Step 10 Visualisation

Carlos Moura

COIN 2017 - 15th JRC Annual Training on Composite Indicators & Scoreboards
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Effective communication through visualization

Why investing on visual information?

Effective communication through visualization

How many P's can you find in the text?

A M C D F G O I S H P O F Q H O P I U O I U L F K S D K

F K F J Z F C P T H B M U G I N D I C A T O R S D H D X

B E W Z C O M P O S I T E A E T F R J L M N O J K P B R

L A D X O G F J E I L K S A P R P U E D G H M X O Q B I

Effective communication through visualization

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L A D X O G F J E I L K S A P R P U E D G H M X O Q B I

Effective communication through visualization

Visualization uses perception to free cognition

Effective visualization

How to achieve it?

Is color important?

Does it have to be pretty?

Where are the guidelines?

Is there any science behind it?

Gestalt psychology

Set of laws that accounts for how we perceive or intuit patterns and conclusions from the things we see.

It allows for

- Better understanding of human perception
- Achieving better visuals
- Speeding up development by removing trial and error.

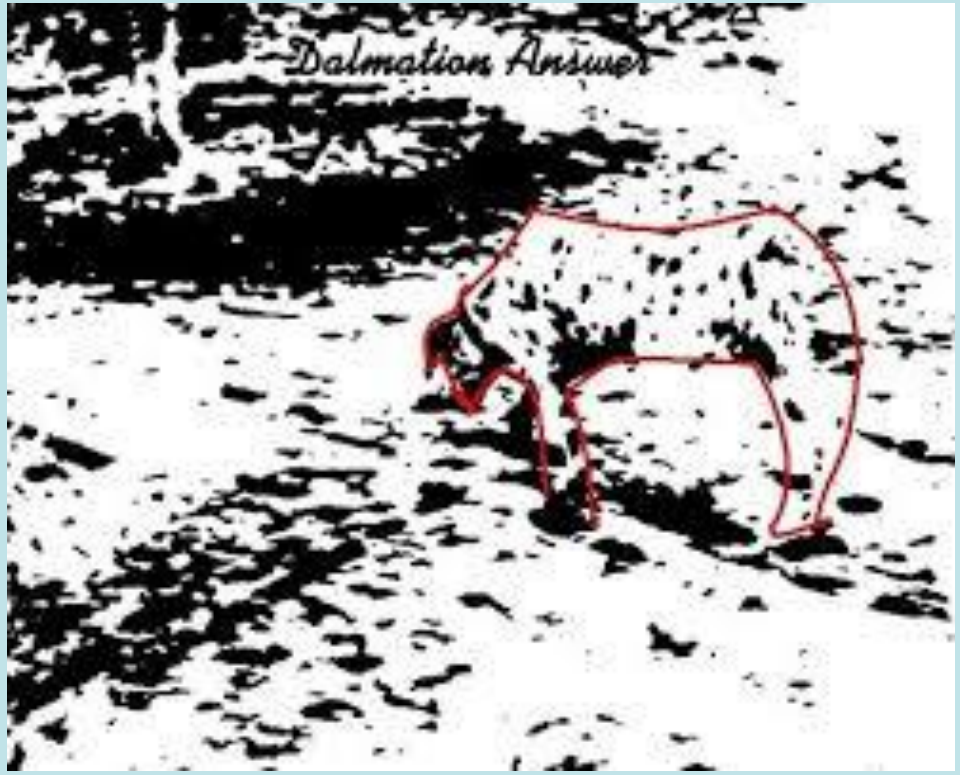
Visual perception and the Principles of Gestalt

Emergence – forming complex patterns from simple rules.

Can you see the dog?

Visual perception and the Principles of Gestalt

Emergence – forming complex patterns from simple rules.

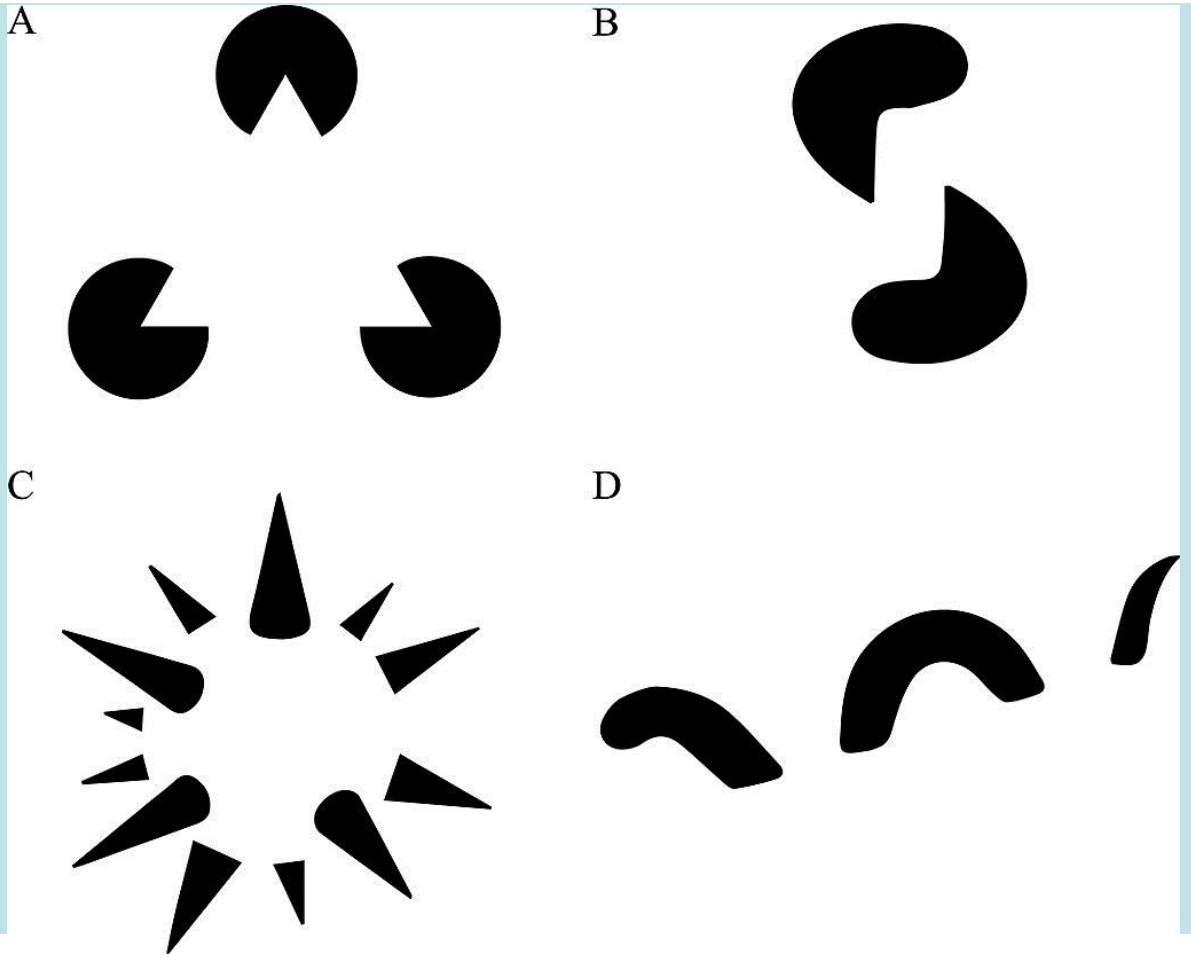


Visual perception and the Principles of Gestalt

Reification

Constructive aspect of perception.

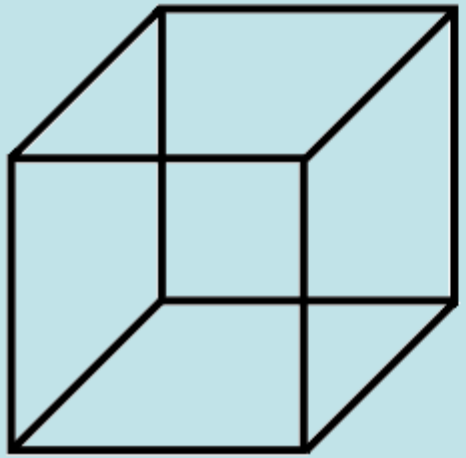
The perceived experience contains more information than the sensorial stimulus.

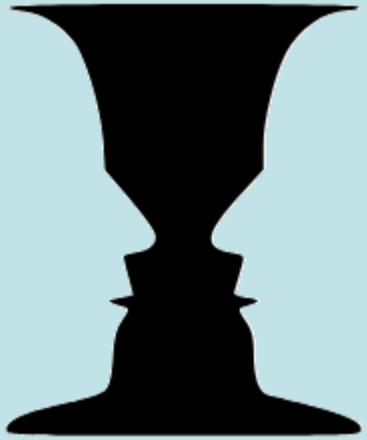


Visual perception and the Principles of Gestalt

Multistability

Ambiguous perceptual experiences to pop back and forth between alternative interpretations.

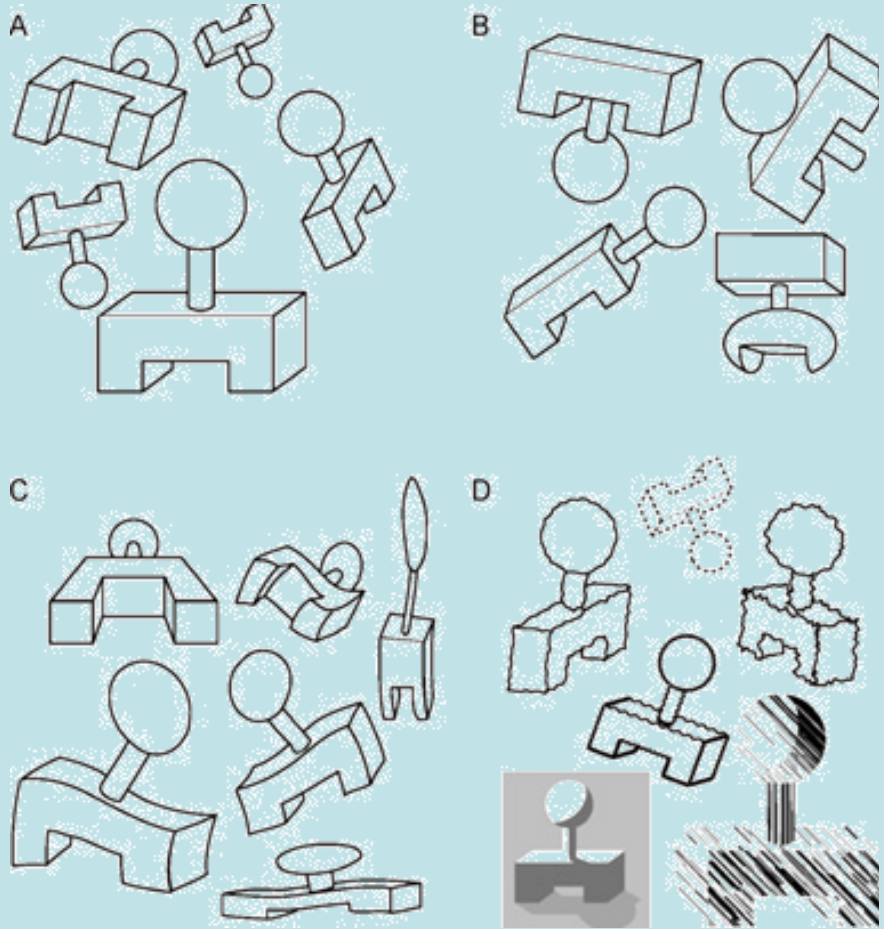




Visual perception and the Principles of Gestalt

Invariance

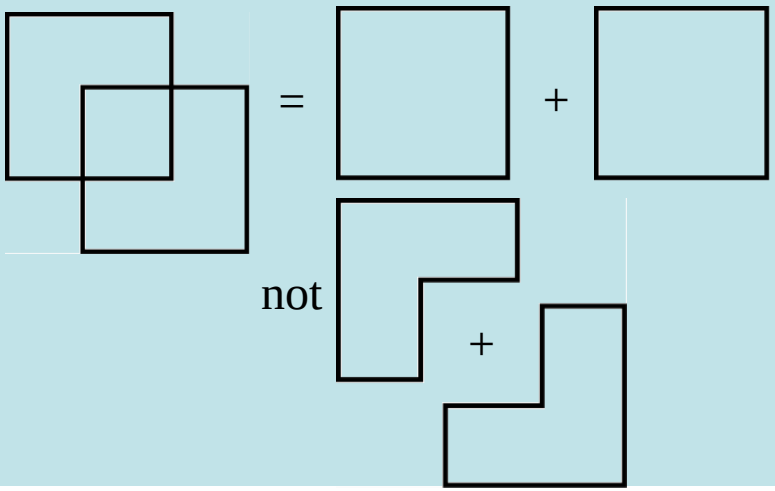
Simple objects are recognized independent of rotation, translation and scale.



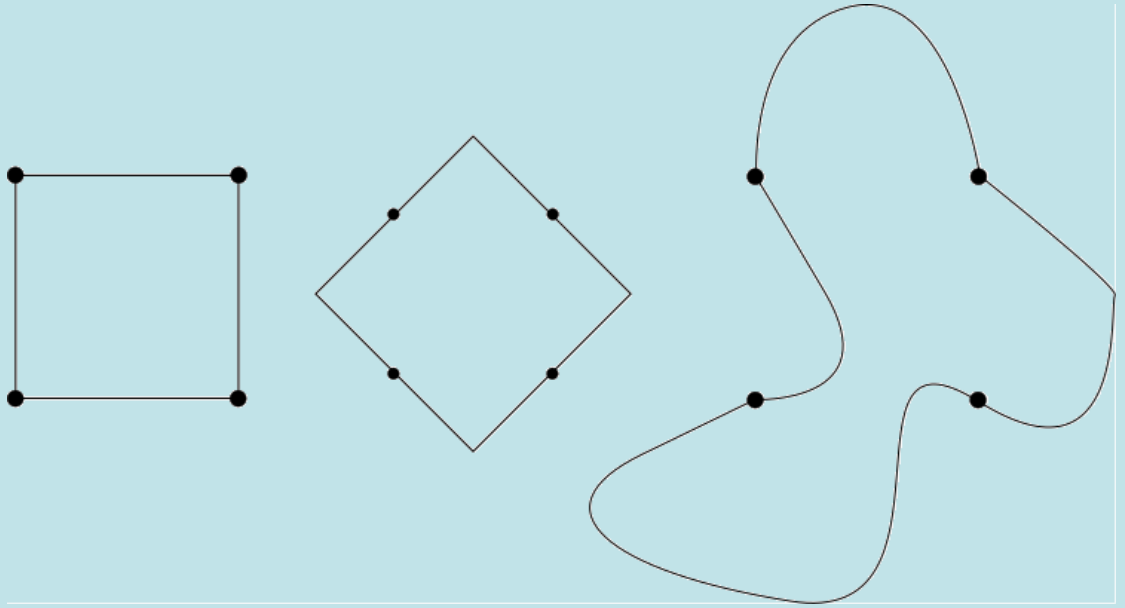
European Commission

Pragnanz – Simplicity is the key

People will perceive and interpret ambiguous or complex images as the simplest and complete form(s) possible.

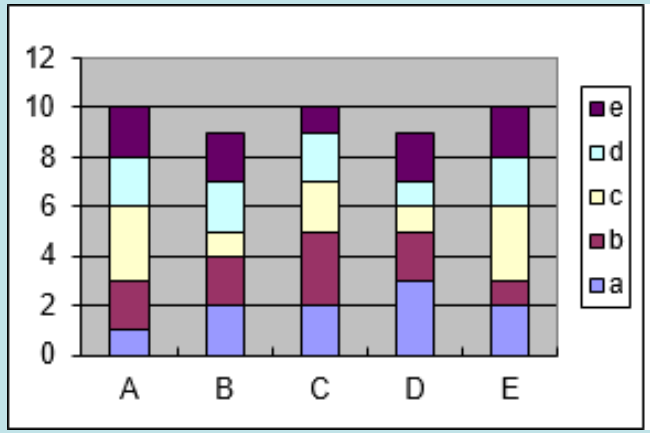


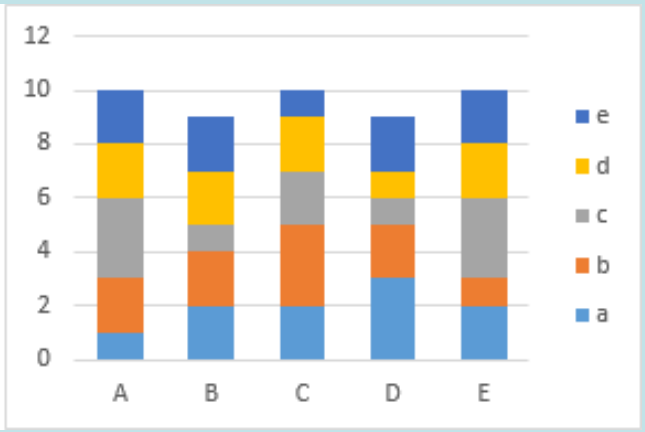
Independently of the figure, we always see the 4 points as vertices of a square



Pragnanz – Simplicity is the key

Excel 2003 vs Excel 2013





$$\text{Data-Ink ratio} = \frac{data-ink}{total\ ink\ used\ to\ make\ the\ graphic}$$

= 1 – proportion of a graphic that can be erased without loss of data-information

(Tufte, Edward – *The visual display of quantitative information*)

Some suggestions to reduce data-ink ratio:

