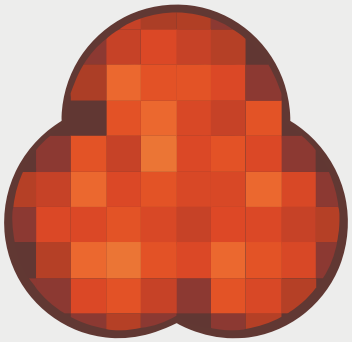

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06.- 08.09.2019.

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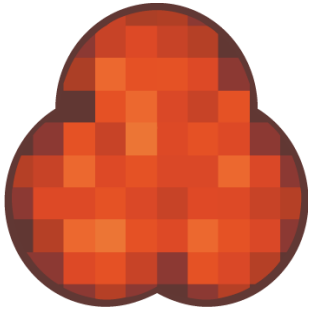

DATA VISUALIZATION 101

HOW TO PROPERLY DISPLAY DATA

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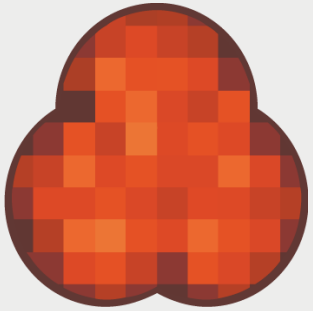
Hello

JOSIP ŠABAN, M. Sc., MBA

Erste Group IT, Vienna / Meridian Data, Worldwide

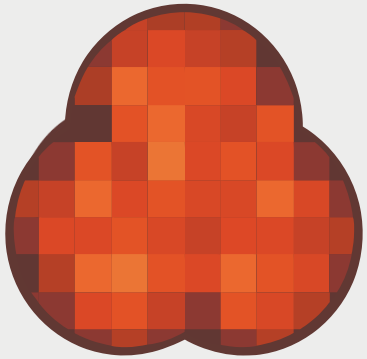
RENEE AHEL, M. Sc.

Optimum, Worldwide



AGENDA

- Human visual perception
- Basic data visualization lessons
- Graphical form & integrity
- Dashboards



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Human visual perception

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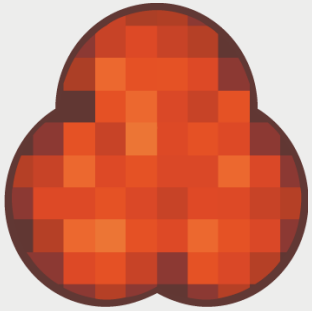
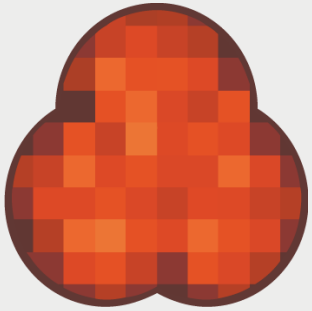


INTRODUCTION

- To use and communicate using visual perception, you must understand its rules
- Effective visualization is a product of proper design

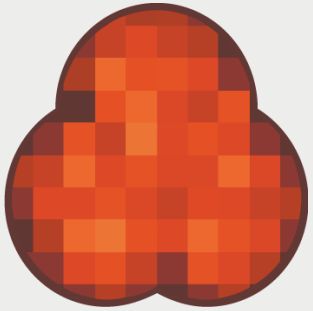
INTRODUCTION

- Visual is the most powerful sense
- To display data effectively you must understand visual perception
  - What works?
  - What doesn't work?
  - Why it works?



INTRODUCTION

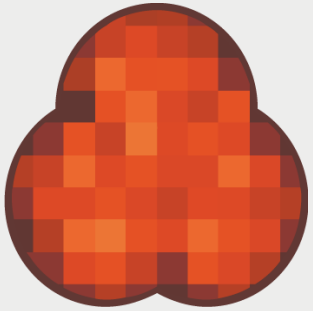
- I will discuss a small part
  - Pattern principles of visual perception



VISUALLY ENCODING DATA FOR RAPID PERCEPTION

- Preattentive processing is tuned to detect a specific set of visual attributes
- Attentive processing is sequential, and therefore much slower

– Let's demonstrate…



TWENTY SECOND TEST...HOW MANY FIVE'S IN THE LIST (ATTENTIVE PROCESSING)

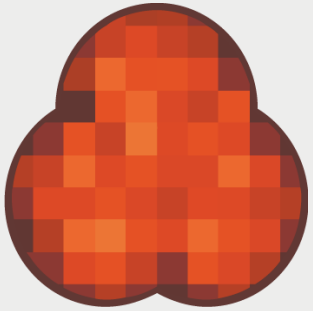
98133478993495334899284292384839112984989 98

98134123412388239146100913280953891208955131

12341239323049120886797865412980481952313 14

12312441234984152678251283876514589119892 13

13049128517642149128094932455788123871928 35



TWENTY SECOND TEST…HOW MANY FIVE'S IN THE LIST (PRE-ATTENTIVE PROCESSING)

9813347899349**5**33489928429238483911298498998

98134123412388239146100913280953891208955131

12341239323049120886797865412980481952231314

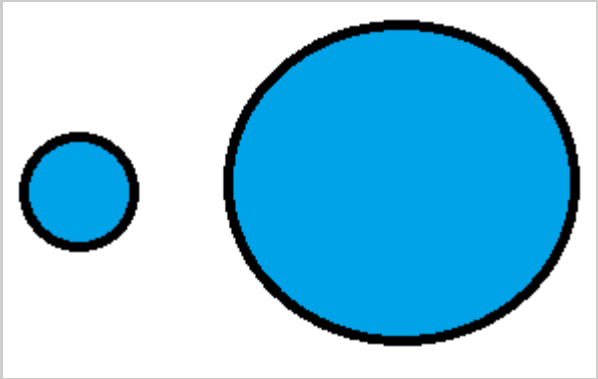
12312441234984152678251283876514589119892 13

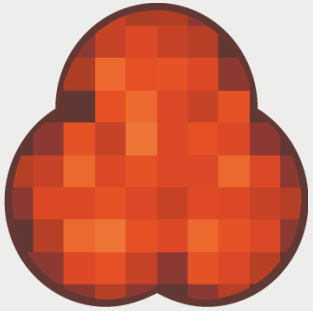
13049128**5**1764214912809493245578881238719283**5**

ENCODING QUANTITATIVE VERSUS CATEGORICAL DATA

- While some attributes allow us to perceive one thing as greater than others in some way (bigger, taller, more important), others merely indicate that items are distinct from one another, without any sense of some being greater than or less than others

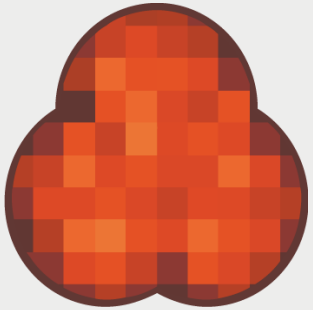
– It is obvious that the circle on the right is bigger than the circle on the left, but how much bigger?





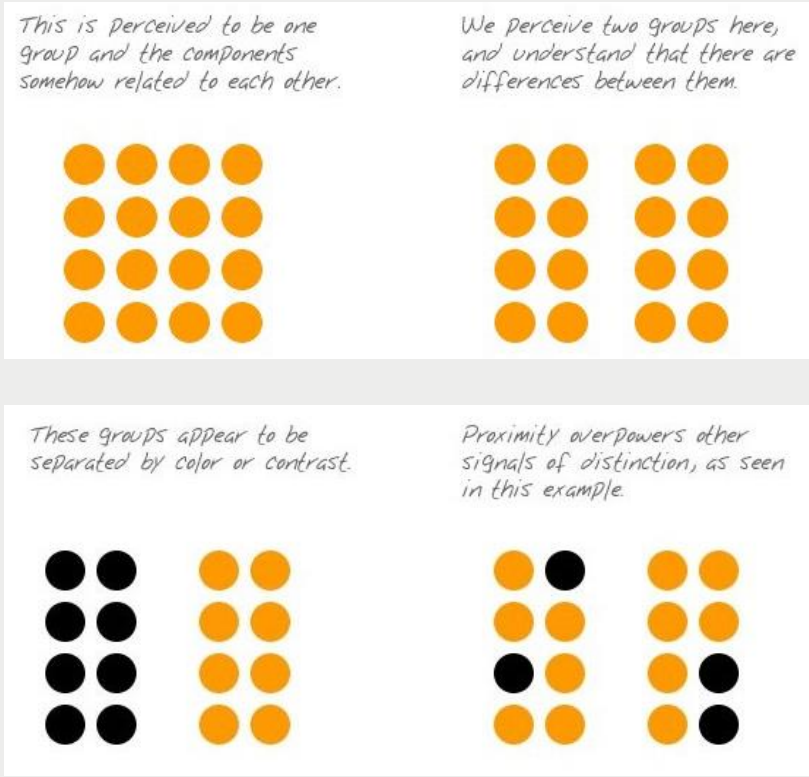
PATTERN PRINCIPLES OF VISUAL PERCEPTION

- We will discuss some of perception principles
  - Proximity
  - Closure
  - Similarity
  - Enclosure



