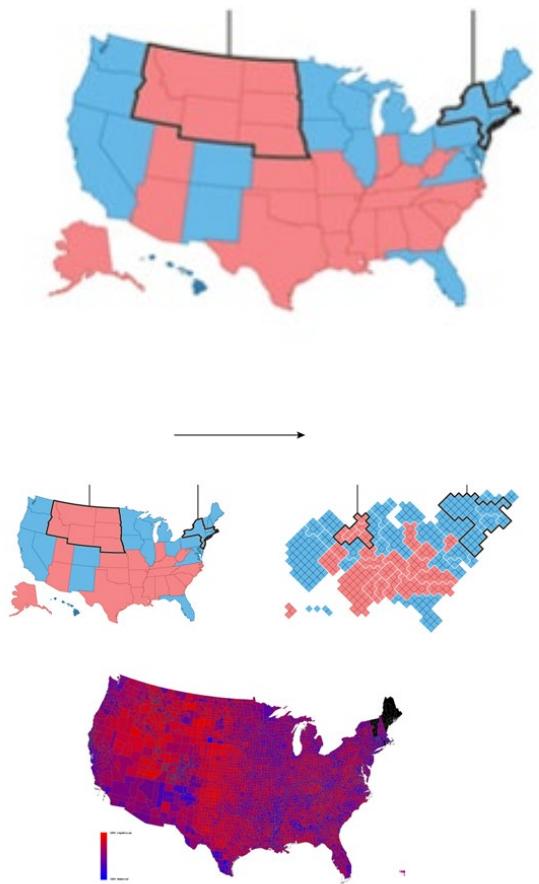
7)



Be careful with areas (area vs diameter). Corrected chart:



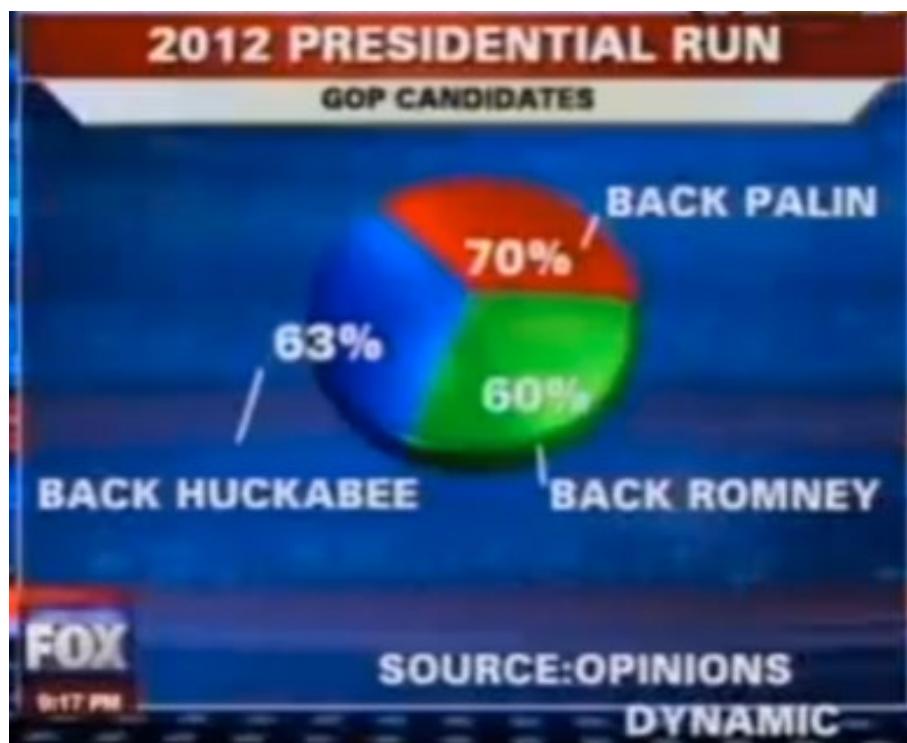
8) Don't oversimplify with aggregation



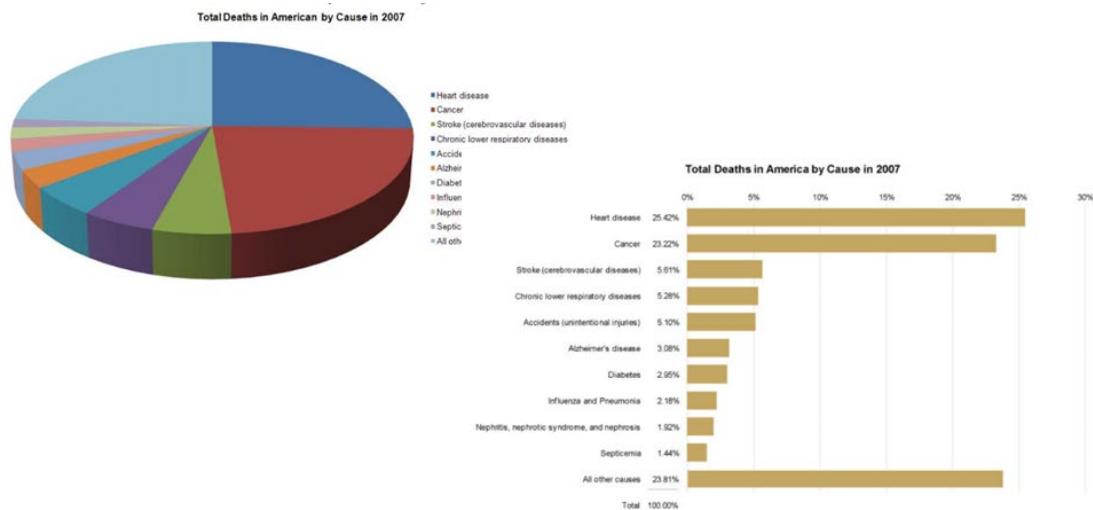
9) Small size effect



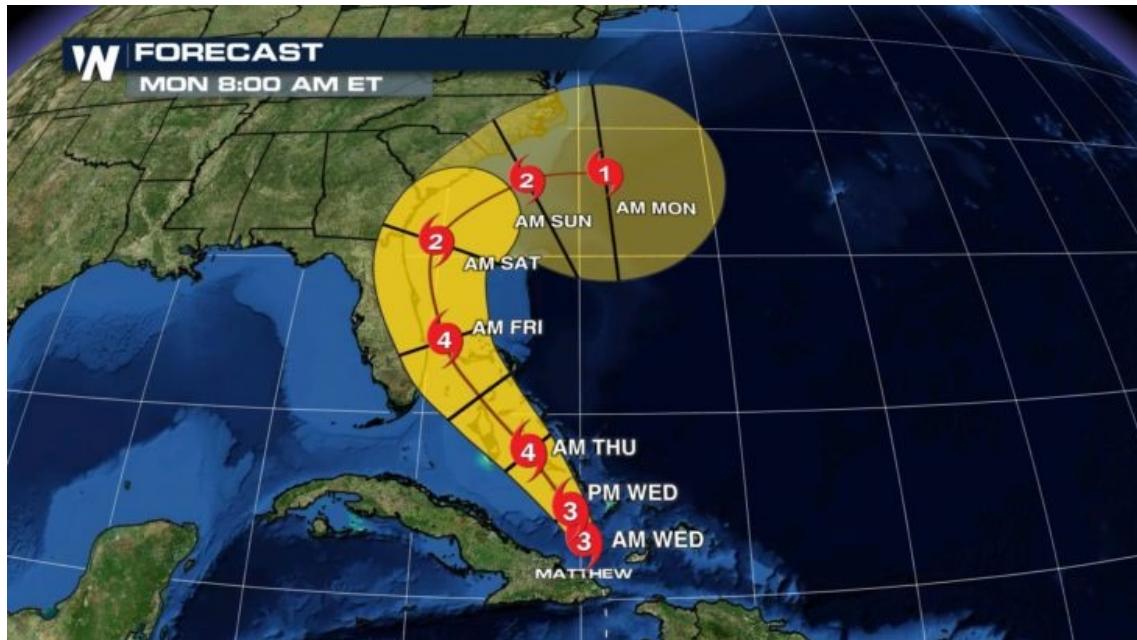
10) Basic arithmetic. Follow conventions