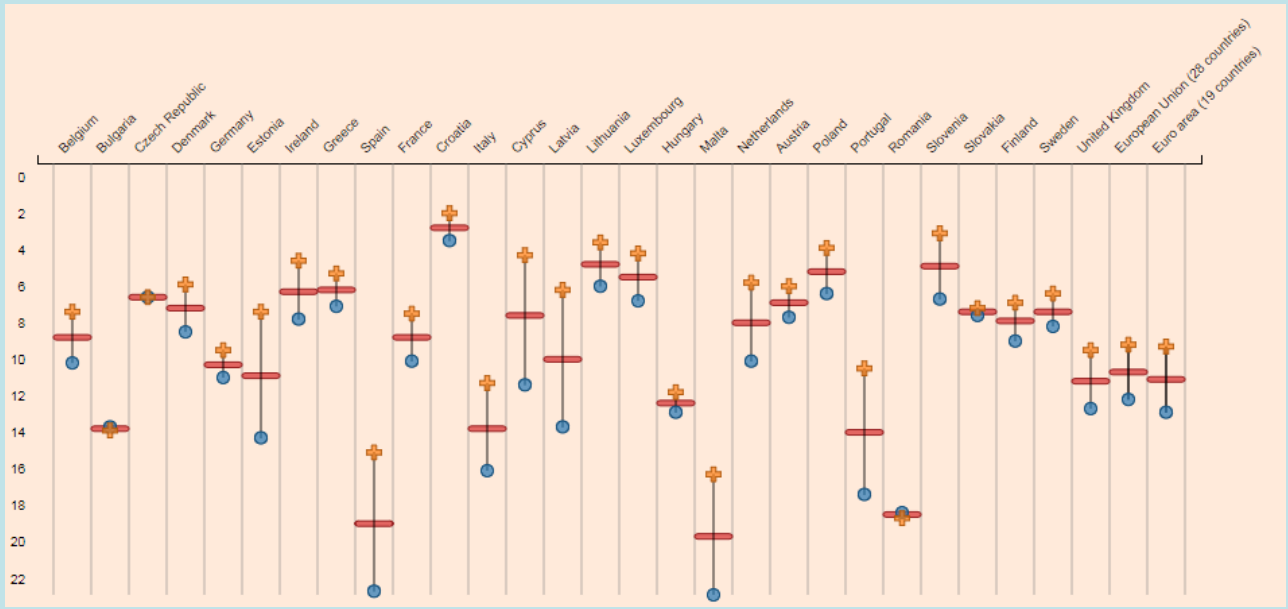
- No 3d charts

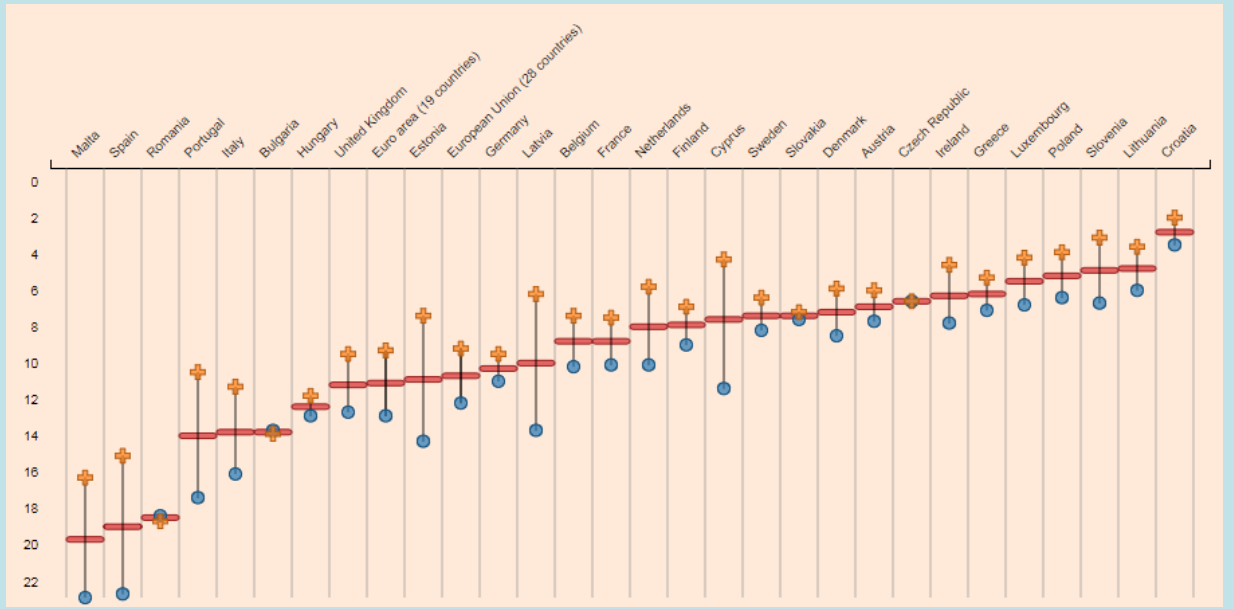
- No backgrounds, shadows or gradients

- Remove gridlines, decoration, borders, fillcolors

Pragnanz – Simplicity is the key

An ordered chart is easier to read





European Commission

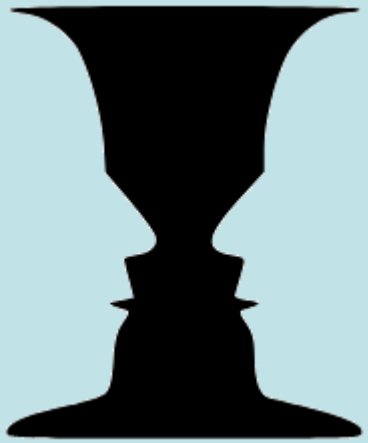
Gestalt principles

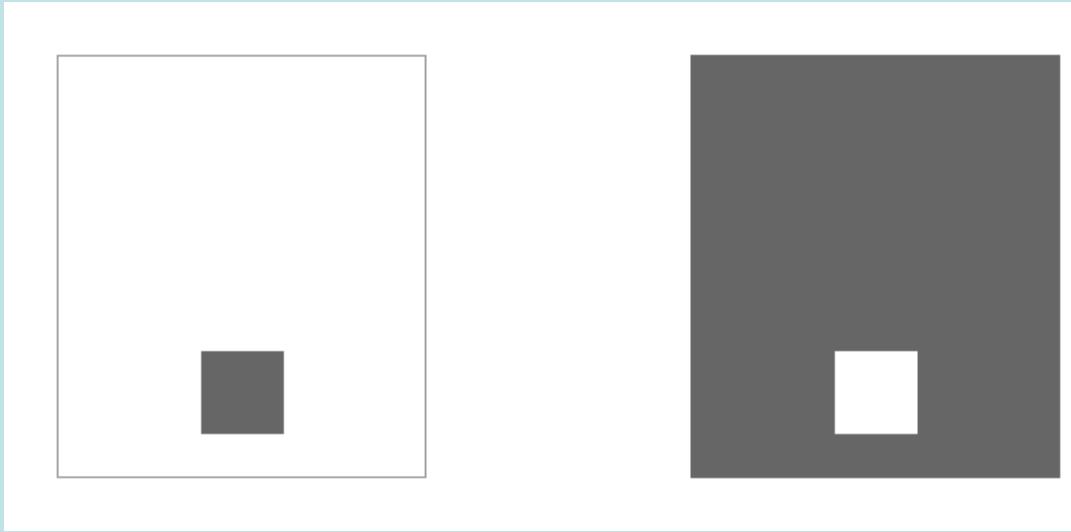
Figure-ground organization

The eye differentiates an object from its surroundings.

Objects are either classified as figure or ground.

Balancing figure and ground can make the perceived image more clear.

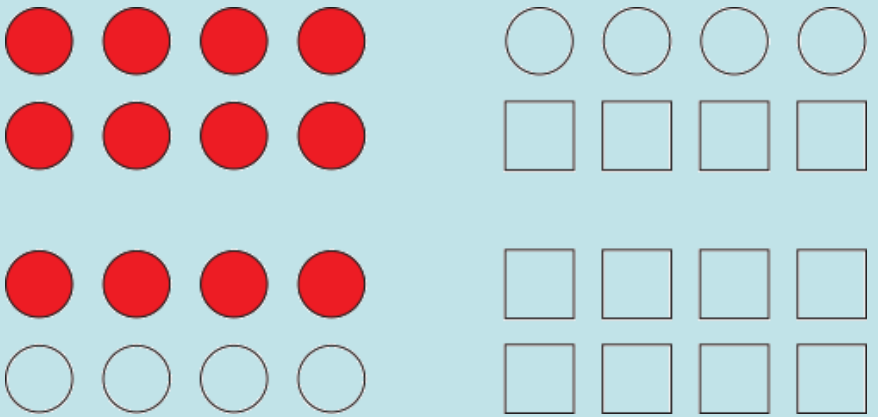




Gestalt principles

Law of Proximity

Objects or shapes that are close to another appear to form groups.



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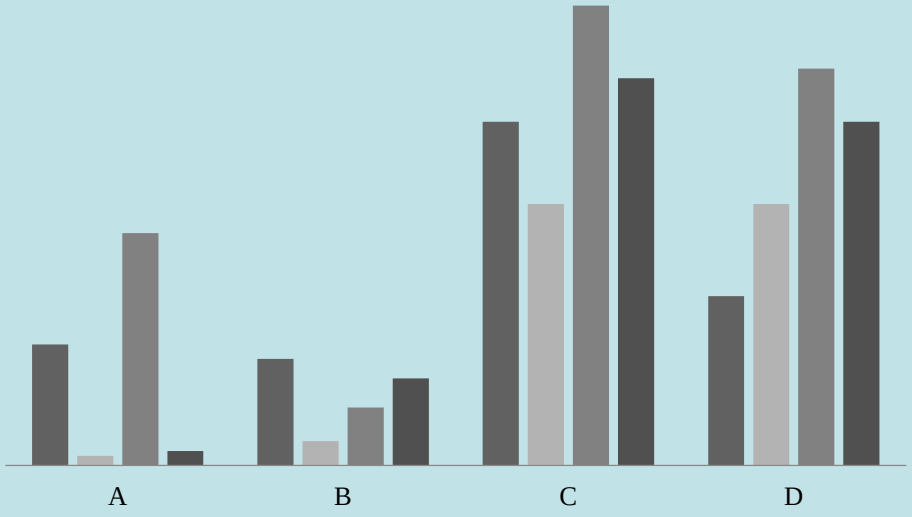
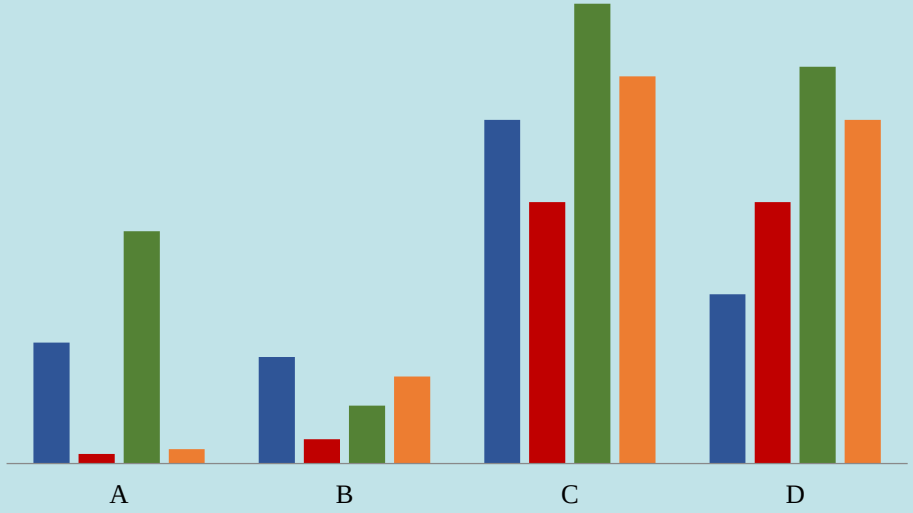


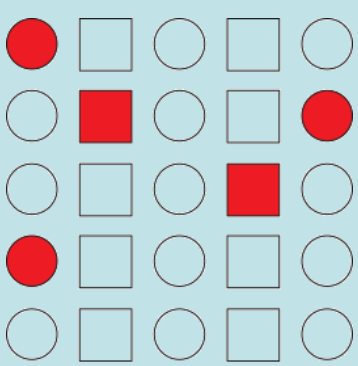


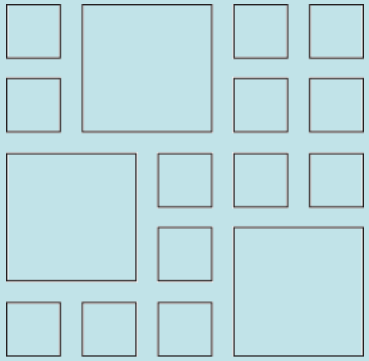
Gestalt principles

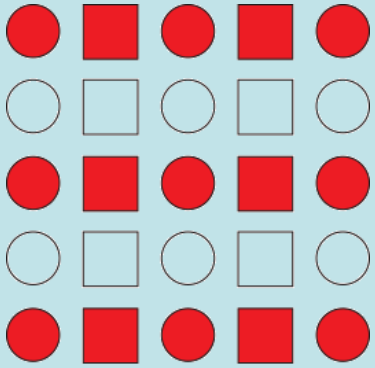
Law of Similarity

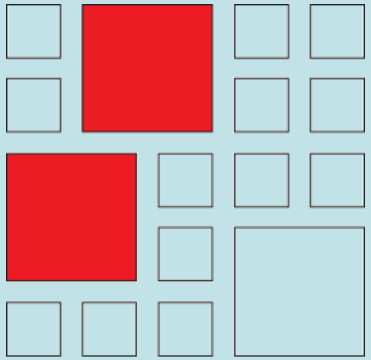
Elements that share similar characteristics are perceived as more related than elements that don’t share those characteristics.

Similarity is particularly affected by color.









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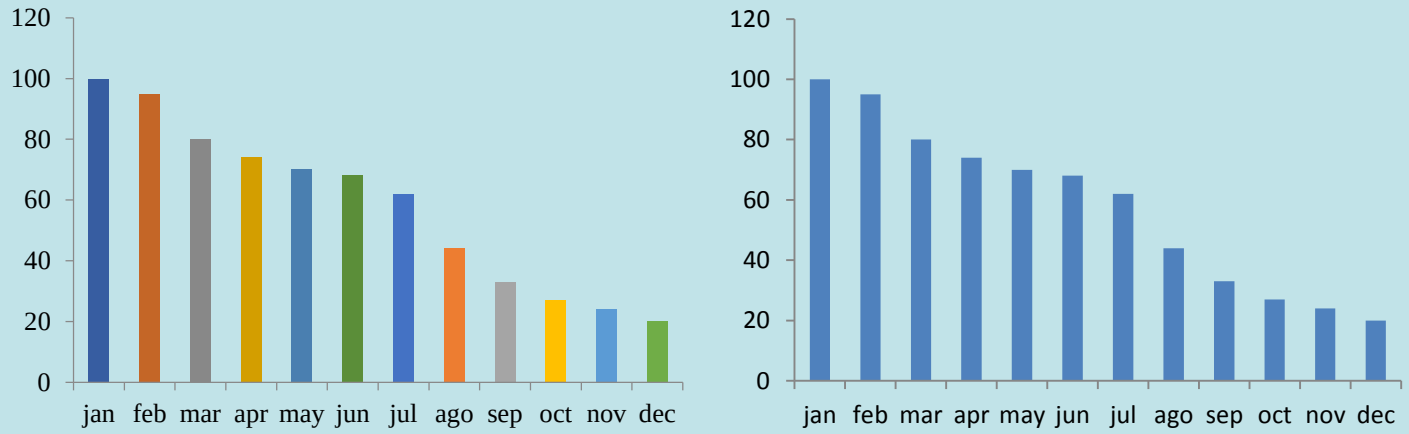

European Commission

Gestalt principles

Law of Closure

The minds tendency to see complete figures of forms even if a figure is incomplete, partially hidden by other objects or if part of the information is missing.

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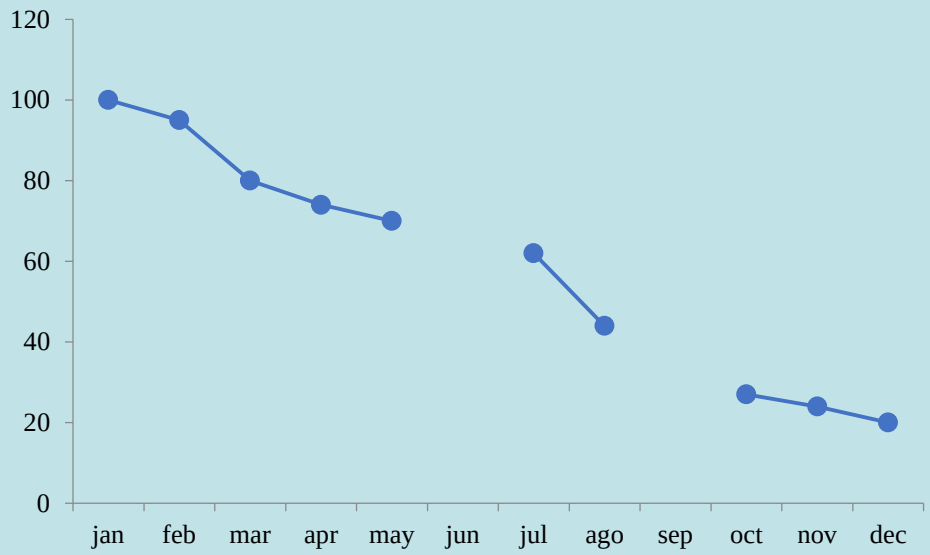

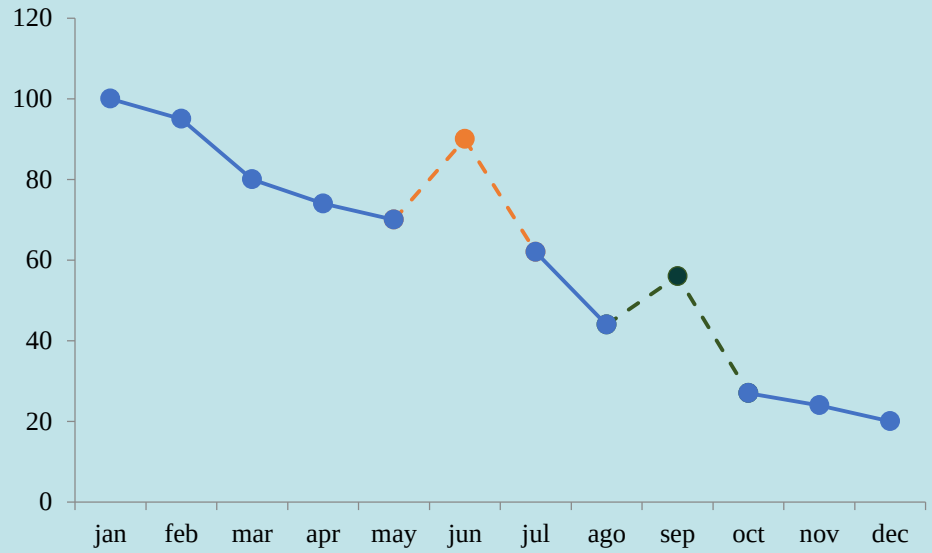

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Gestalt principles

Law of Simetry

The minds perceives objects as being symmetrical and forming around a center point. When two symmetrical elements are unconnected the mind perceptually connectes them to form a coherent shape.