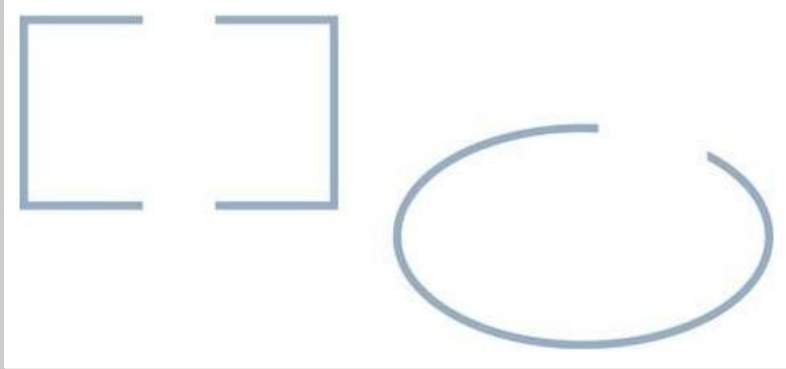
THE PRINCIPLE OF PROXIMITY

- We perceive objects that are located near one another as belonging to the same group
- This is the simplest way to link data that you want to be seen together
- White space alone is usually all you need to separate these groups from the other data that surrounds them



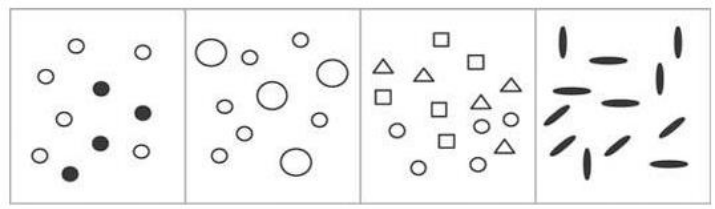
THE PRINCIPLE OF CLOSURE

- We as humans have a keen dislike for loose ends
- When faced with ambiguous visual stimuli, objects that could be perceived either as open/incomplete/unusual or as closed/complete/regular, we naturally perceive them as the latter



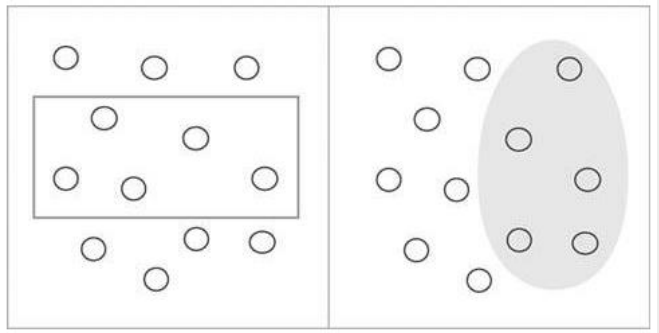
THE PRINCIPLE OF SIMILARITY

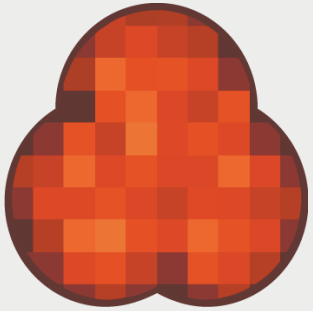
- We tend to group together objects that are similar in color, size, shape, and orientation
- The principle of similarity applies very effectively to groups of visual objects that vary as different expressions of preattentive attributes
- It works especially well as a means of identifying different data sets in a graph (for example, income, expenses, and profits)



THE PRINCIPLE OF ENCLOSURE

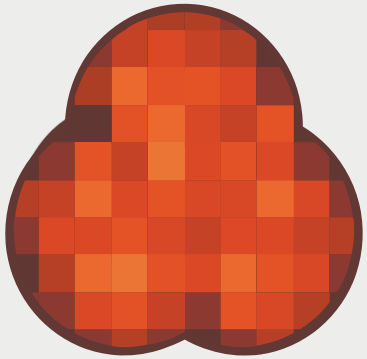
- We perceive objects as belonging together when they are enclosed by anything that forms a visual border around them
- This enclosure causes the objects to appear to be set apart in a region that is distinct from the rest of what we see





CLOSING THOUGHTS

- Vision is fast, reason is slow
- Human brain is natural cartographer
- Seeing, perceiving, and knowing are not the same thing
- Vision is the result of mapping your environment based on the aggregated information your eyes obtain from multiple fixations
- They are attracted first to certain features before they move to others…they prioritize



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Basic data visualization rules

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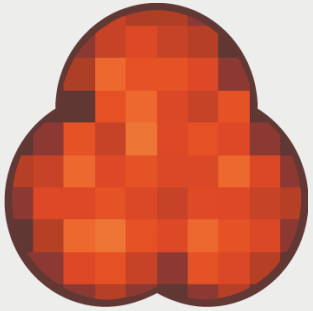
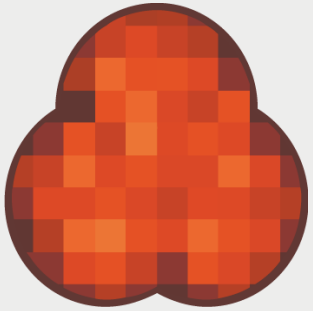


INTRODUCTION

- We discuss details about some basic topics
  - Maximize data ink
  - Avoid chart junk

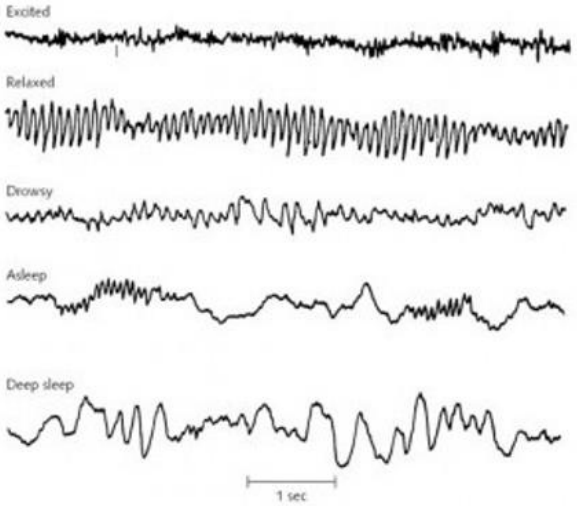
- There is many more we don't have time to cover



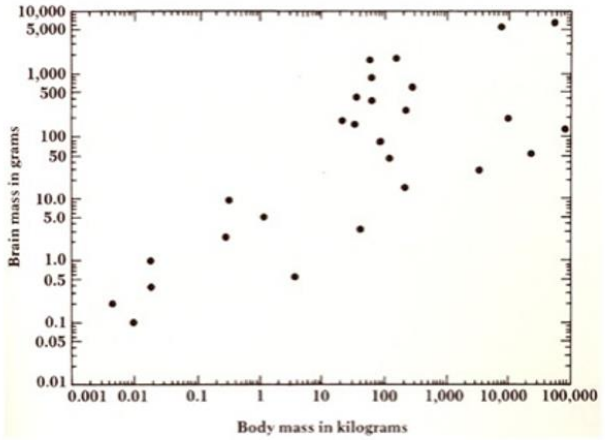
MAXIMIZE DATA INK

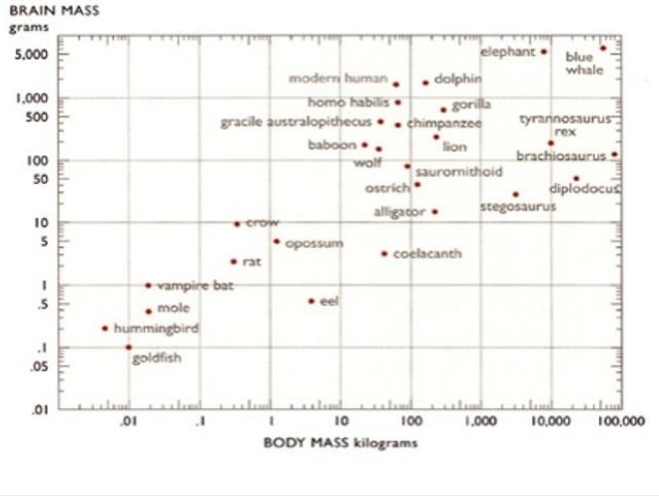
- The ink on a graph that represents data
- Good graphical representations maximize data-ink and erase much non-data-ink as possible
- The data-ink ratio is calculated by 1 minus the proportion of the graph that can be erased without loss of data-information