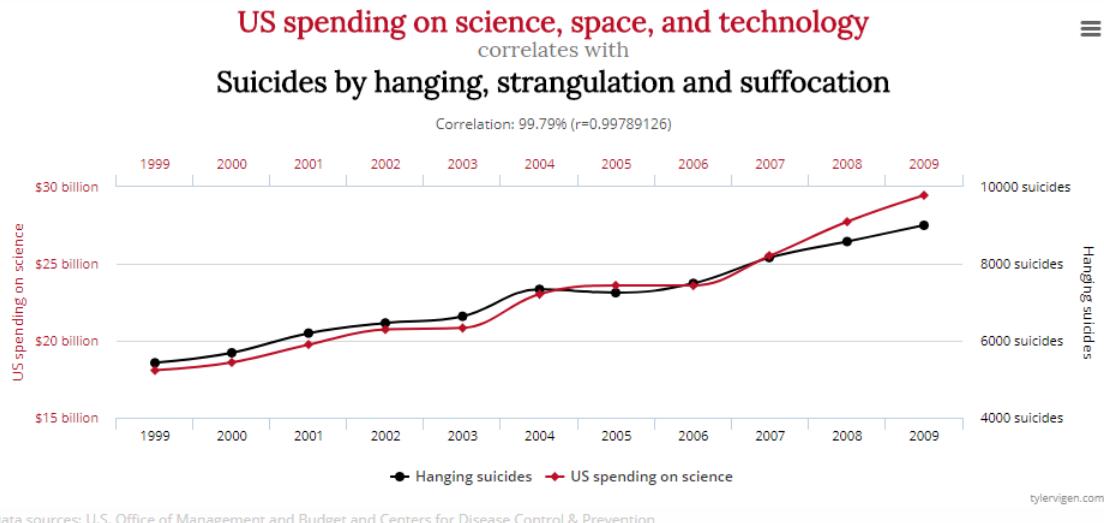
11) Use the appropriate chart



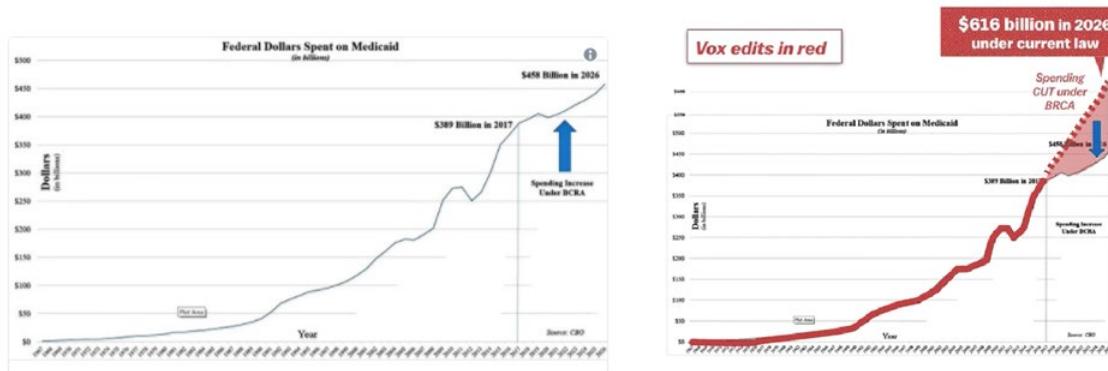
12) What is the possible problem?



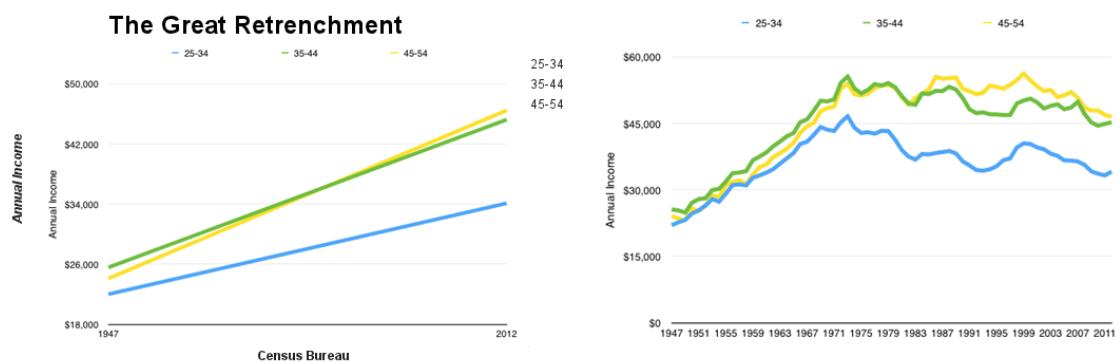
13) What is confusing here? It gives the wrong context



14) Which one is best, and why? The context helps understanding



15) Which one is best, and why? The context helps understanding



16) What is wrong with the first image? Not showing the context gives the wrong message