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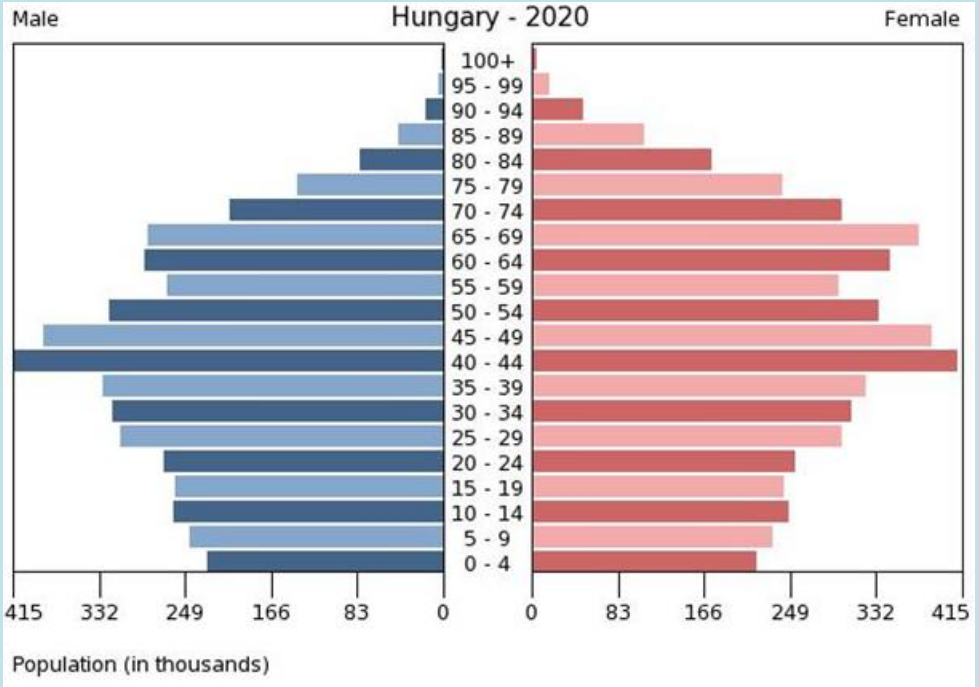


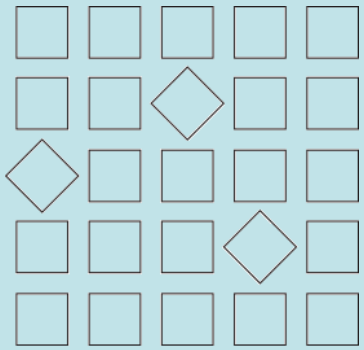
European Commission

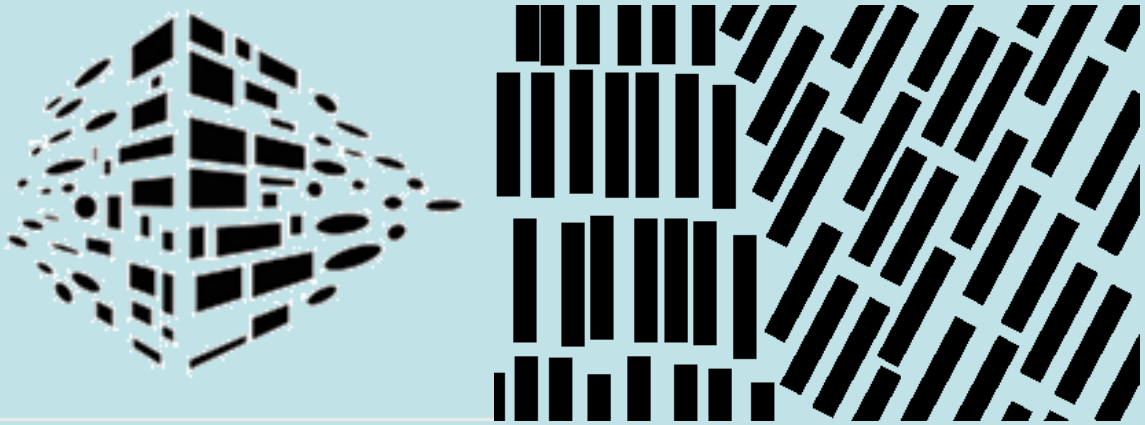
Gestalt principles

Law of Common fate

Visual elements moving in the same direction are perceived as being related to each other more than being related with others stationary or moving in a different direction.

Images can also relate to similarity by shape.





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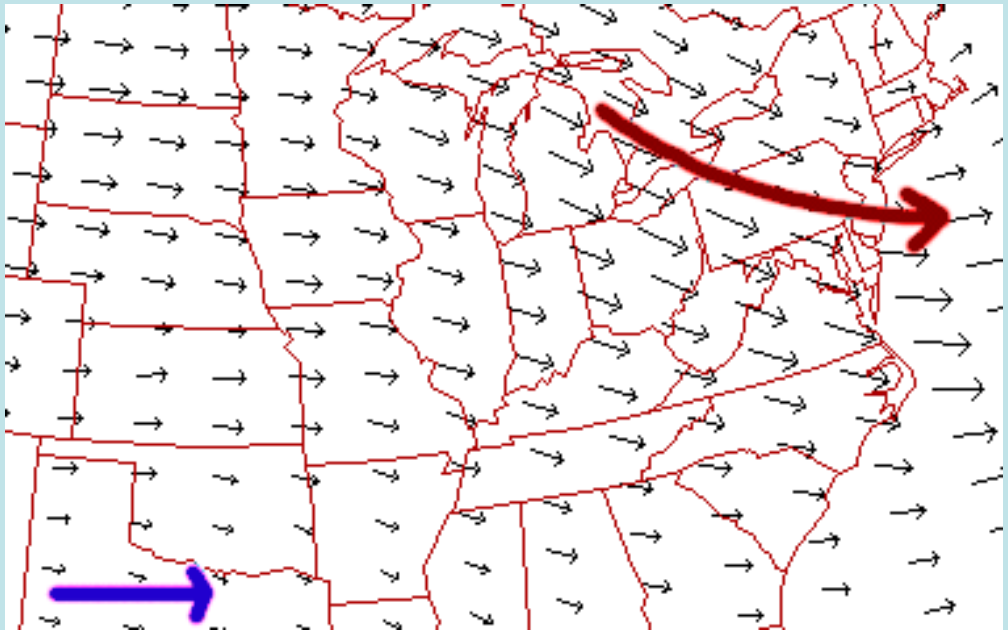

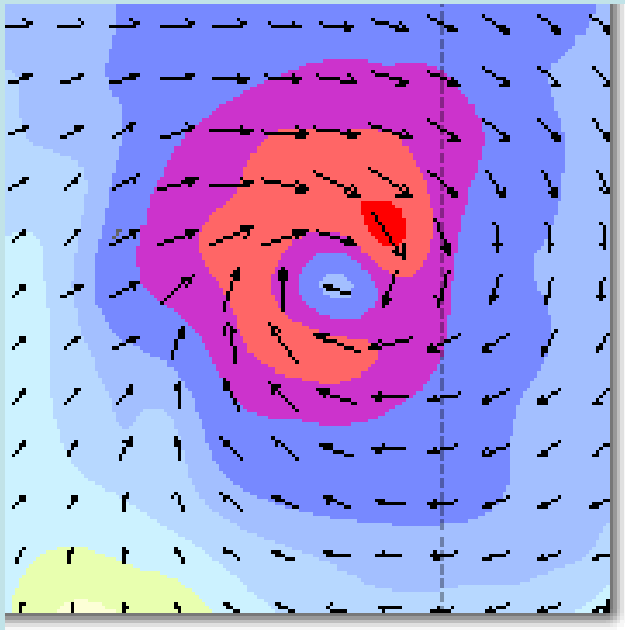

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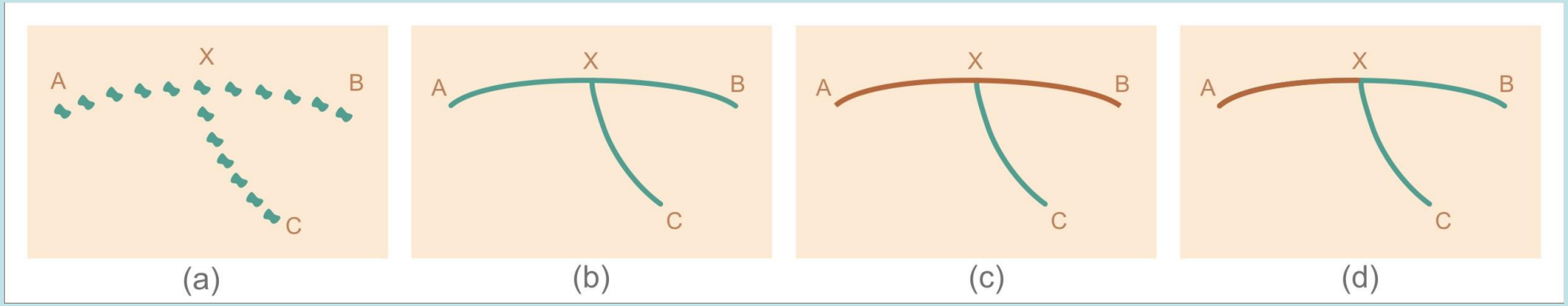
Gestalt principles

Law of Continuity

Elements tend to be grouped together if they are aligned within an object.

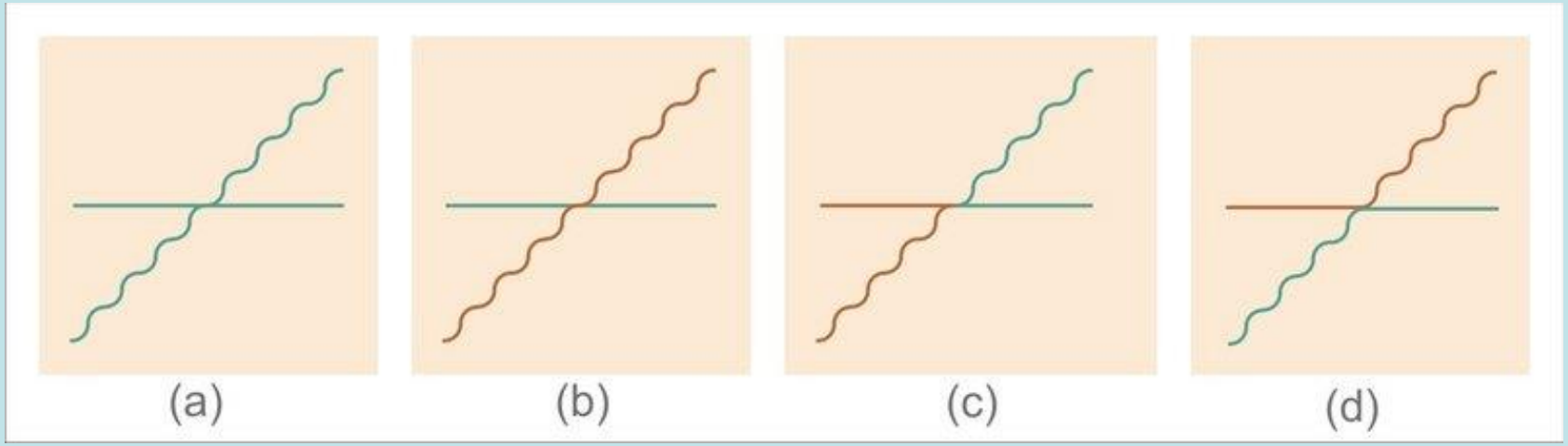


Gestalt principles

Law of Good Gestalt

Objects tend to be perceptually grouped together if they form a pattern that is regular, simple and orderly.

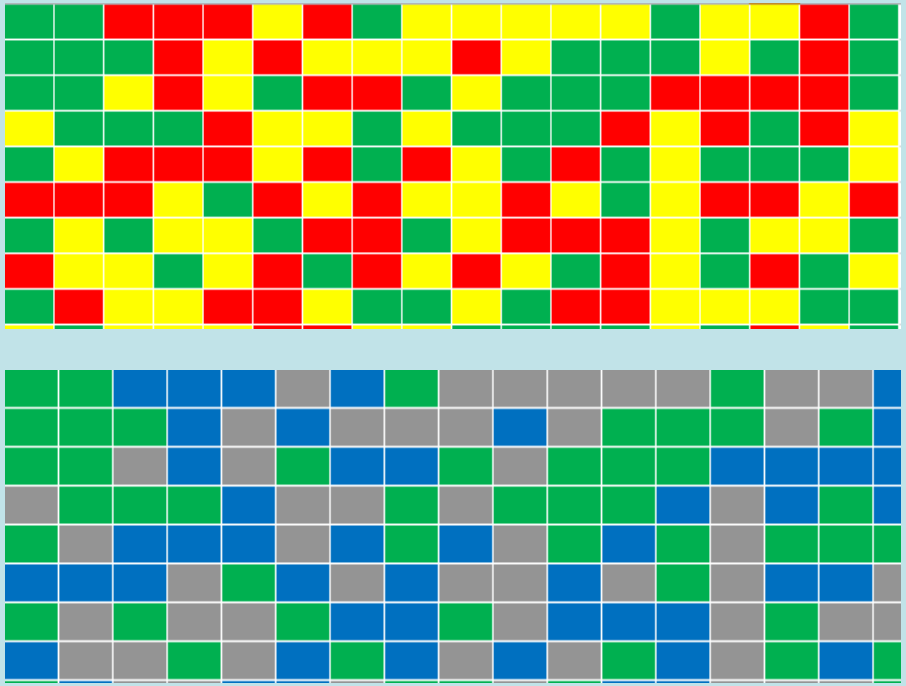
It means that as individuals perceive the world, they eliminate complexity and unfamiliarity so they can observe a reality in is most simplistic form.

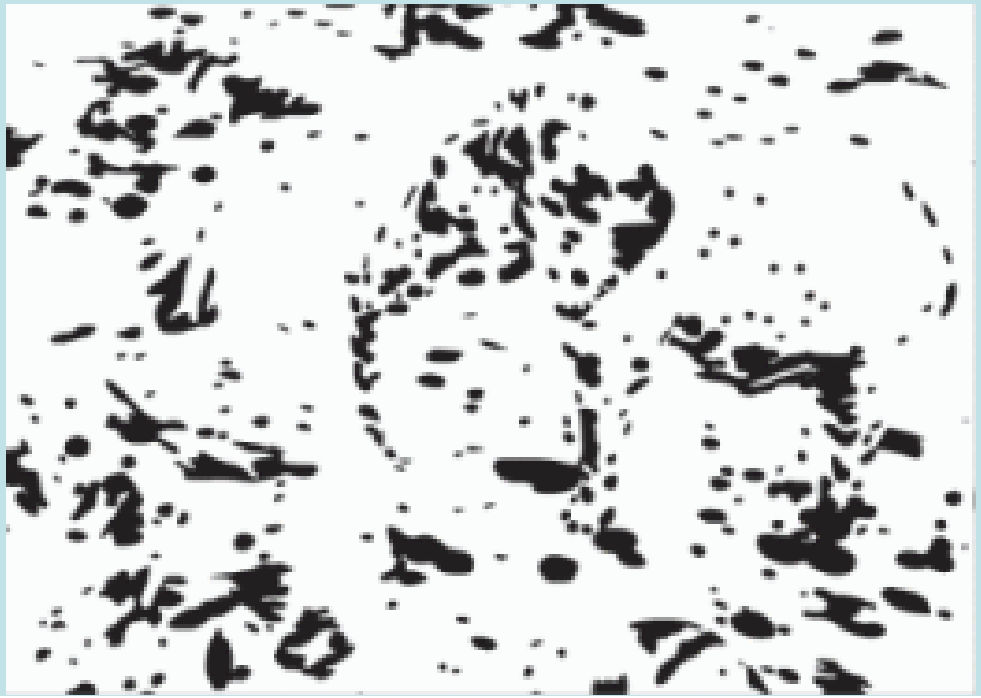


Gestalt principles

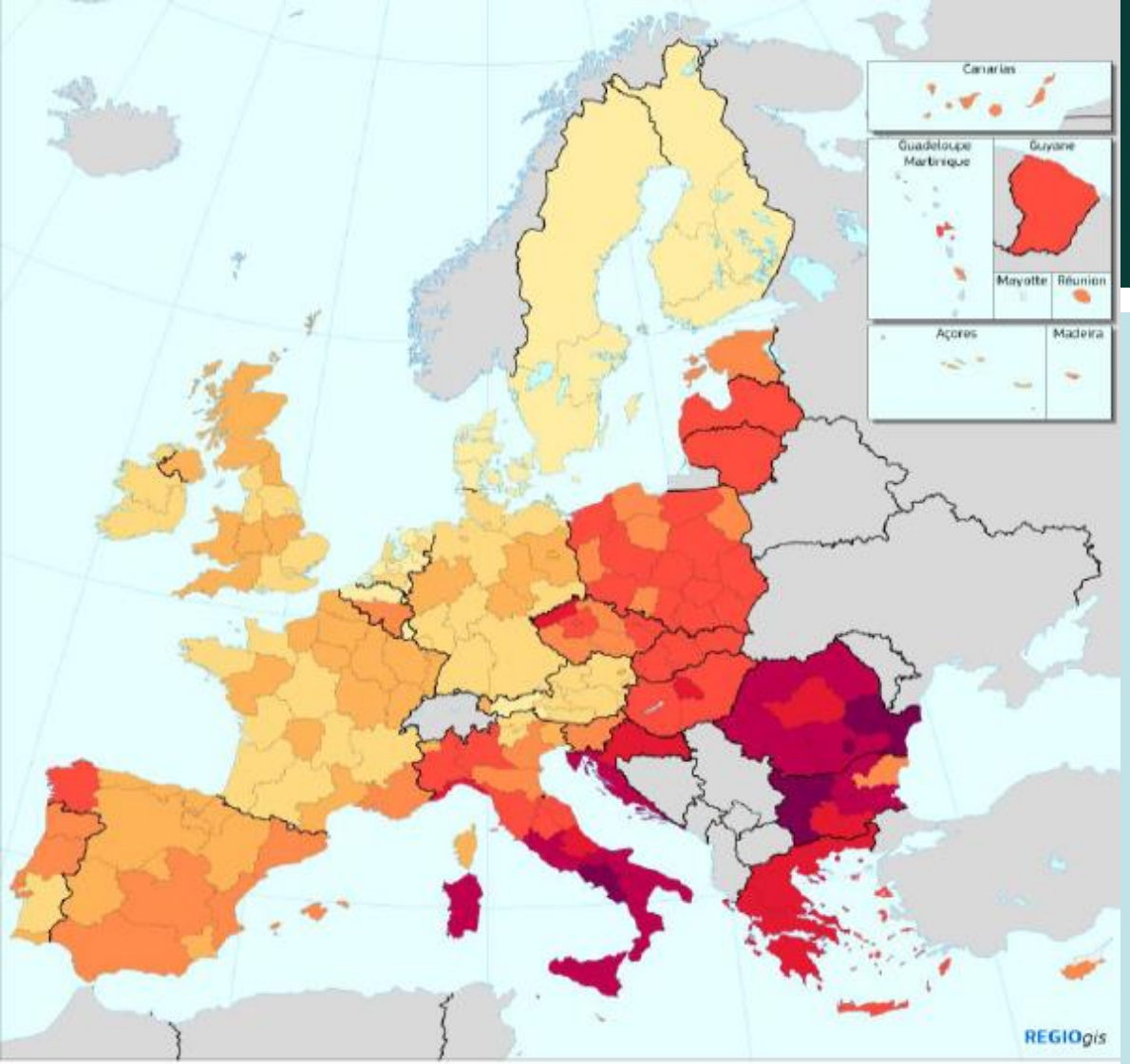
Law of Past experience (isomorphic correspondance)

Under some circunstances, visual stimuli are categorized according to past experience