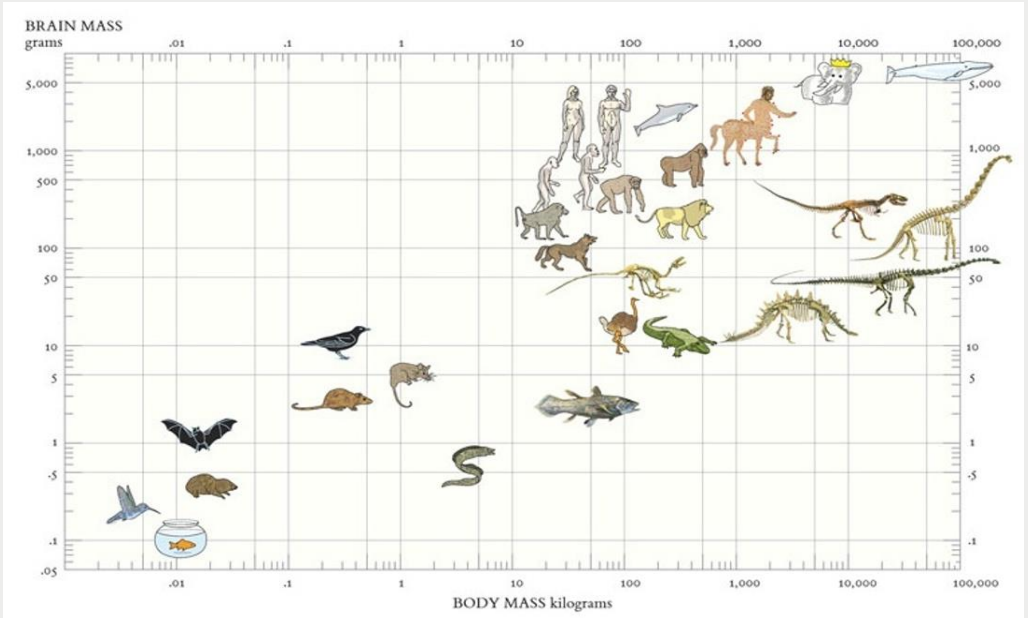
MAXIMIZE DATA INK



It's an electroencephalogram – a graph that records the electrical activity from the brain. This graph would have a very high data-ink ratio of 1.

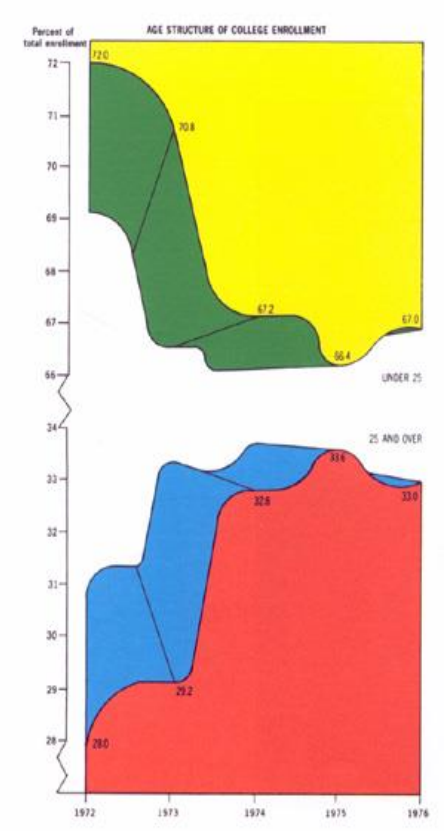


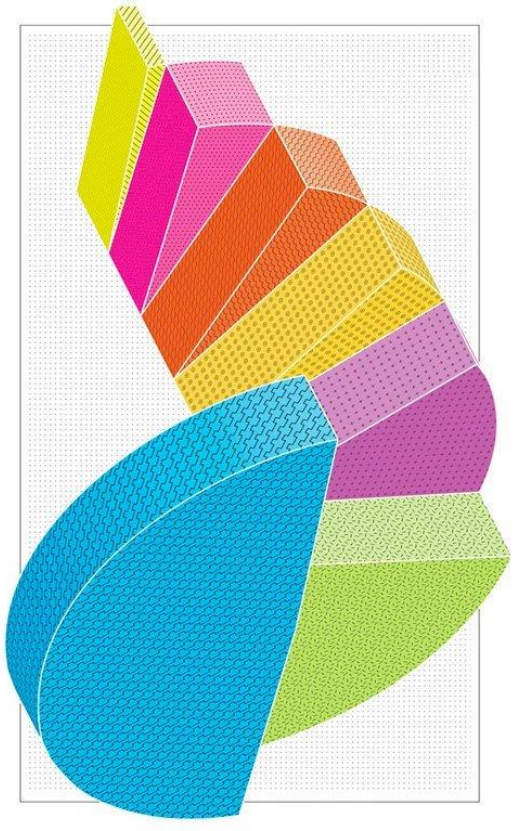


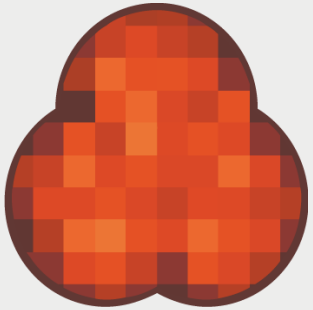


AVOID CHART JUNK

- The excessive and unnecessary use of graphical effects in graphs used to demonstrate the graphic ability of the designer rather than display the data

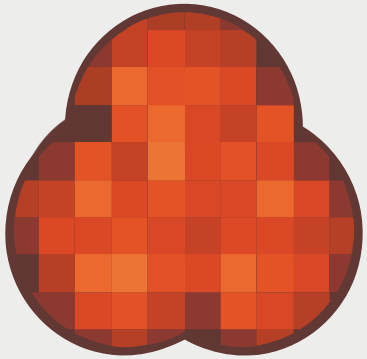






CLOSING THOUGHTS

- Take every chance to show a tangible object
- Don’t use boxes or 3-D objects
- When presenting - focus on two things - story and credibility
- To clarify - add detail
- Tell the audience what is important
- A number provides information, but it doesn’t give context
- You don’t need multiple corporate logos on every slide or graphics
- If a summary is tough to write, your content is weak
- Final part is Q&A, press conference style



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Graphical form

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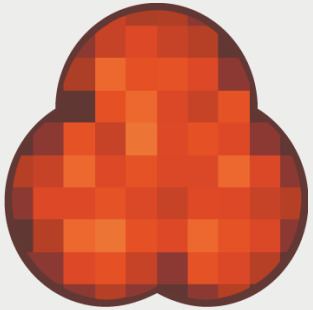


Carte Figurative des pertes successives en hommes de l'Armée Française dans la campagne de Russie 1812-1813.

Dressée par M. Minard, Inspecteur Général des Ponts et Chaussées en retraite.

Paris, le 20 Novembre 1869.

Les nombres d'hommes présents sont représentés par les largeurs des zônes colorées à raison d'un millimètre pour dix mille hommes; ils sont de plus écrits en travers des zônes. Le rouge désigne les hommes qui entrent en Russie, le noir ceux qui en sortent. — Les renseignements qui ont servi à dresser la carte ont été puisés dans les ouvrages de M.M. Thiers, de Ségur, de Fezensac, de Chambray et le journal inédit de Jacob, pharmacien de l'Armée depuis le 28 Octobre.

Pour mieux faire juger à l'œil la diminution de l'armée, j'ai supposé que les corps du Prince Jérôme et du Maréchal Davoust qui avaient été détachés sur Minsk et Mobilow et ont rejoint vers Orscha et Witebsk, avaient toujours marché avec l'armée.

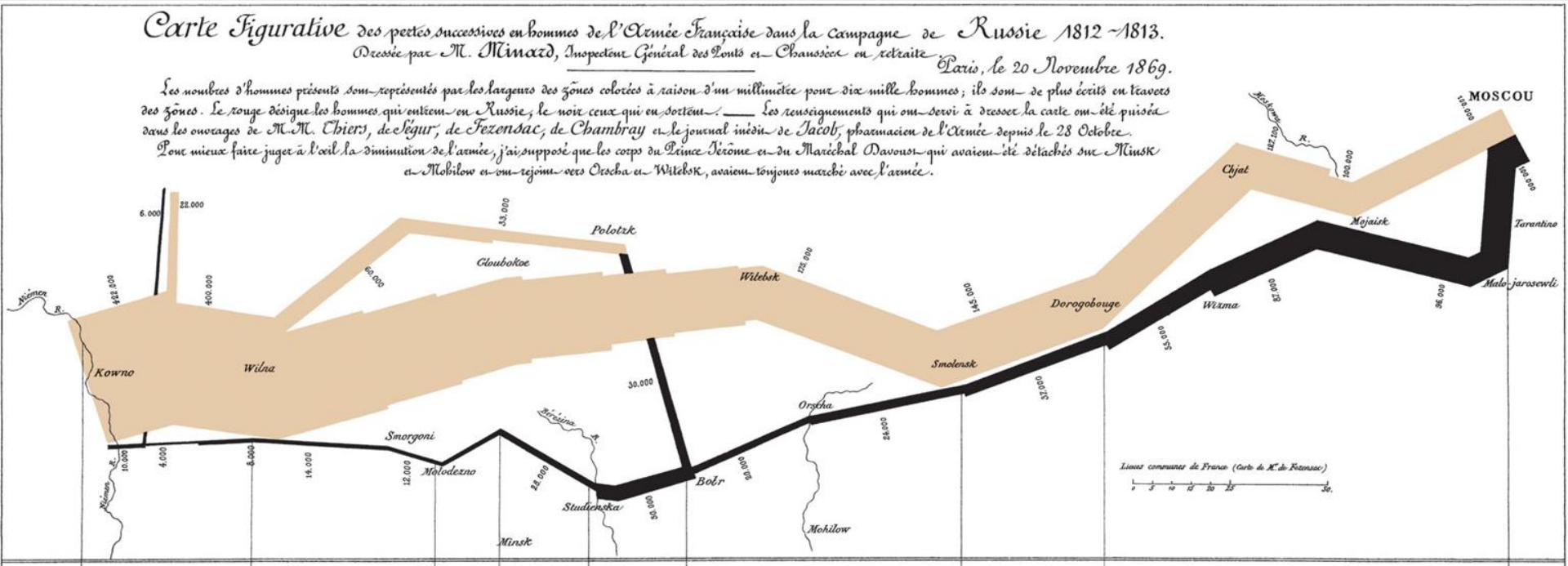
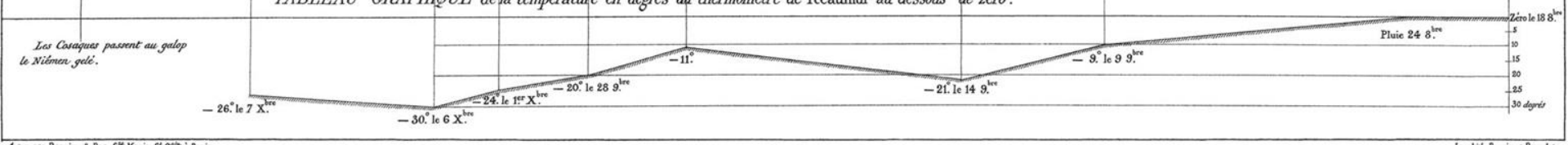
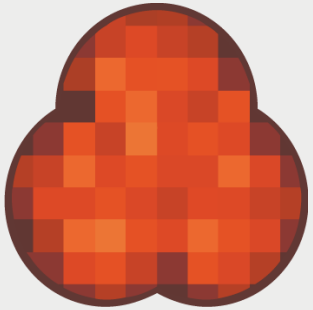


TABLEAU GRAPHIQUE de la température en degrés du thermomètre de Réaumur au dessous de zéro.



Autog. par Regnier, 8. Pas. St.e Marie St. Gelais à Paris.

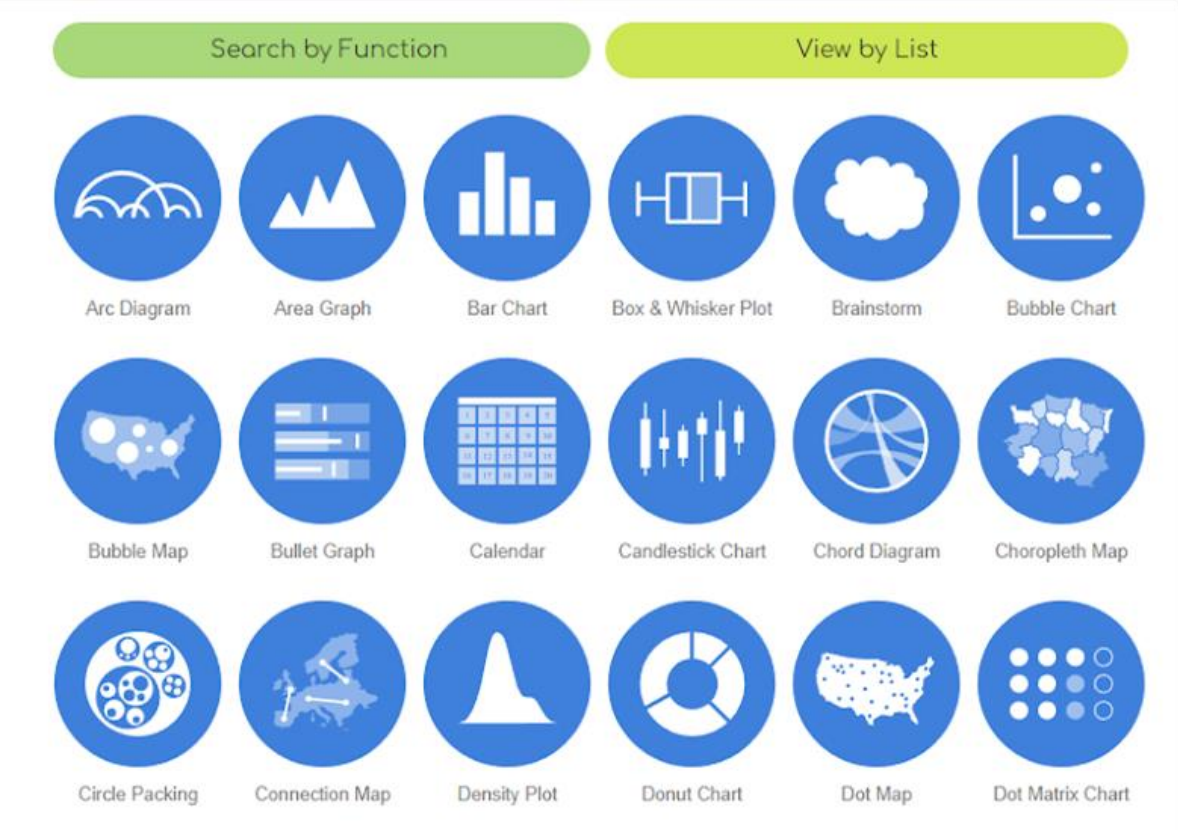
Imp. Lith. Regnier et Dourdet.