Gestalt principles

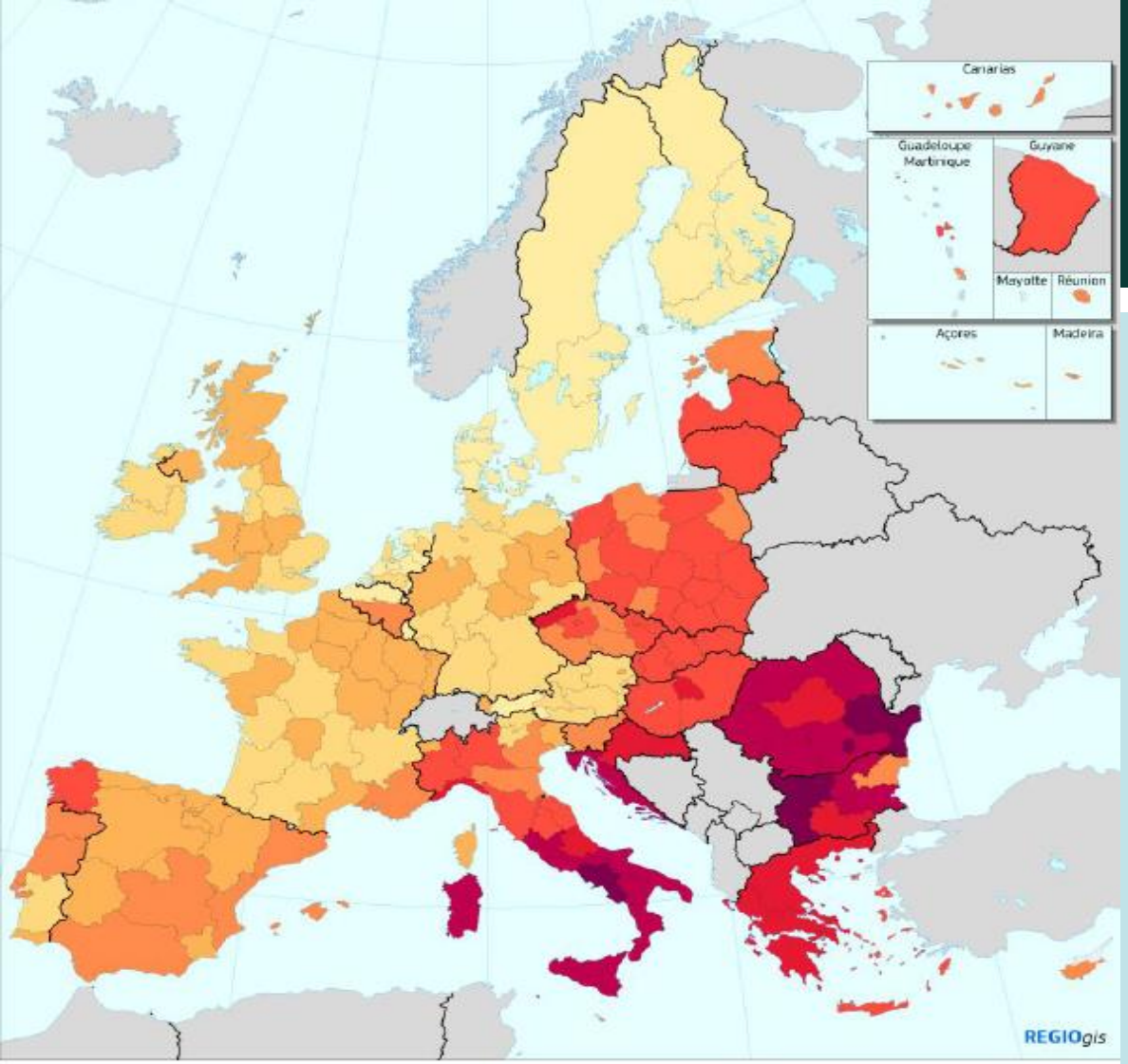


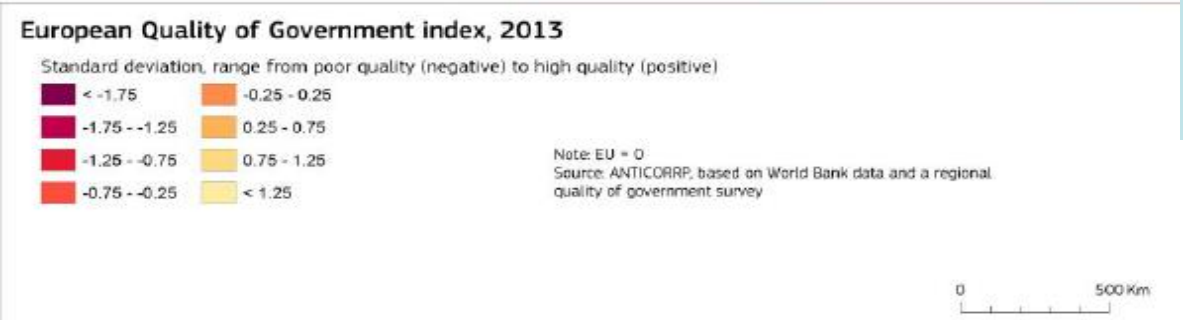
European Quality of Government index, 2013

Quality of Government

- *First published in 2010 as a working paper*
- *Picked up by academic research*
- *Financed for 2013 update through FP7*
- *Included in the Cohesion Report*
- *One of the pillars of the Cultural and Creative Cities Monitor*

Gestalt principles





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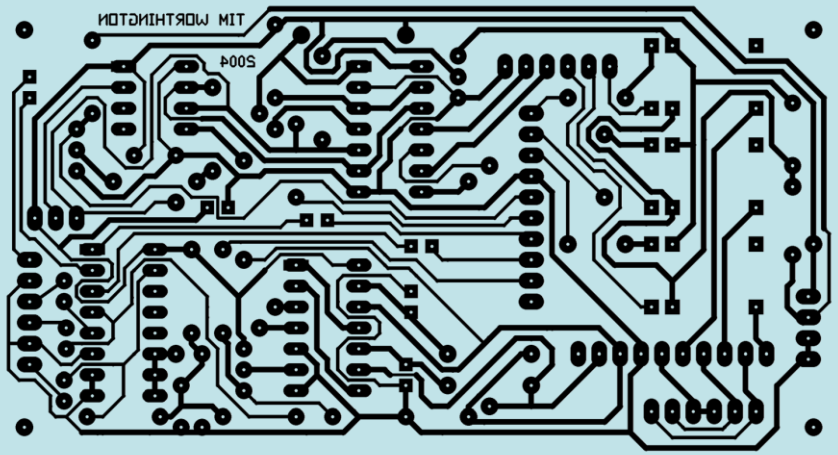
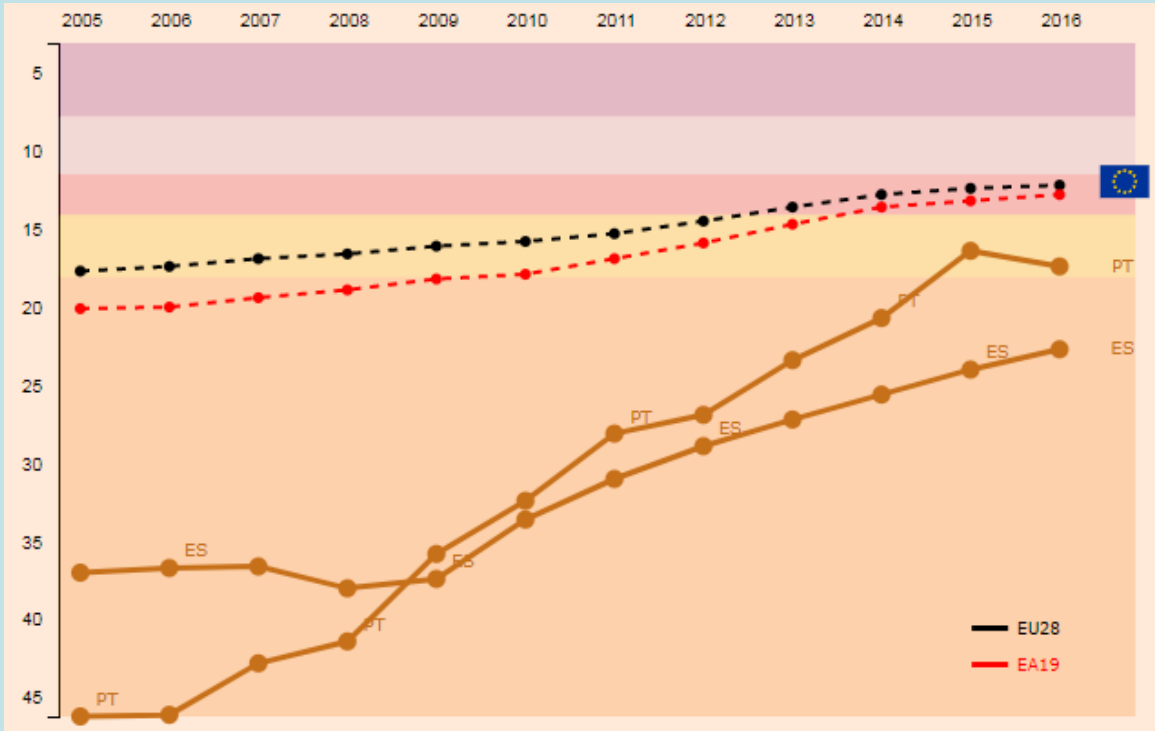
European Commission

Gestalt principles

Law of Uniform connectedness

Elements that are visually connected are perceived as more related than elements with no connection.



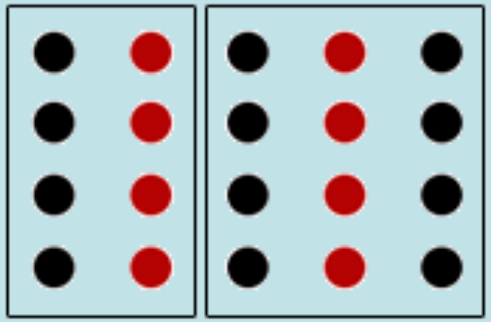


European Commission

Gestalt principles

Law of Common regions

Elements are perceived as part of a group if they are located within the same closed region.



Gestalt principles

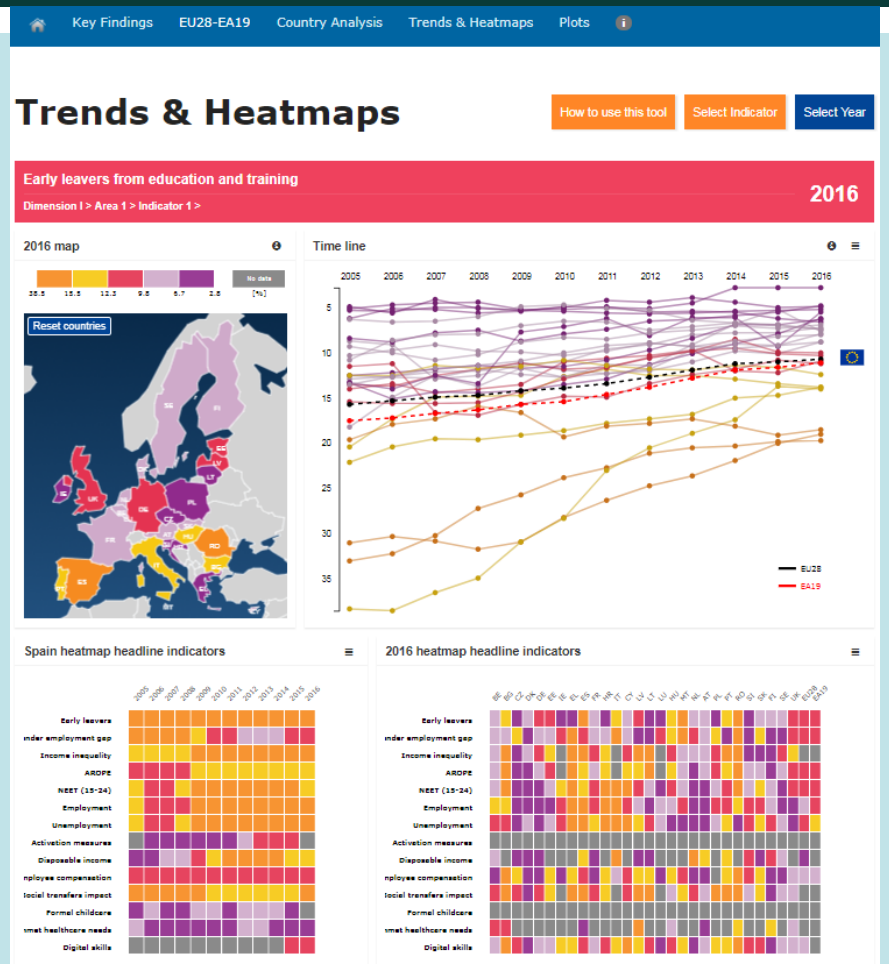
Law of Common regions

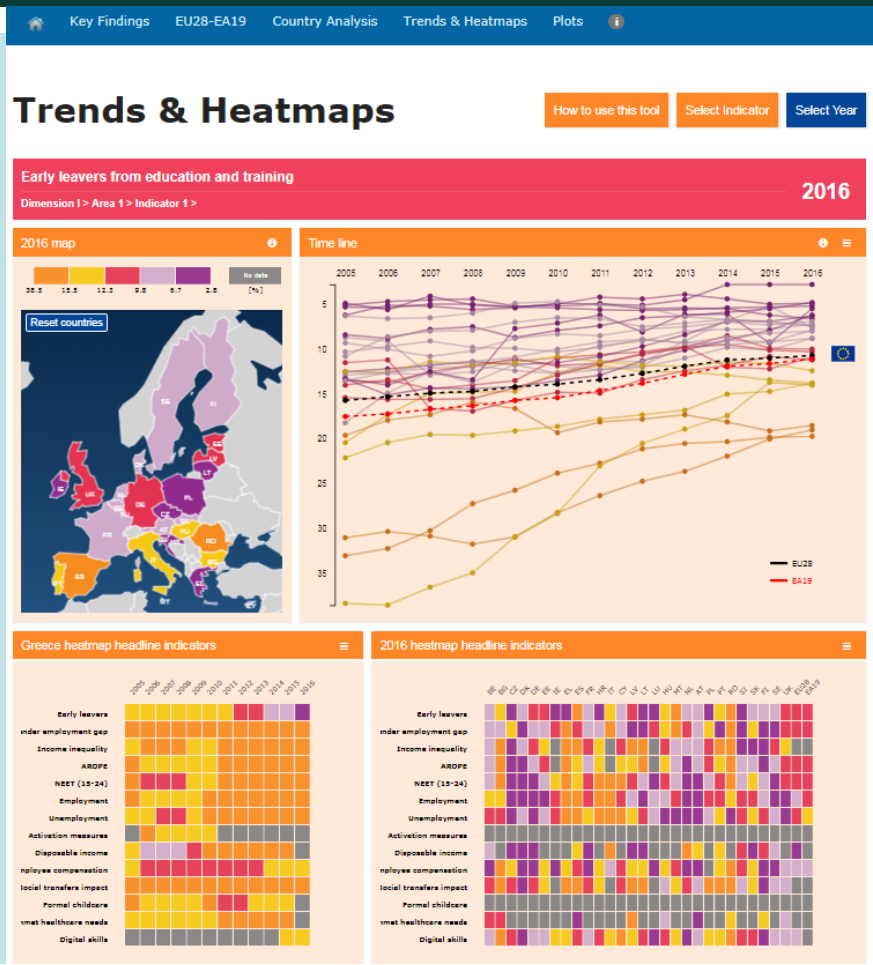
Visual perception: 1 section containing many different elements

Visual perception: 1 section containing 3 groups of metrics

Gestalt principles

Law of Common regions

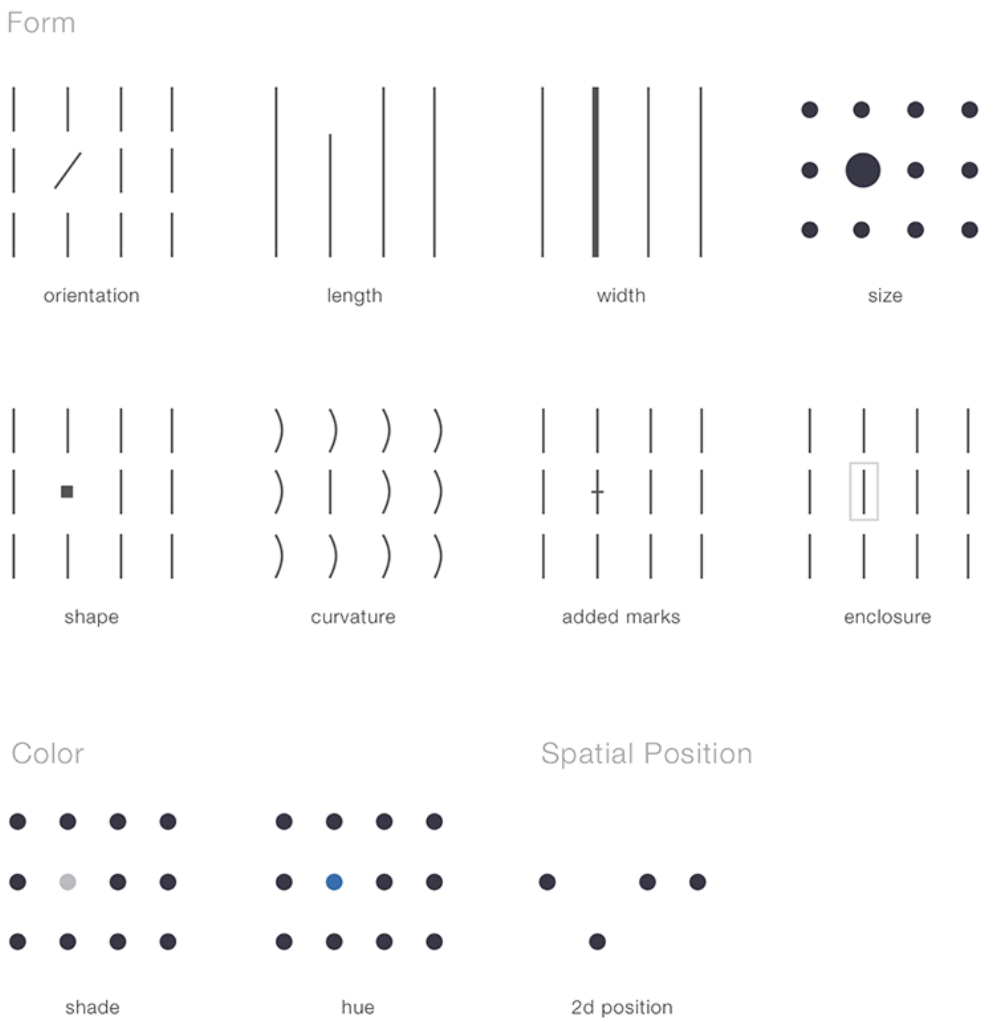




https://composite-indicators.jrc.ec.europa.eu/social-scoreboard

European Commission

Preattentive attributes



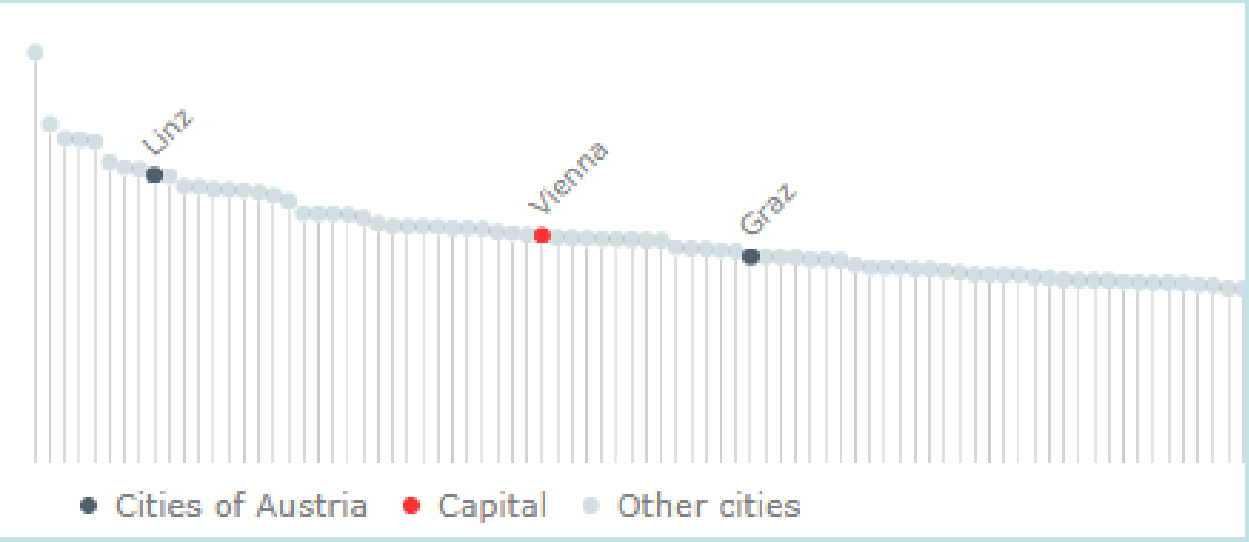
Used in data visualization to quickly focus the readers view on the most important point of information

Preattentive attributes - examples

Cultural and Creative Cities Monitor

Rank – Country page

Preattentive attributes: Length/position and hue



Social scoreboard – Country Analysis

Preattentive attributes: Position, hue, enclosure + connectedness

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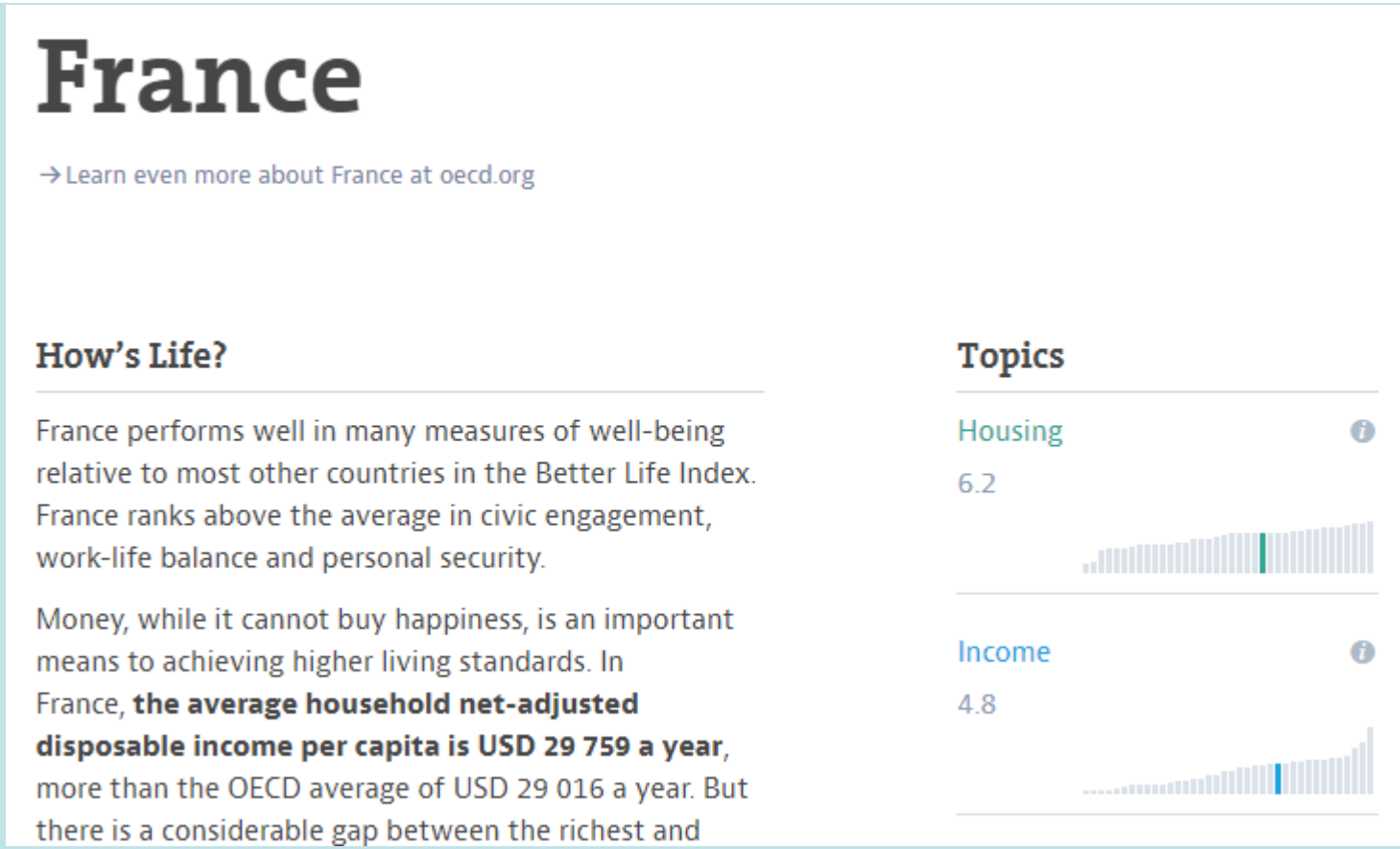
Preattentive attributes - examples

OECD Better Life Index

Preattentive attributes: hue



France

→Learn even more about France at oecd.org

How's Life?

France performs well in many measures of well-being relative to most other countries in the Better Life Index. France ranks above the average in civic engagement, work-life balance and personal security.

Money, while it cannot buy happiness, is an important means to achieving higher living standards. In France, **the average household net-adjusted disposable income per capita is USD 29 759 a year**, more than the OECD average of USD 29 016 a year. But there is a considerable gap between the richest and

Topics

Housing

6.2

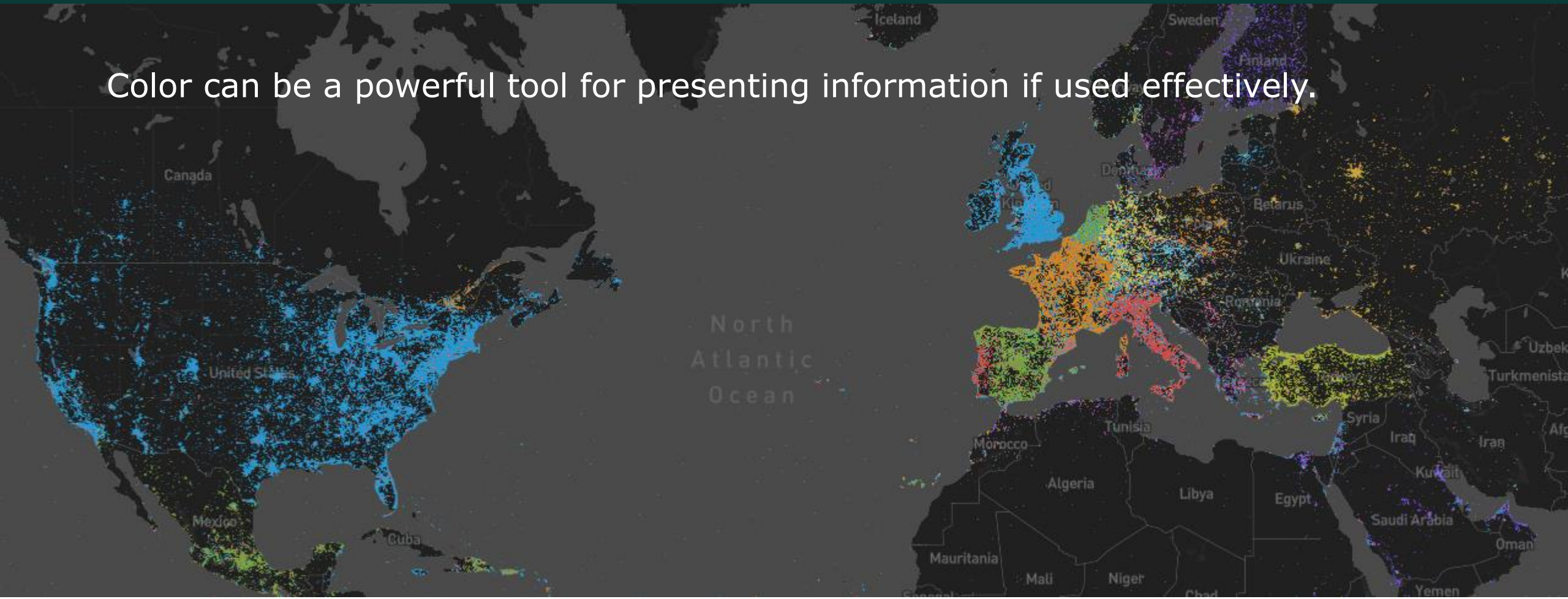
Income

4.8

http://www.oecdbetterlifeindex.org/countries/france/

Color

Color can be a powerful tool for presenting information if used effectively.



https://www.mapd.com/demos/tweetmap/

European Commission

Color

Used innefectively, it can be a tool for disaster

- Capital regions are closer to the Europe 2020 targets
- Performance of less developed regions crucial for Europe 2020
- High and low poverty road to development
- Quality of government varies dramatically within countries

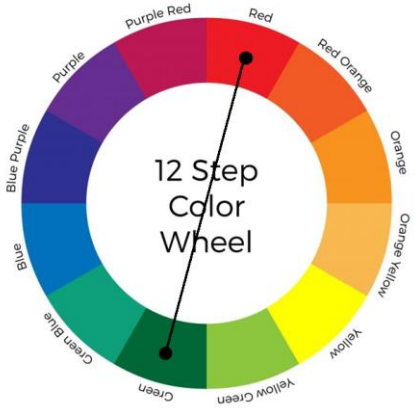
Color

Some tips for choosing colors:

- Limit color usage (less is more) – good chromatic harmony can be achieved with 3 or 4 different colors.
- Readability is fundamental – Enough contrast between background and figure.
- Tints, tones and shades.
- Allow for white space.
- Strategic use of colors to highlight important messages.
- Keep cultural color meanings in mind.
- Consistence use of colors and styles throughout the medium.

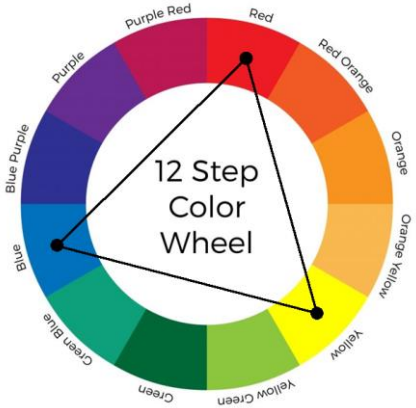
Color Schemes

Complementary



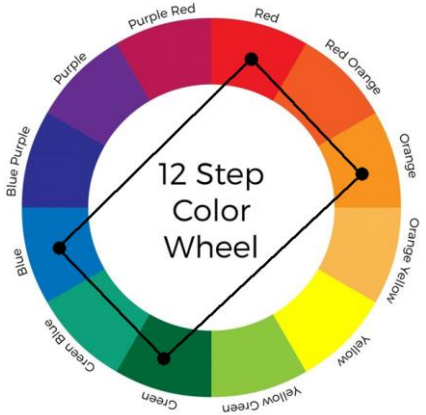
Opposite to each other on the colorwheel

Triadic



Three colors evenly space around the colorwheel

Tetradic

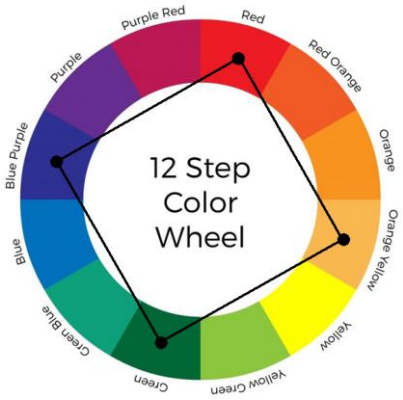


Four colors arranged into two complementary pairs

Analogous

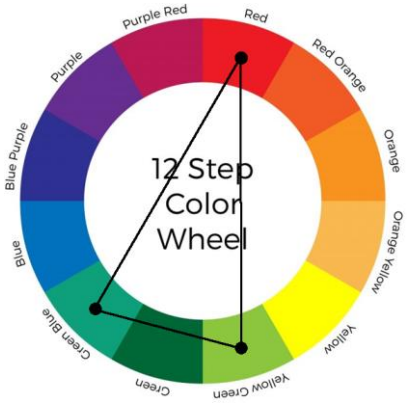
Next to each other in the color wheel

Square



Four colors evenly space around the colorwheel

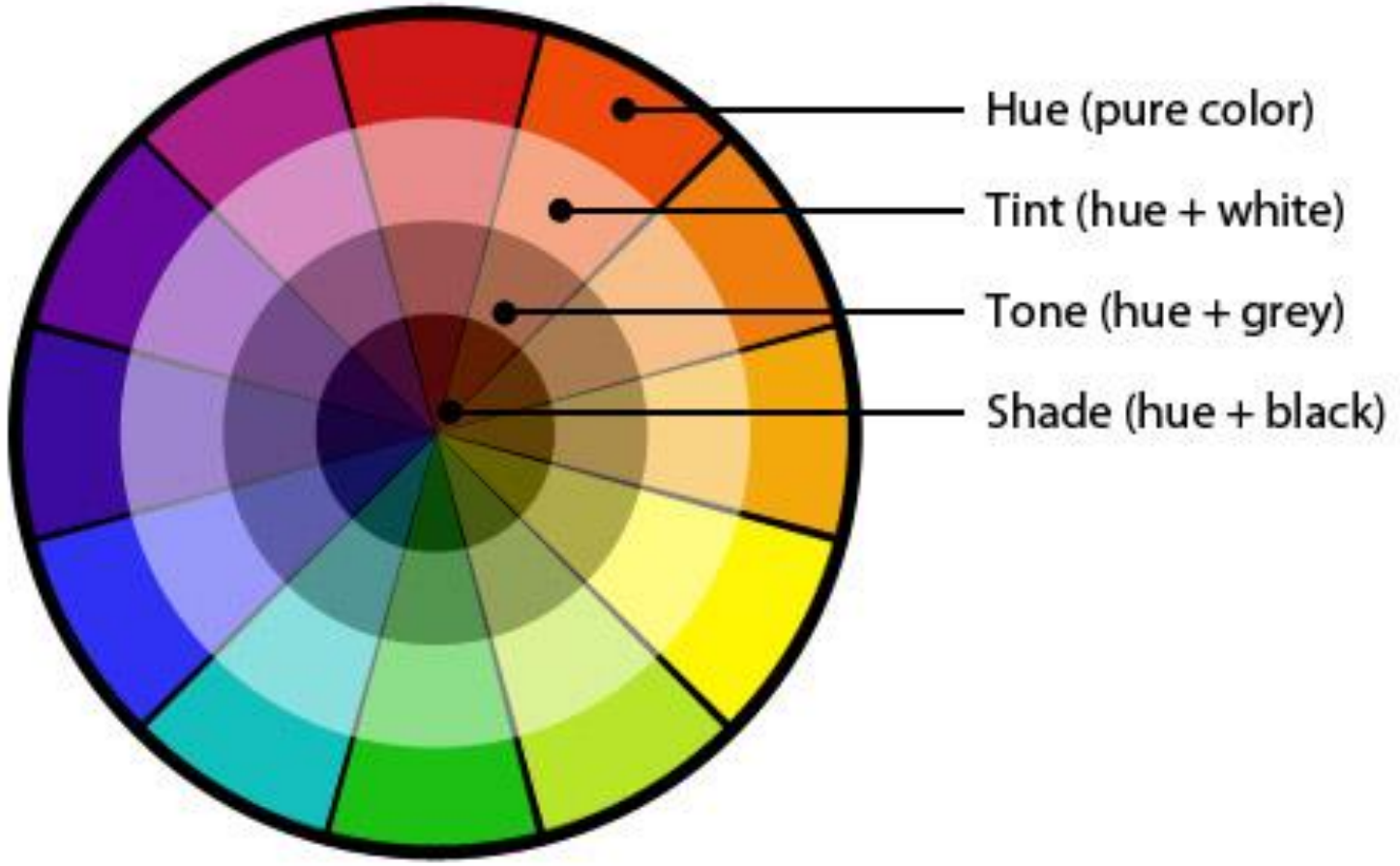
Split complementary



Base color plus the two colors adjacent to it’s complement

European Commission

Color Variations

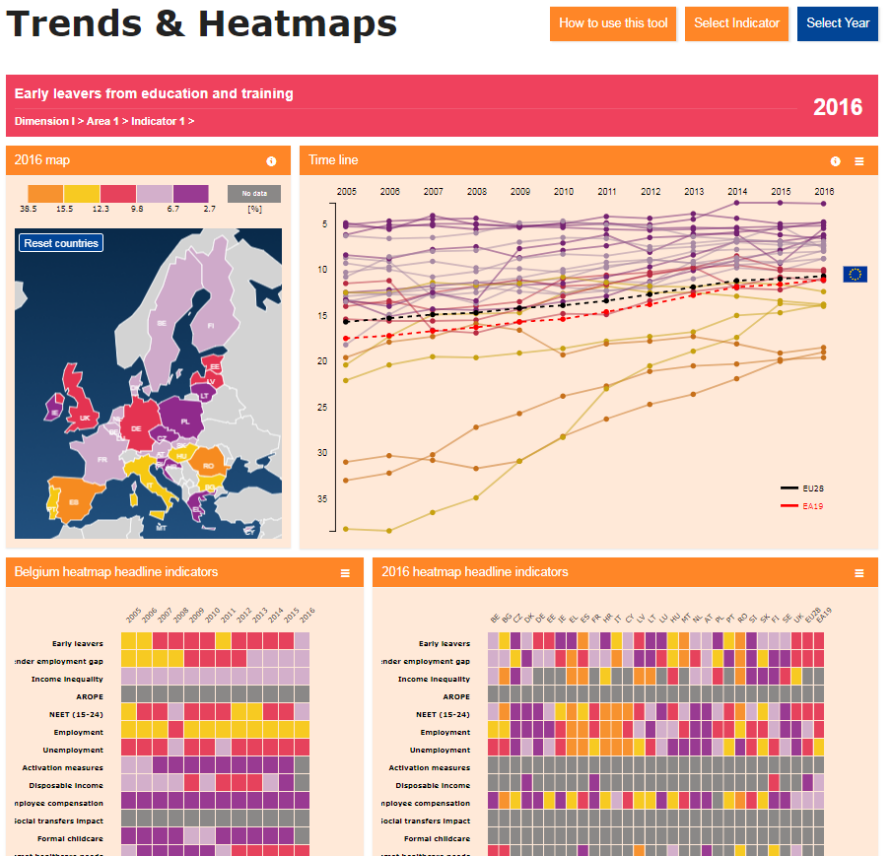


Color issues – don’t forget the 10%

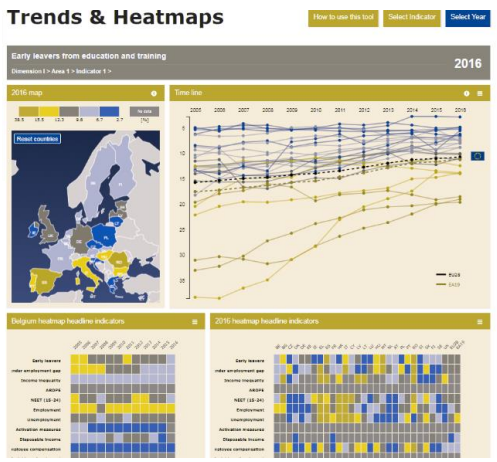
- Color vision deficiency (CVD) affects approximately 8% of men (1 in 12 men) and 0.5% of women (1 in 200 women)
- Which means some people in the audience is affected by it (and some may even not aware).
- Make the test here: http://www.color-blindness.com/ishihara-38-plates-cvd-test/#prettyPhoto
- The most common form is called red-green color blindness and is encoded in the x-chromosome.