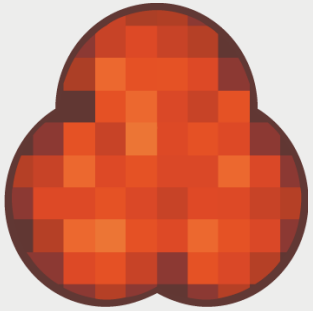
FINDING THE RIGHT GRAPHIC FORM

- What do you want to accomplish?
  - compare
  - see change
  - reveal relationships
  - envision temporal or spatial patterns
- Try different graphic forms
- Arrange the components to make it as easy as possible to extract meaning from it
- Test the outcomes

THE DATA VISUALIZATION CATALOGUE

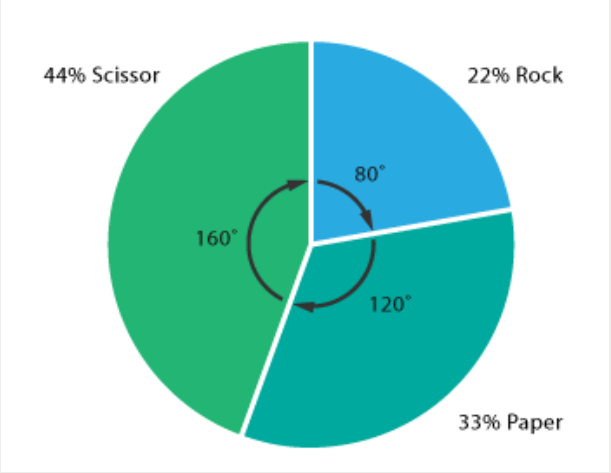


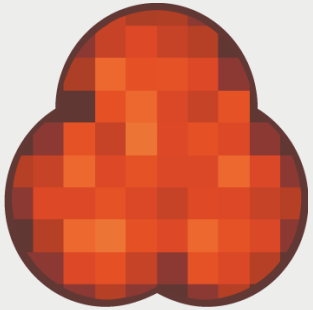
By Severino Ribecca, https://datavizcatalogue.com/



PARTS OF A WHOLE & PROPORTIONS

- Pie chart
- Displays part of a whole
- Bad for proportion perception as human vision does not perceive well angle based proportions
- Not suitable for accurate comparison

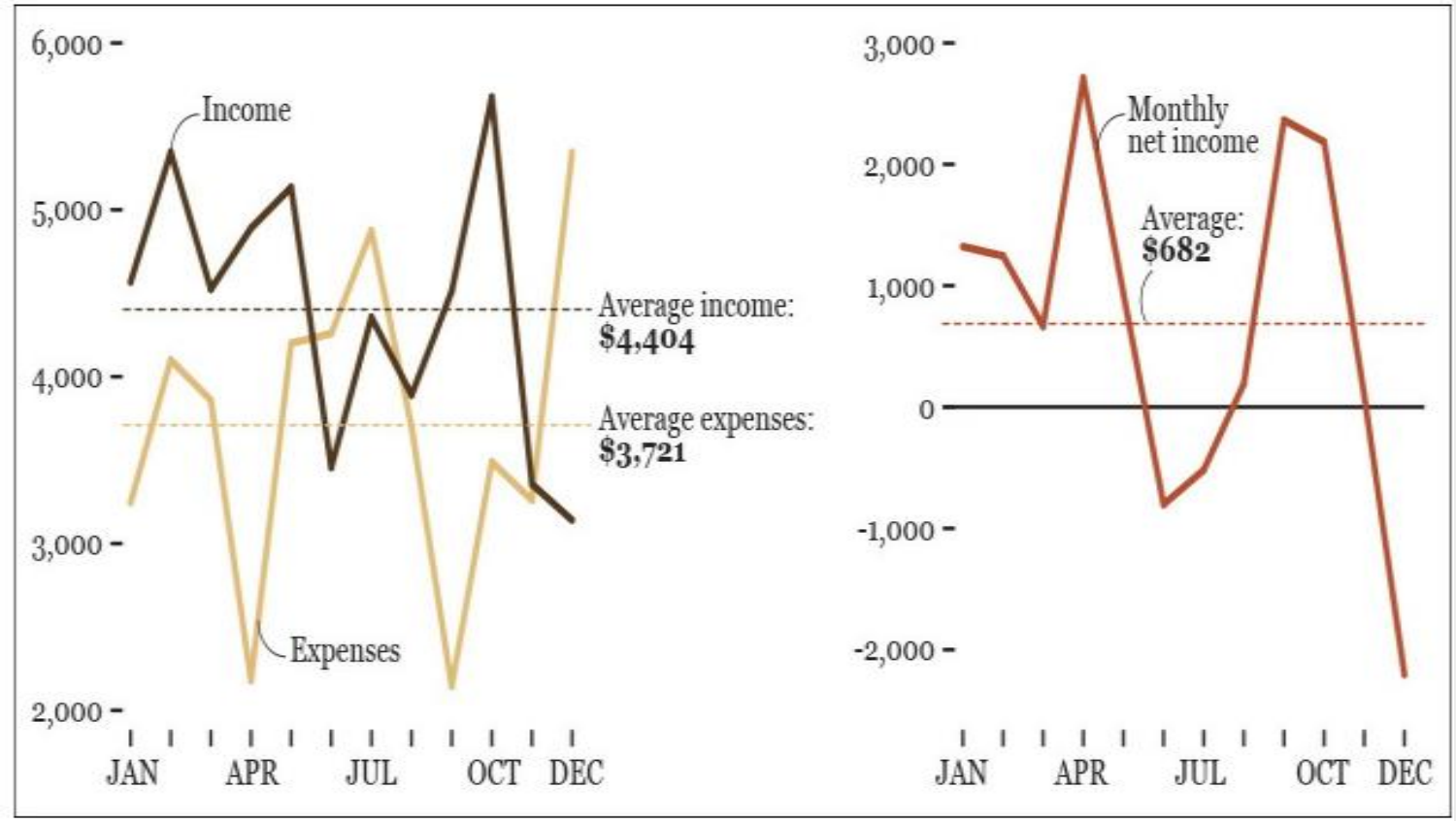


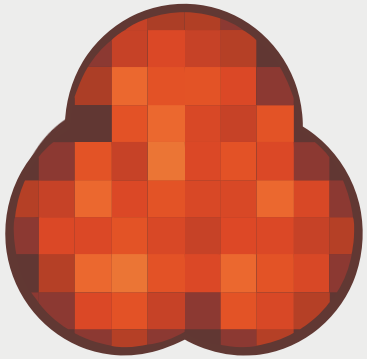


PARTS OF A WHOLE & PROPORTIONS

- Treemap
- Can display a hierarchy
- Impractical with too many small segments
- Impractical with too many hierarchy levels

PLOT WHAT YOU WANT TO SHOW!