Source: http://www.color-blindness.com/

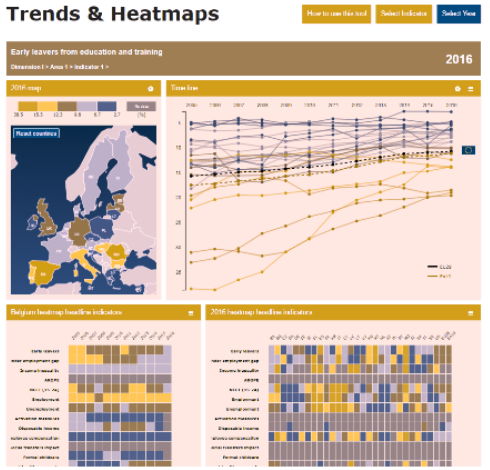
Color issues Social Scoreboard



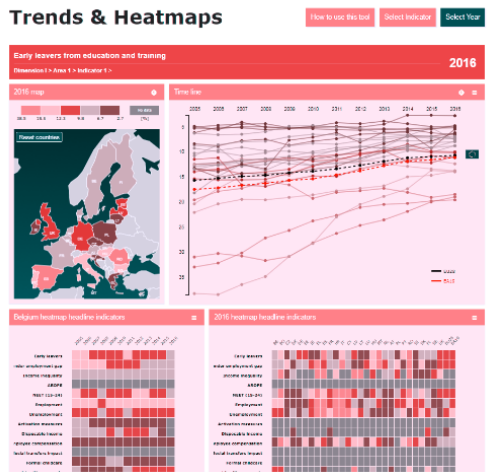
Red-blind (1.3%M/0.02%W)



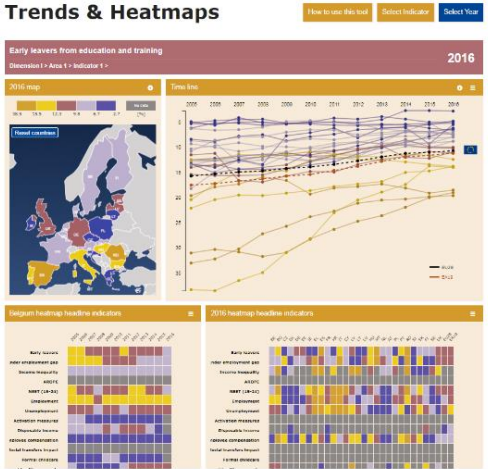
Green-blind (1.3%M/0.01%W)



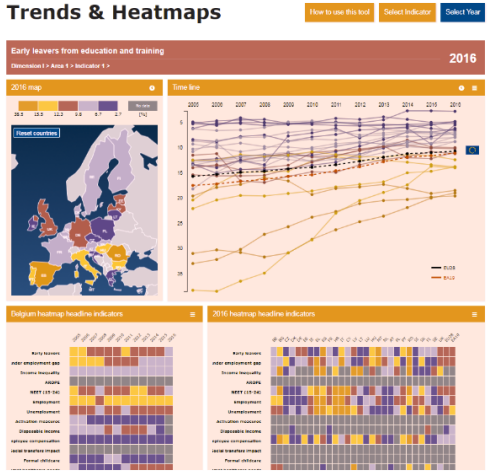
Blue-blind (0.001%M/0.03%W)



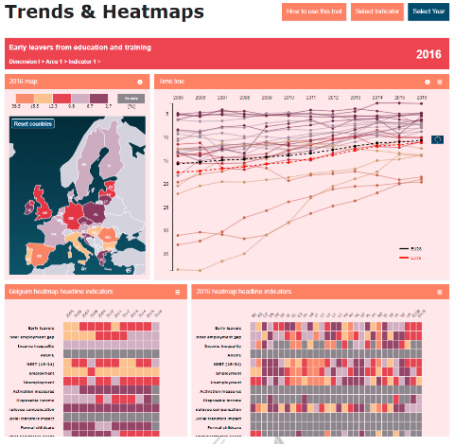
Red-weak (1.3%M/0.02%W)



Green-weak (5%M/0.35%W)



Blue-weak (0.02%M/0.01%W)



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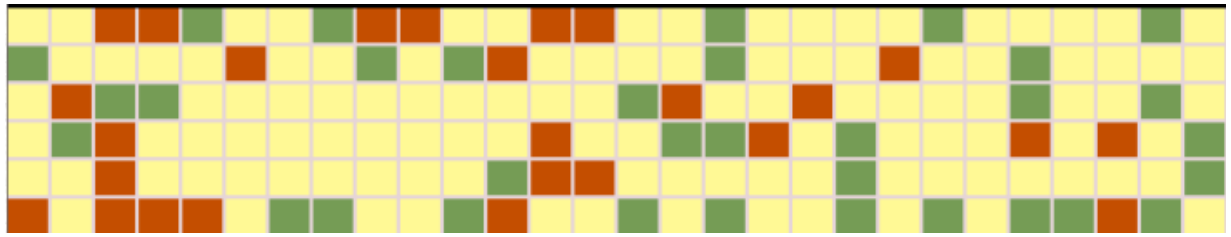
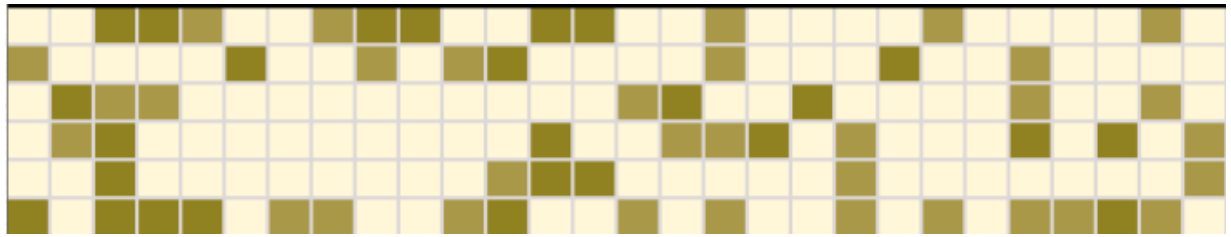
Color issues Heatmap

Normal view

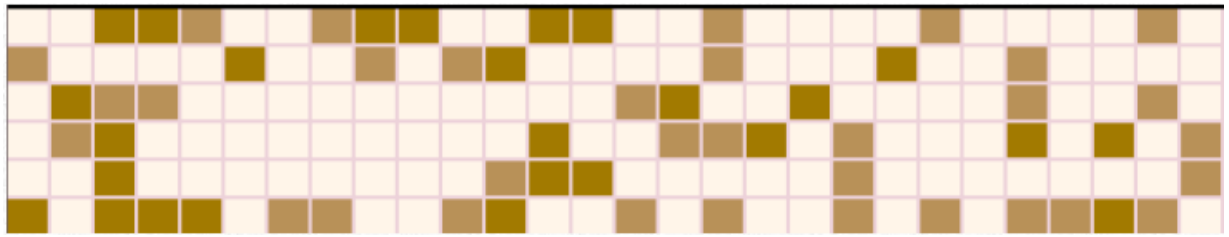
Green-weak
(5%M/0.35%W)



Red-blind
(1.3%M/0.02%W)

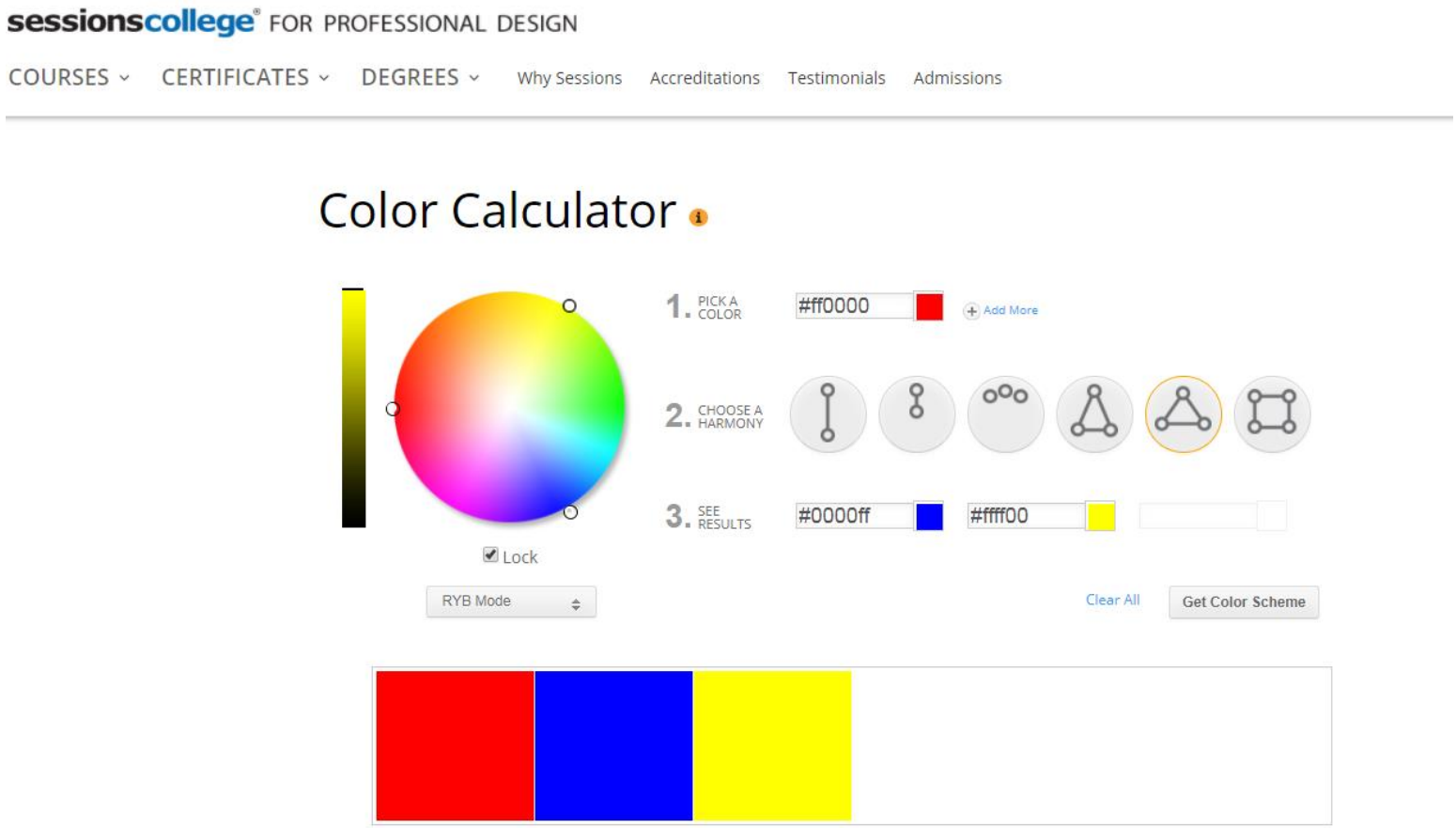


Green-blind
(1.3%M/0.01%W)



Color tools

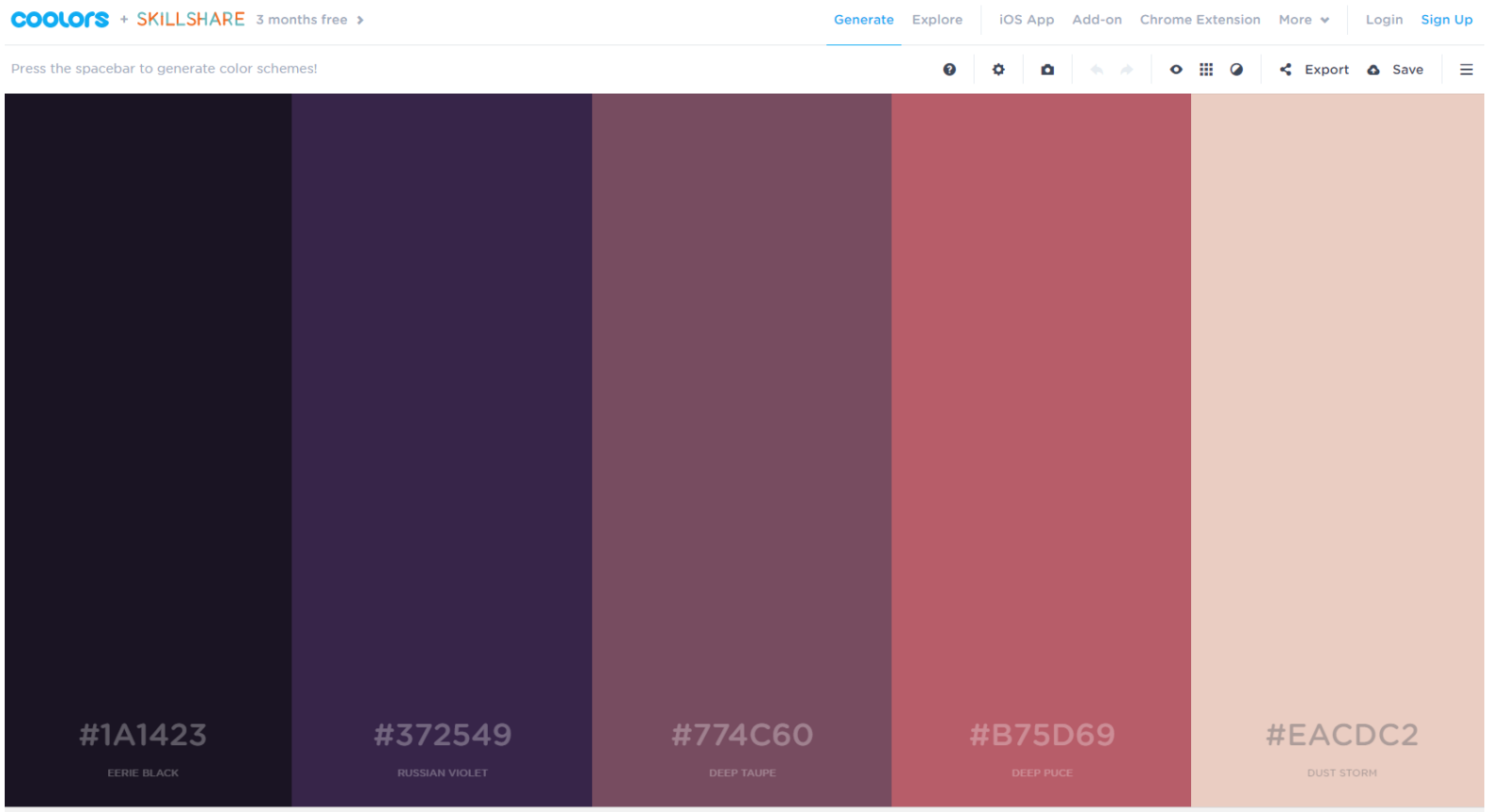
https://www.sessions.edu/color-calculator/



European Commission

Color tools

https://www.coolors.co/app



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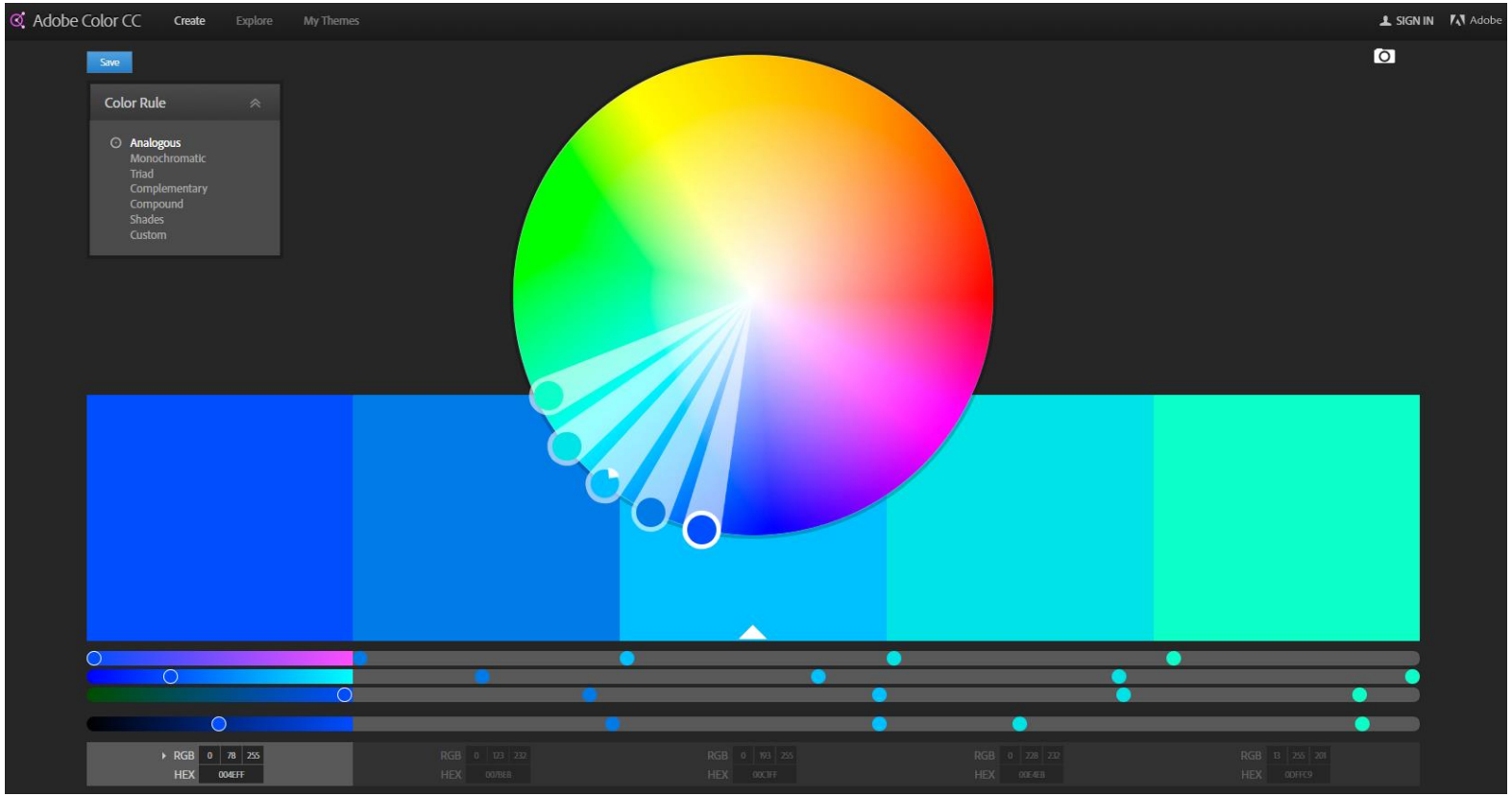
Color tools

https://color.adobe.com



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Color tools

http://colorbrewer2.org/#type=diverging&scheme=RdBu&n=5

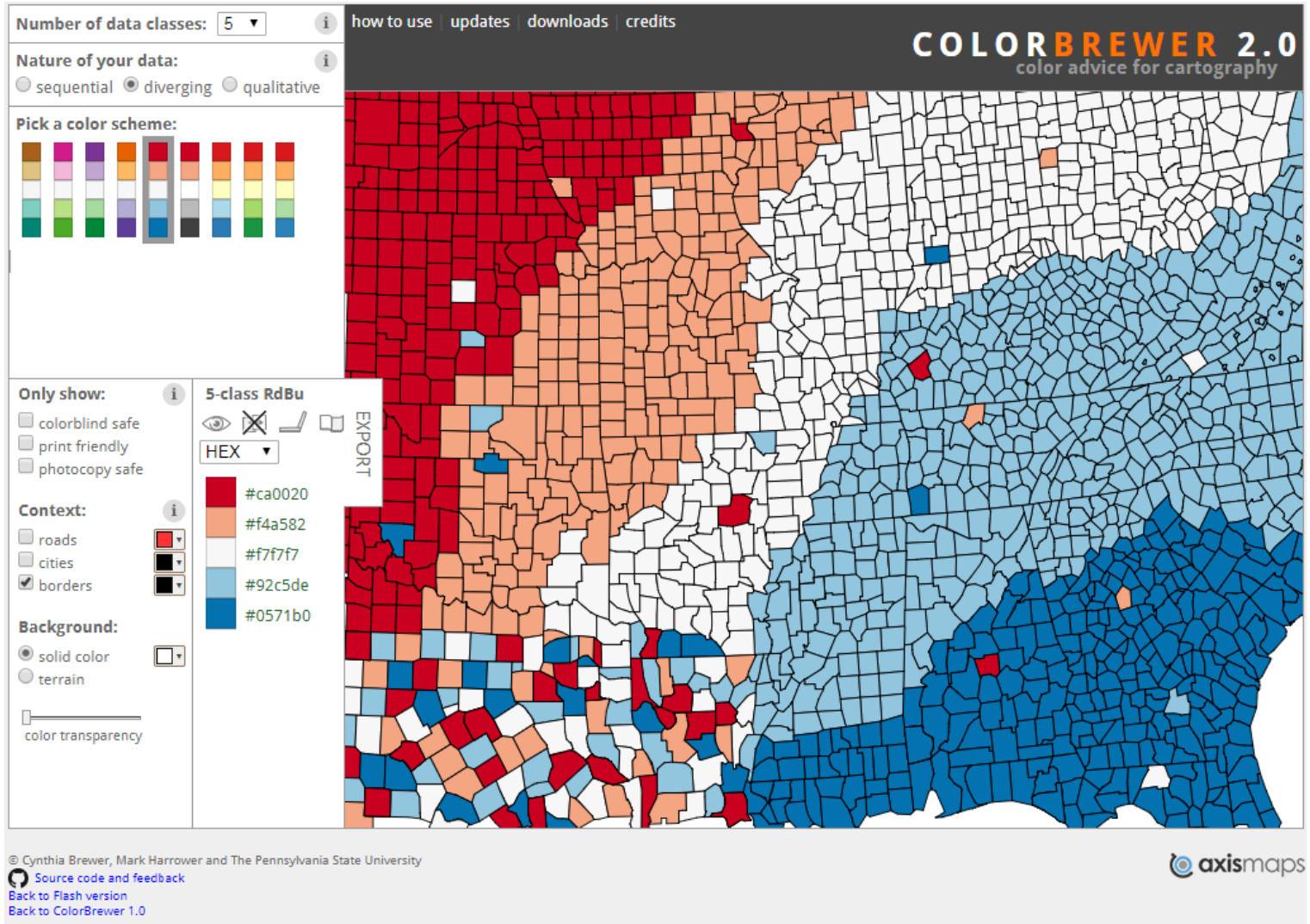

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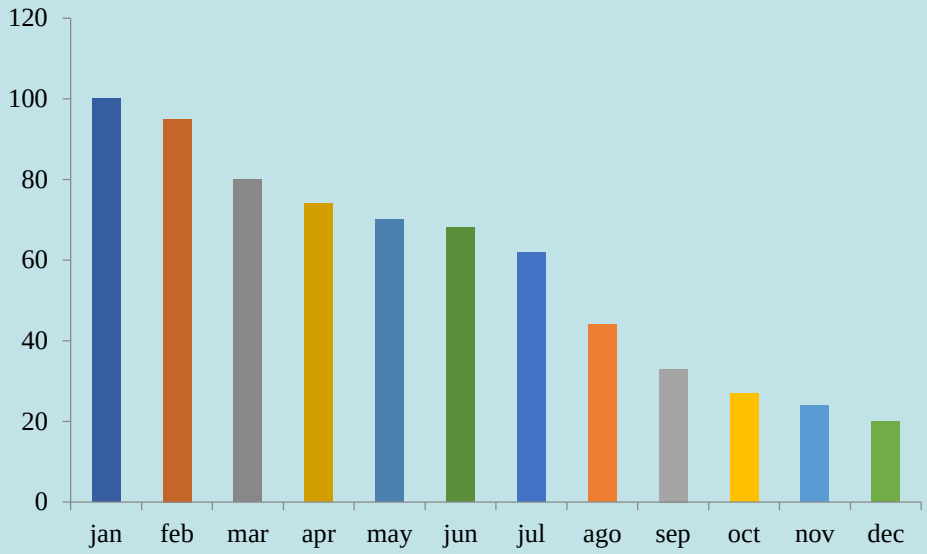
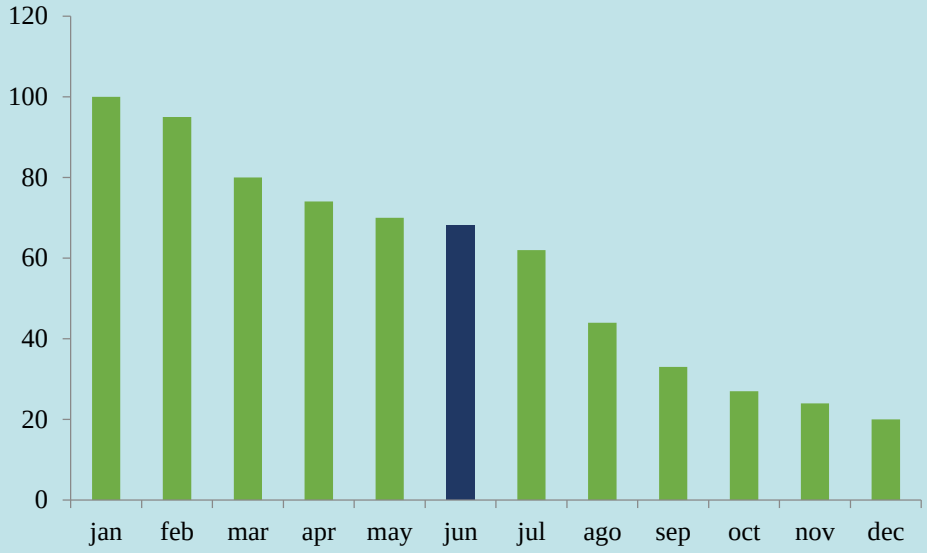
Chart examples bad vs good

Highlight what's important

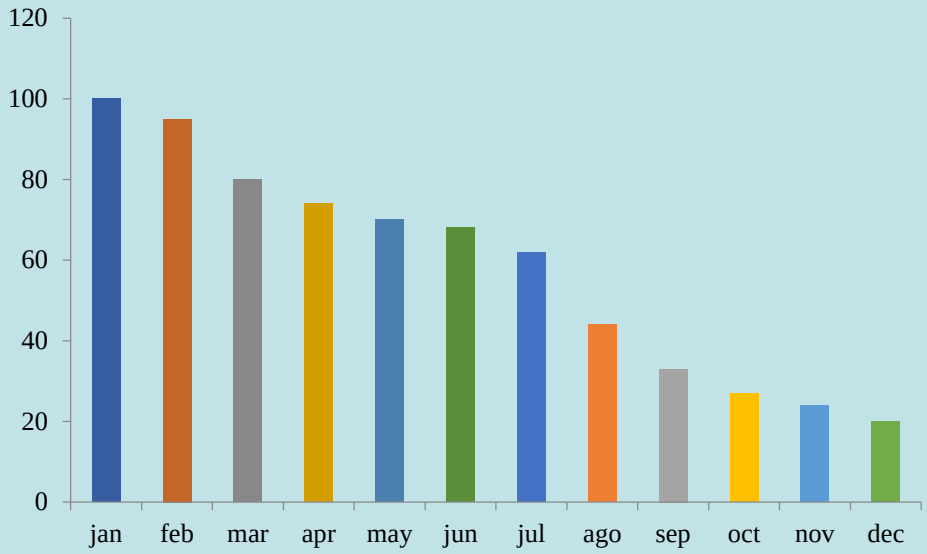




European Commission

Chart examples bad vs good

Highlight what's important



Is it ok?

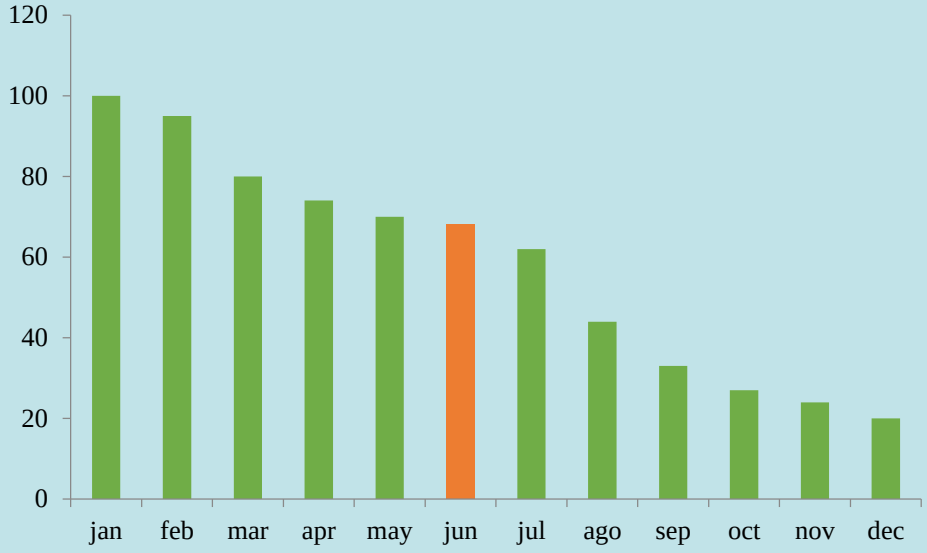


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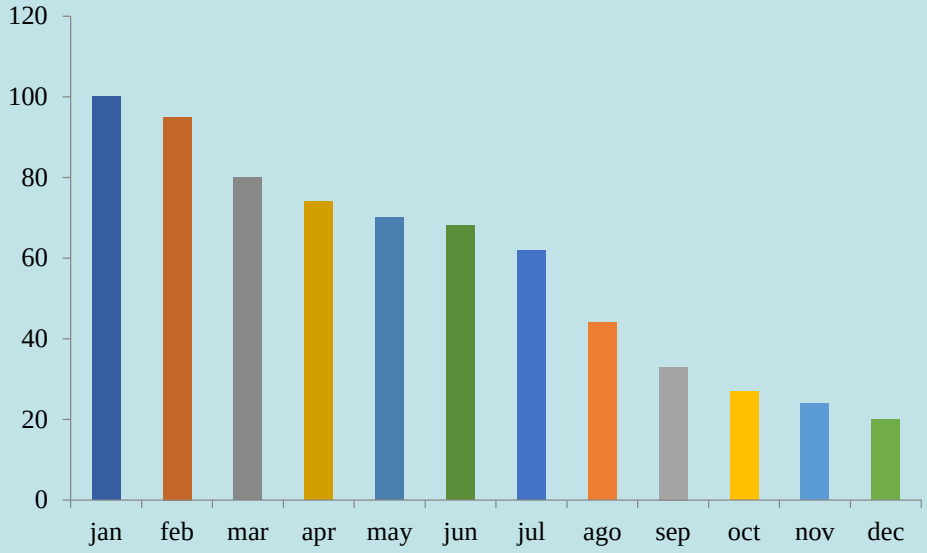
Chart examples bad vs good

Highlight what's important



... not color blind friendly (Red-blind simulation)

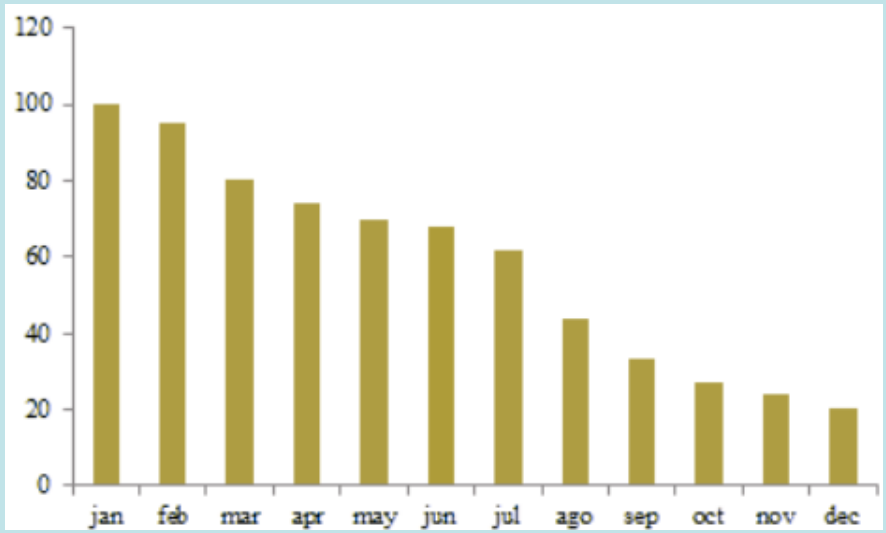


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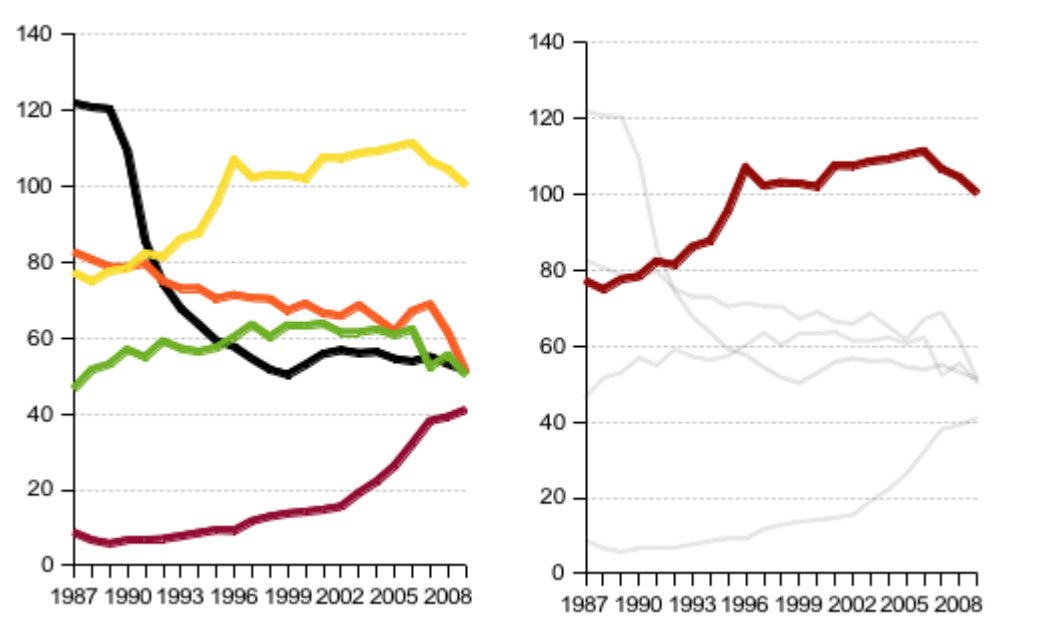
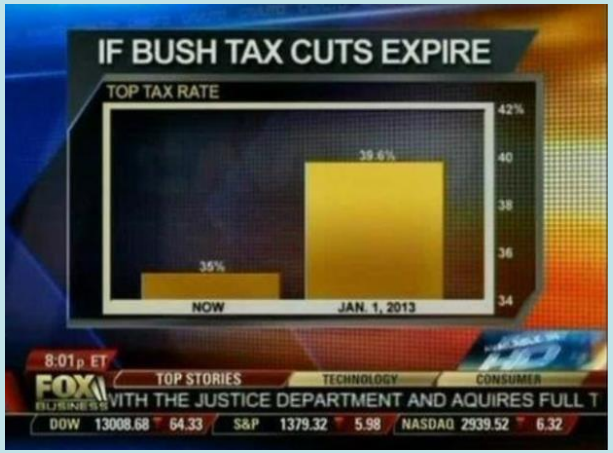
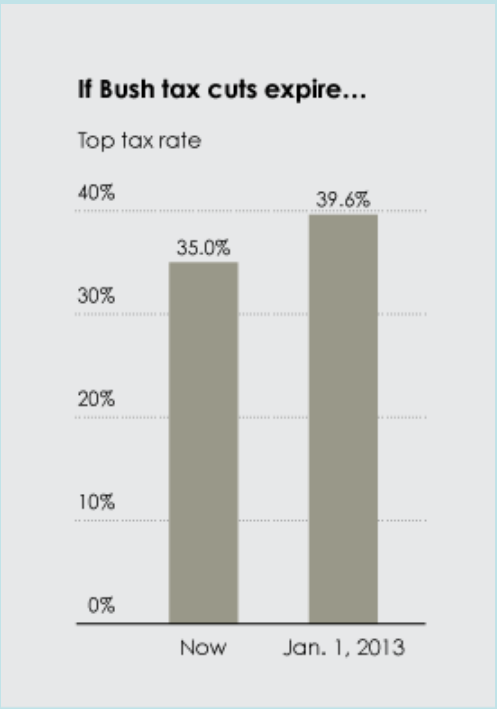
Chart examples bad vs good