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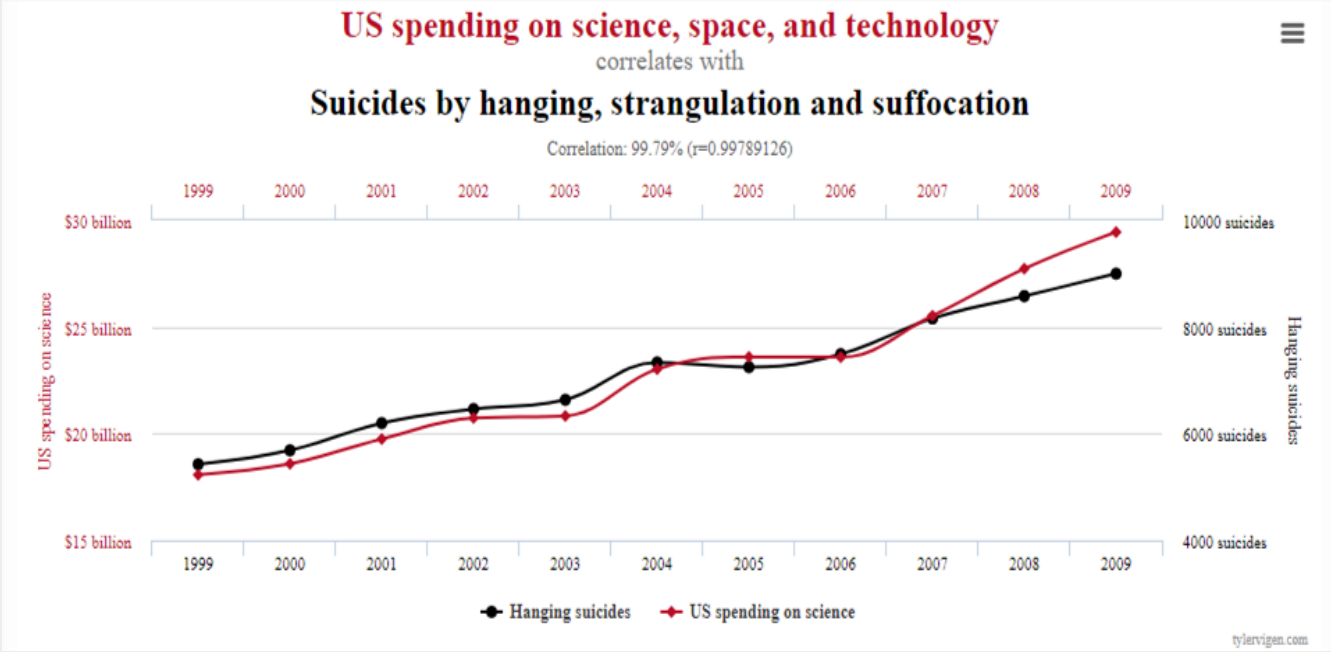
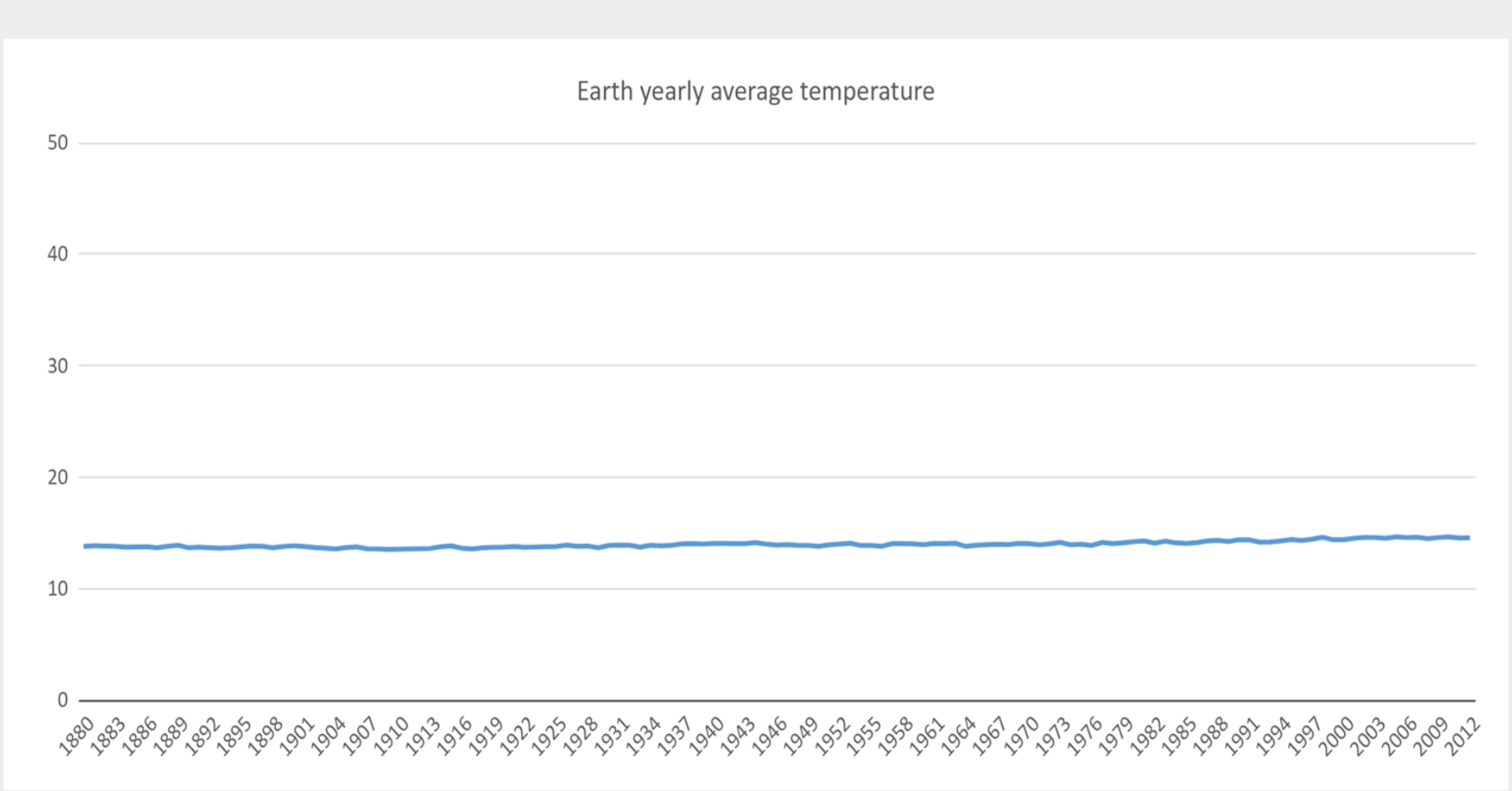
GIGO ALSO APPLIES TO DATA GRAPHICS!

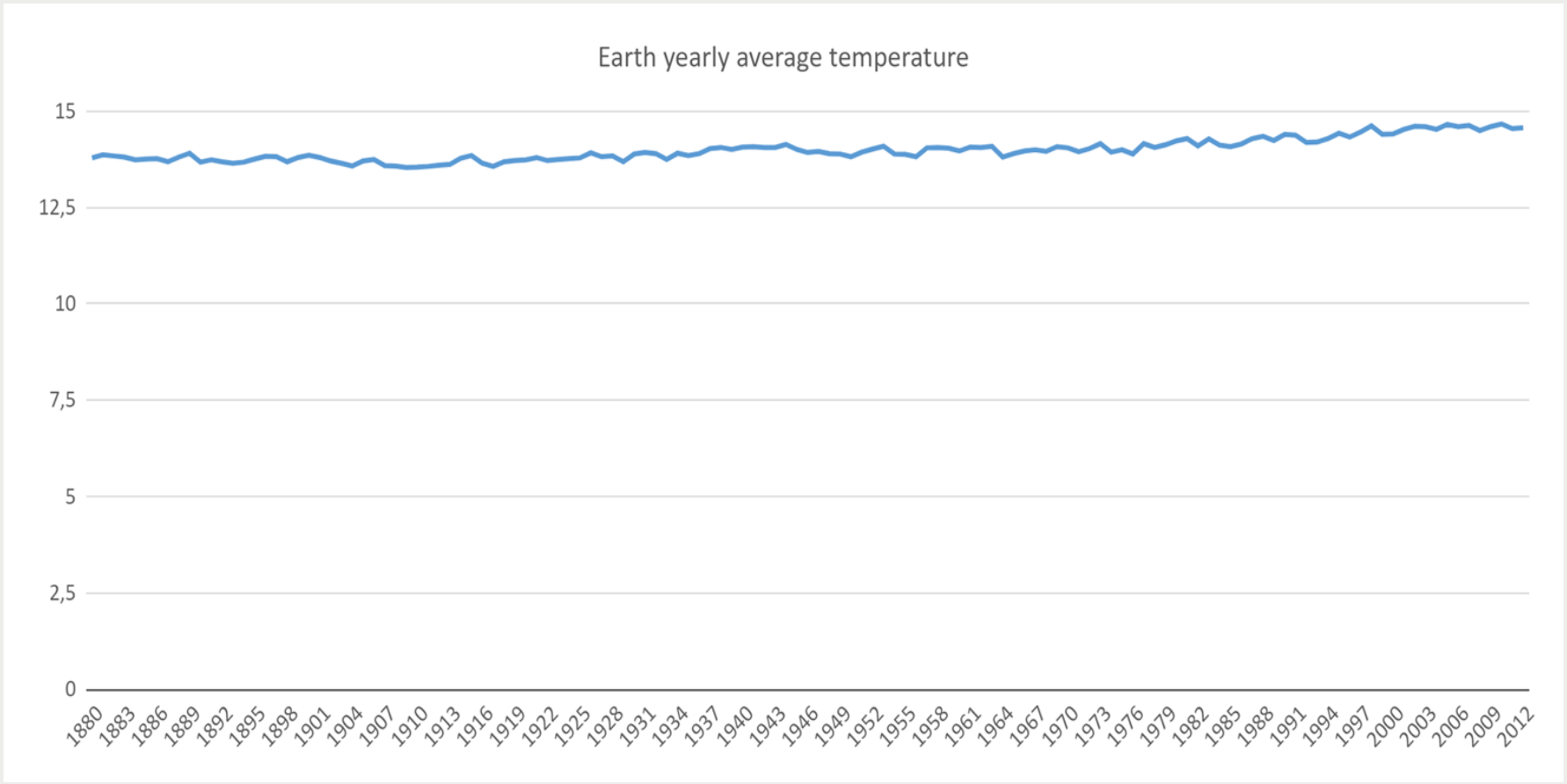
- GIGO - Garbage In, Garbage Out



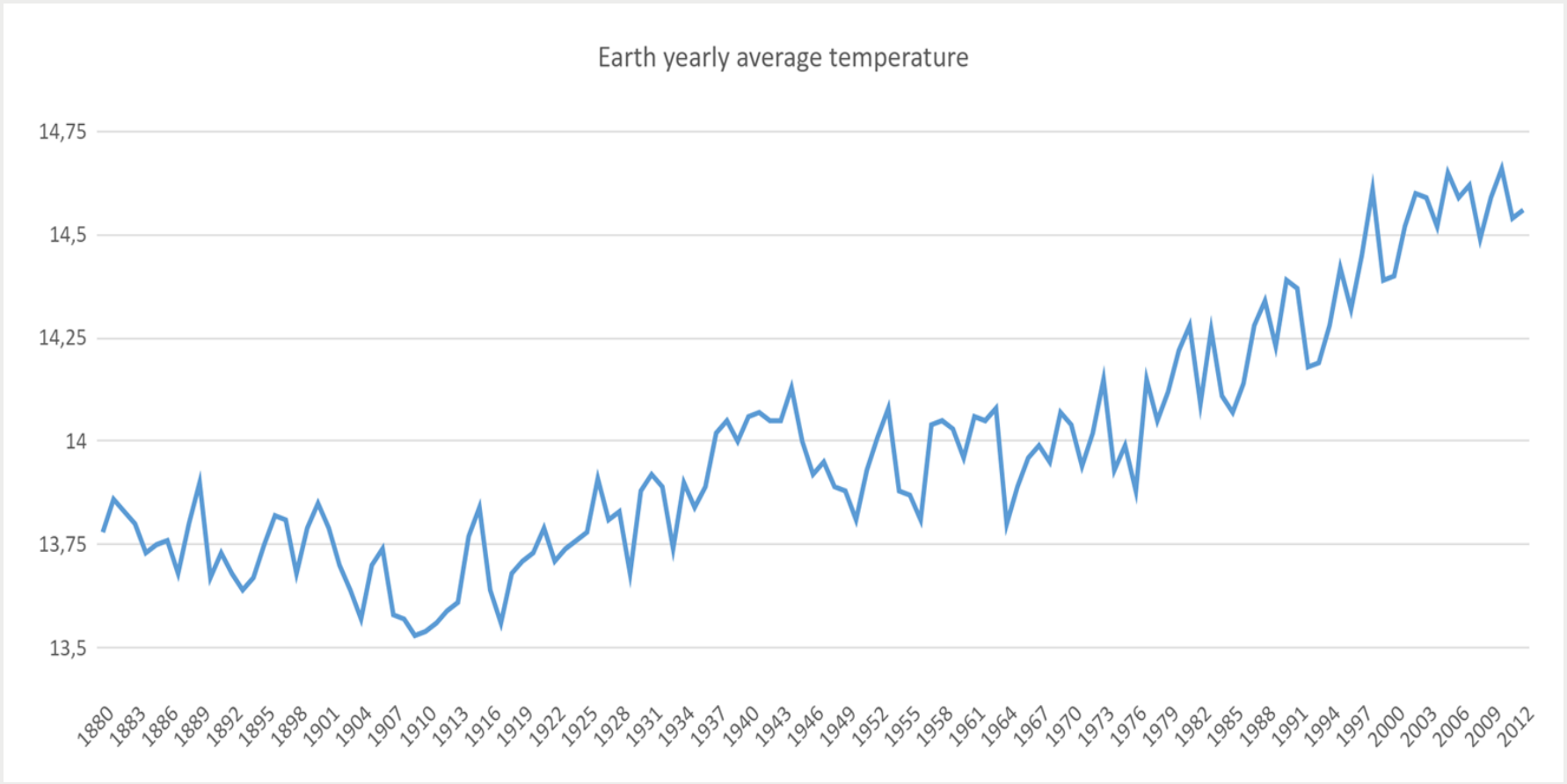
MISLEADING TIME SERIES CHARTS



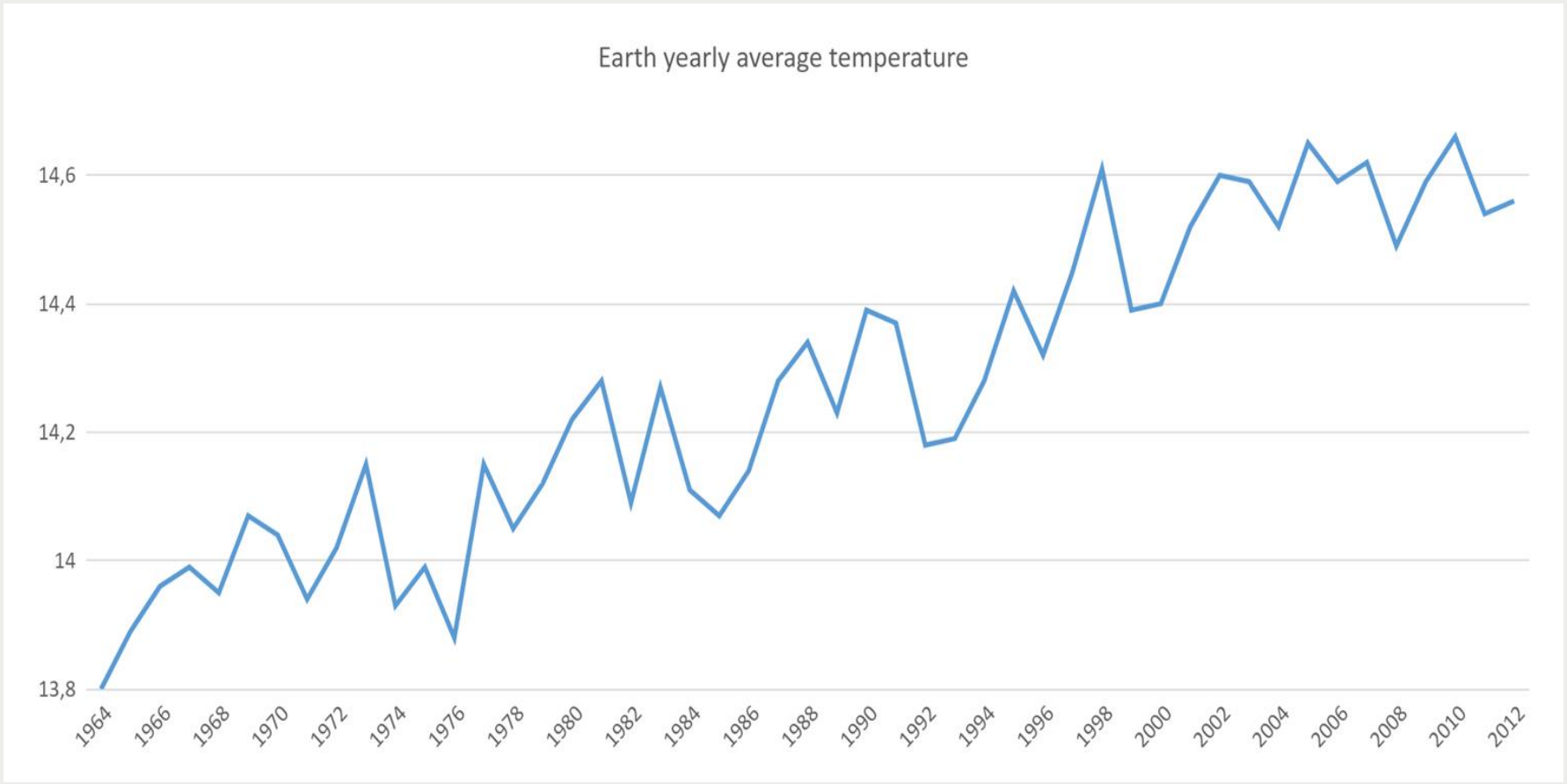
MISLEADING TIME SERIES CHARTS



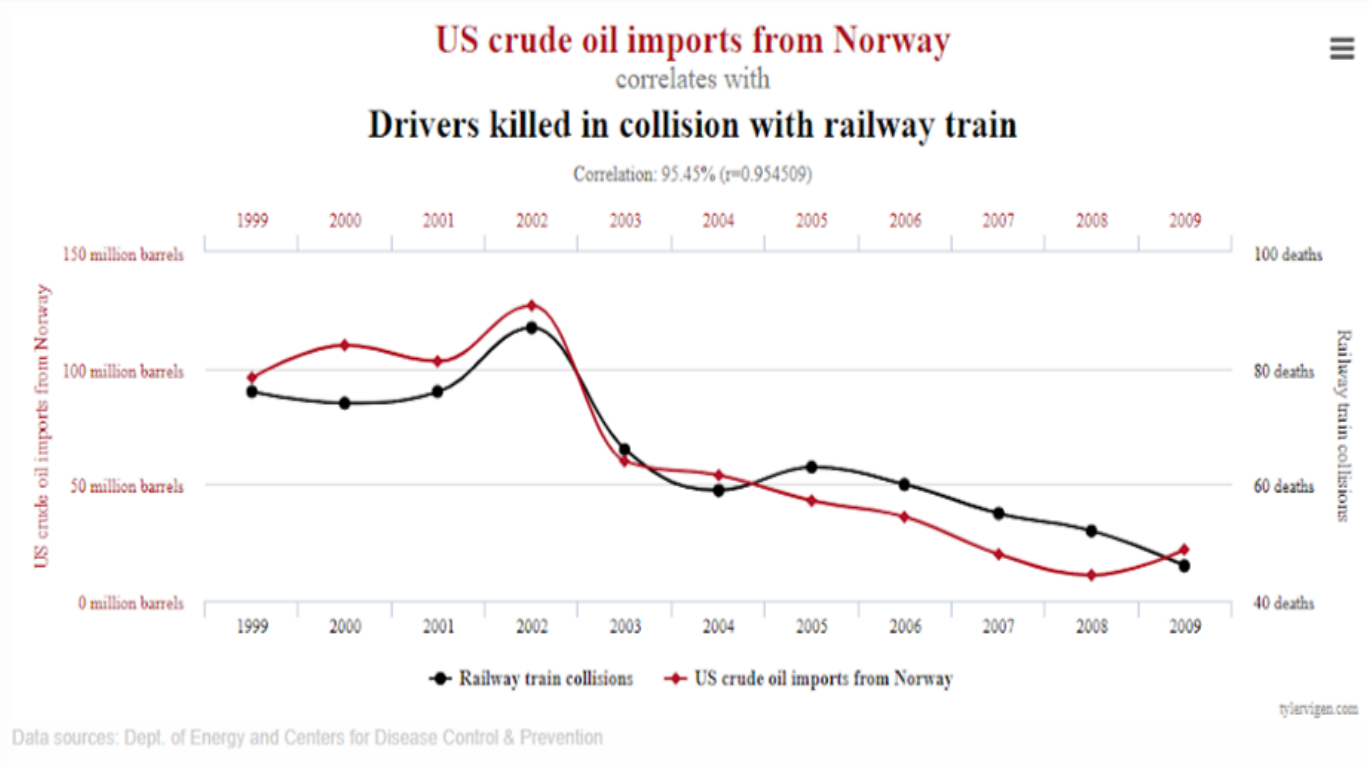