Highlight what's important



Start from zero (and keep it simple)





Source: https://guides.library.duke.edu/datavis/topten

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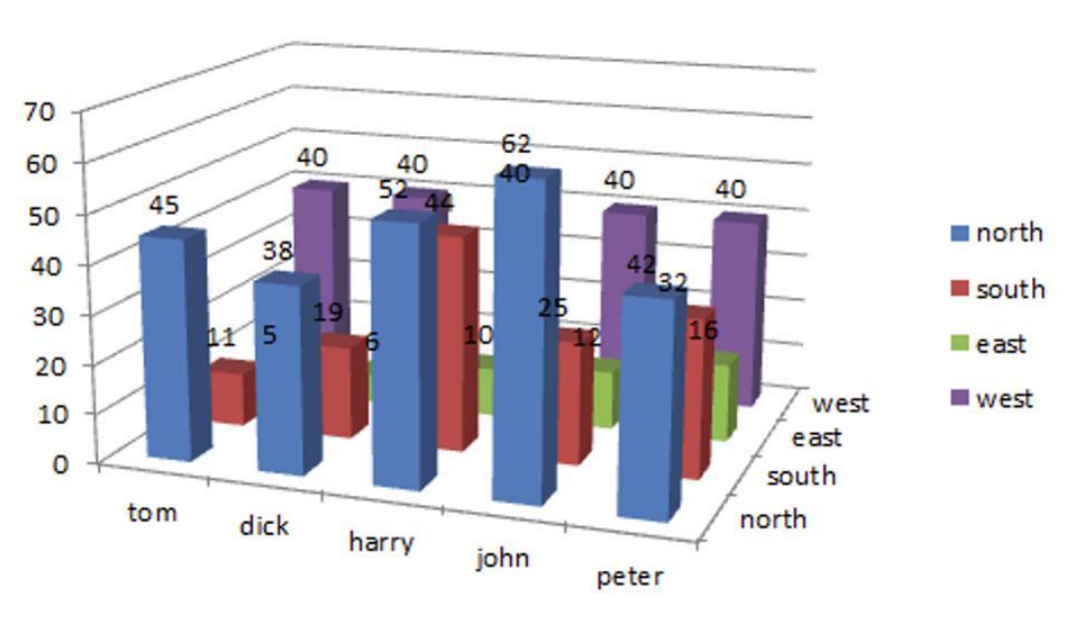
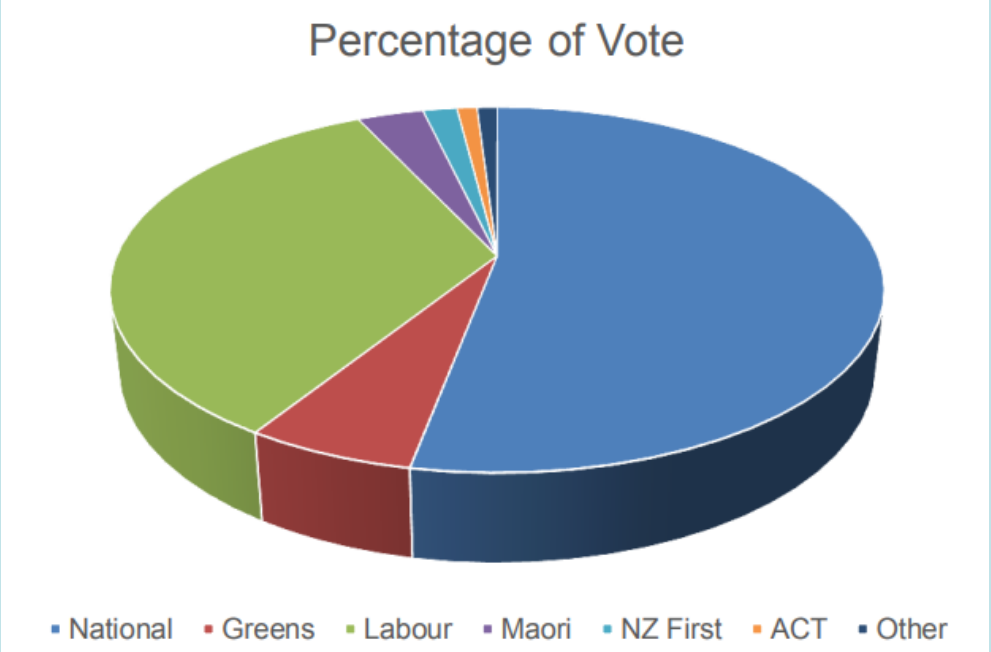
Chart examples bad vs good

Don’t use 3d



Avoid pie charts (specially in 3D)



Source: https://guides.library.duke.edu/datavis/topten

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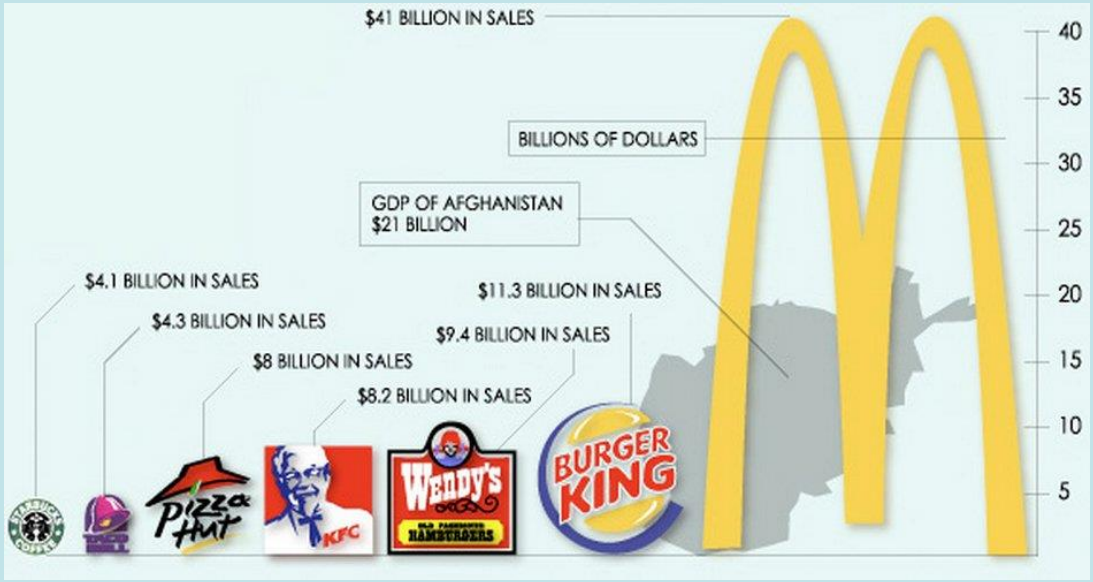
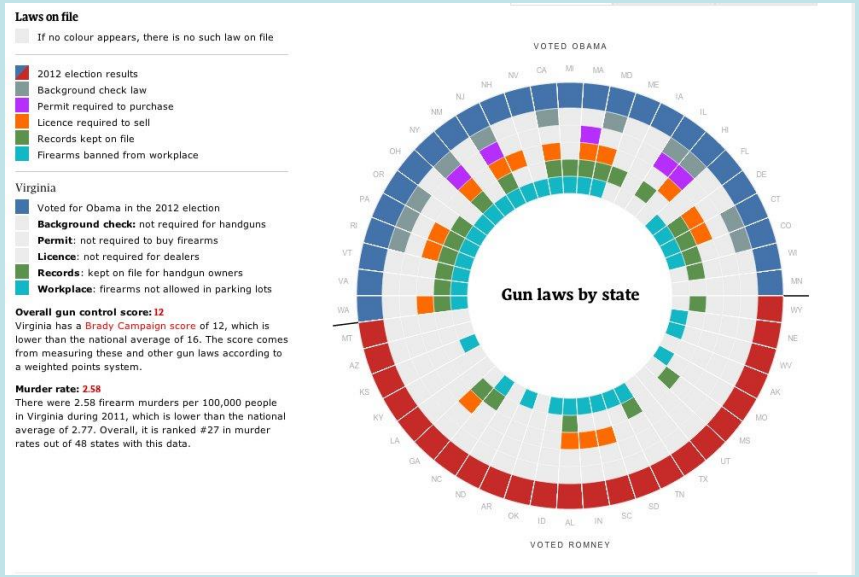
Chart examples bad vs good

Avoid comparing areas (even when the charts make sense)



Keep it simple
(sometimes a table is better to convey information)



Source: https://guides.library.duke.edu/datavis/topten

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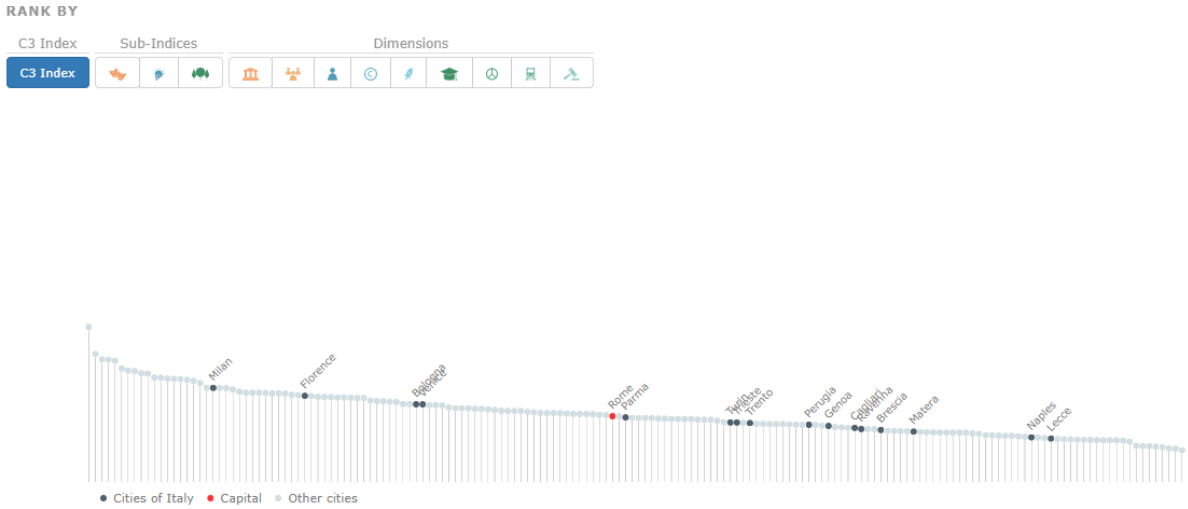
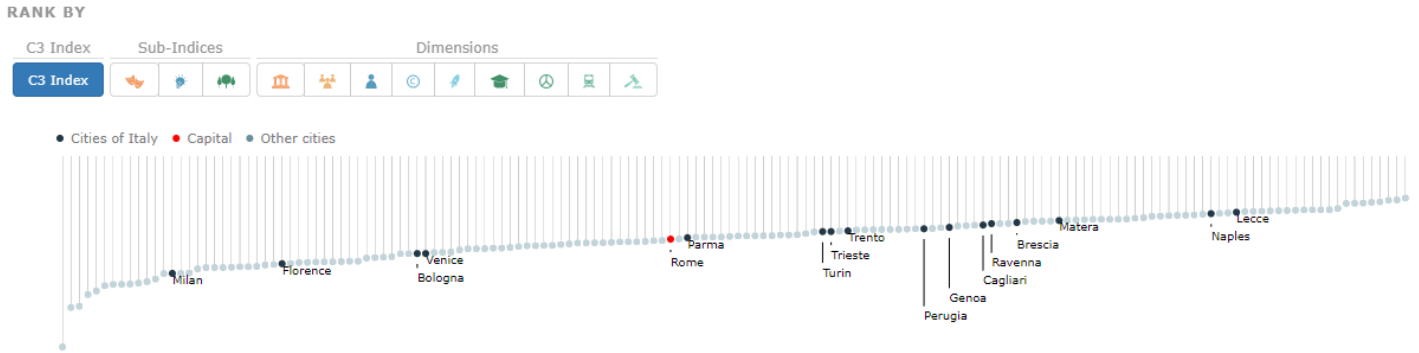
Chart examples bad vs good

C3 monitor country page – cities rank



Possible alternative



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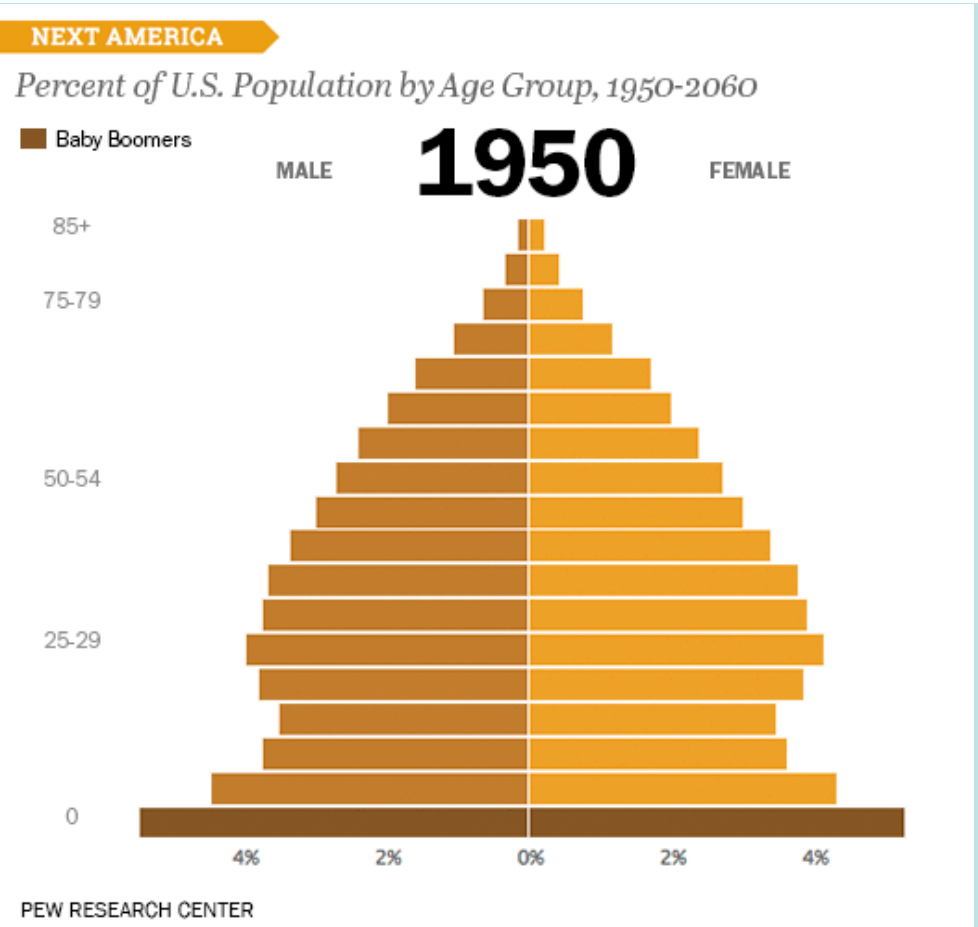
Interactive data visualization



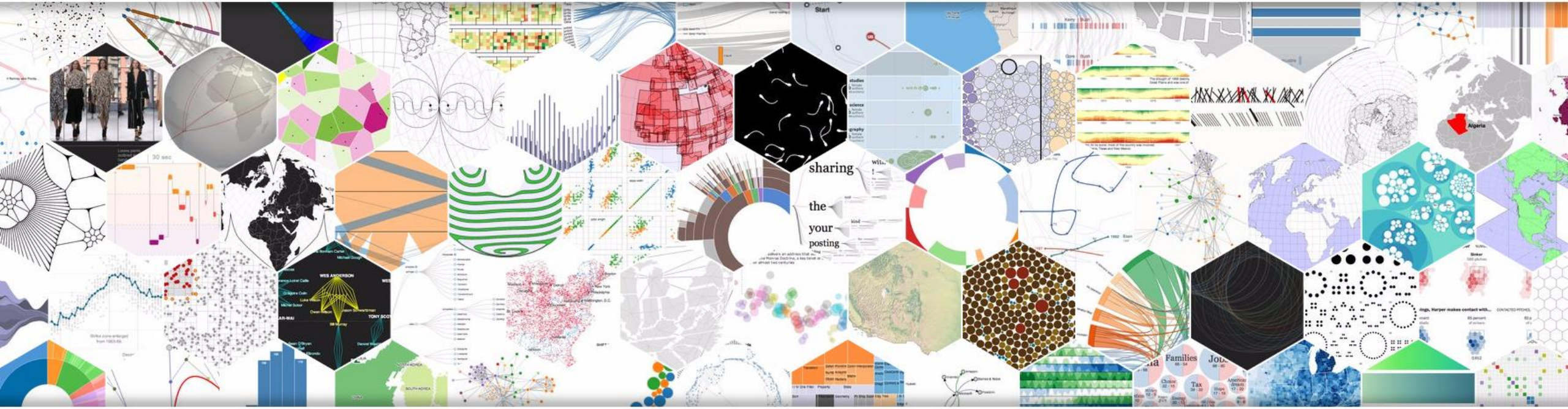
- Attract attention from the public
- Increase engagement
- Increase trust in the data
- The data tells the story
- Hundreds of possible stories
- The user create its own story

Source (image): http://www.pewresearch.org/fact-tank/2014/12/29/our-favorite-pew-research-center-data-visualizations-from-2014/

European Commission

Interactive data visualization

Data-Driven Documents



Source: https://d3js.org/

European Commission

COIN interactive platforms

Social Scoreboard

https://composite-indicators.jrc.ec.europa.eu/social-scoreboard

Cultural and Creative Cities Monitor

https://composite-indicators.jrc.ec.europa.eu/cultural-creative-cities-monitor

Any questions?

You can find me at jrc-coin@ec.europa.eu

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