MISLEADING TIME SERIES CHARTS

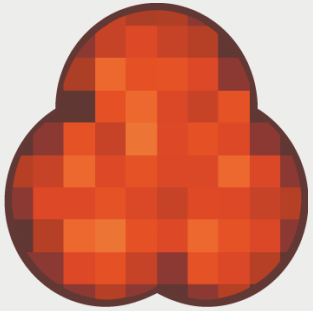


MISLEADING TIME SERIES CHARTS



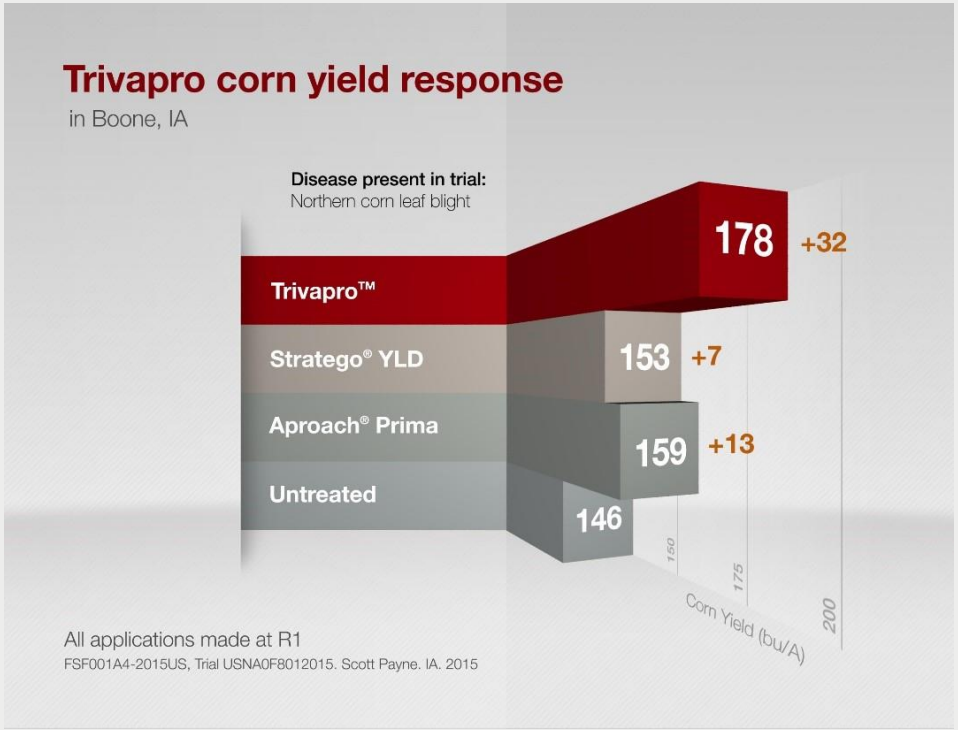
CORRELATION DOES NOT IMPLY CAUSATION



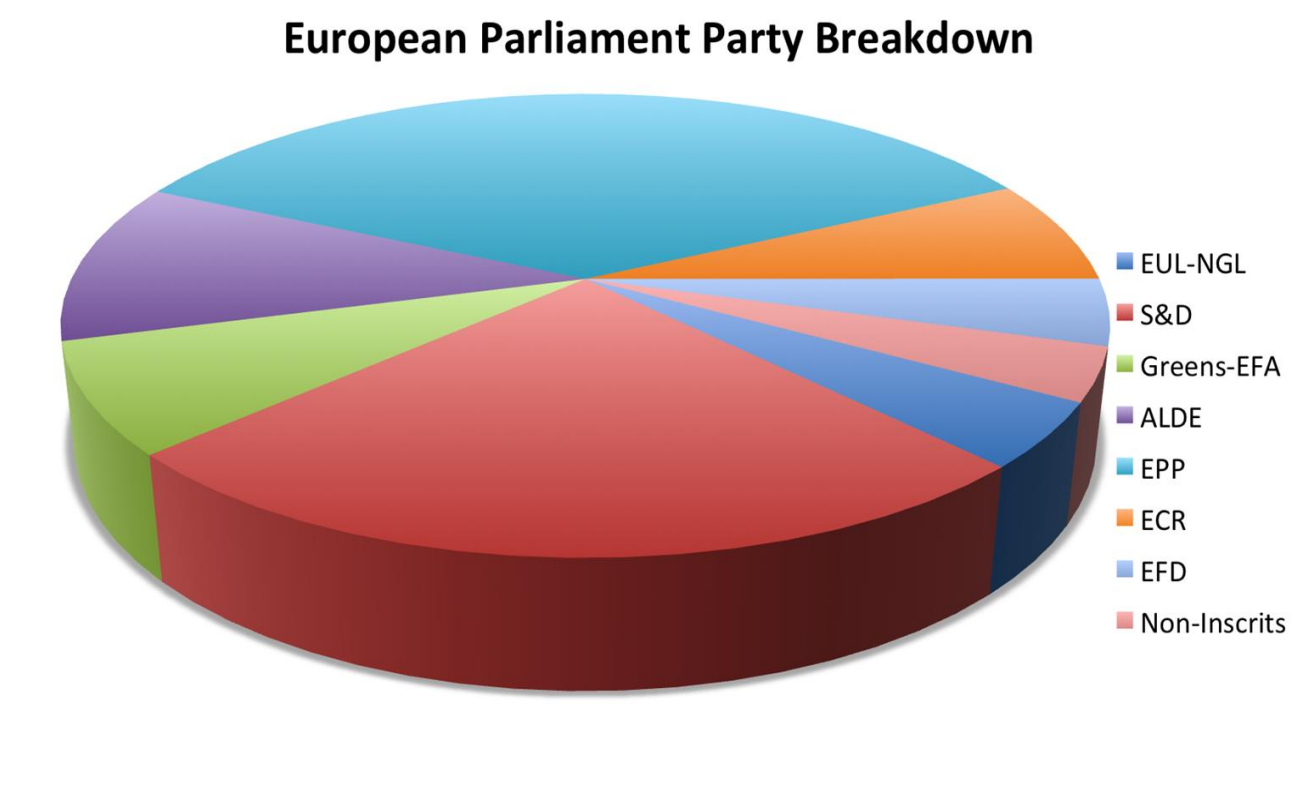


THE DIMENSIONALITY PRINCIPLE

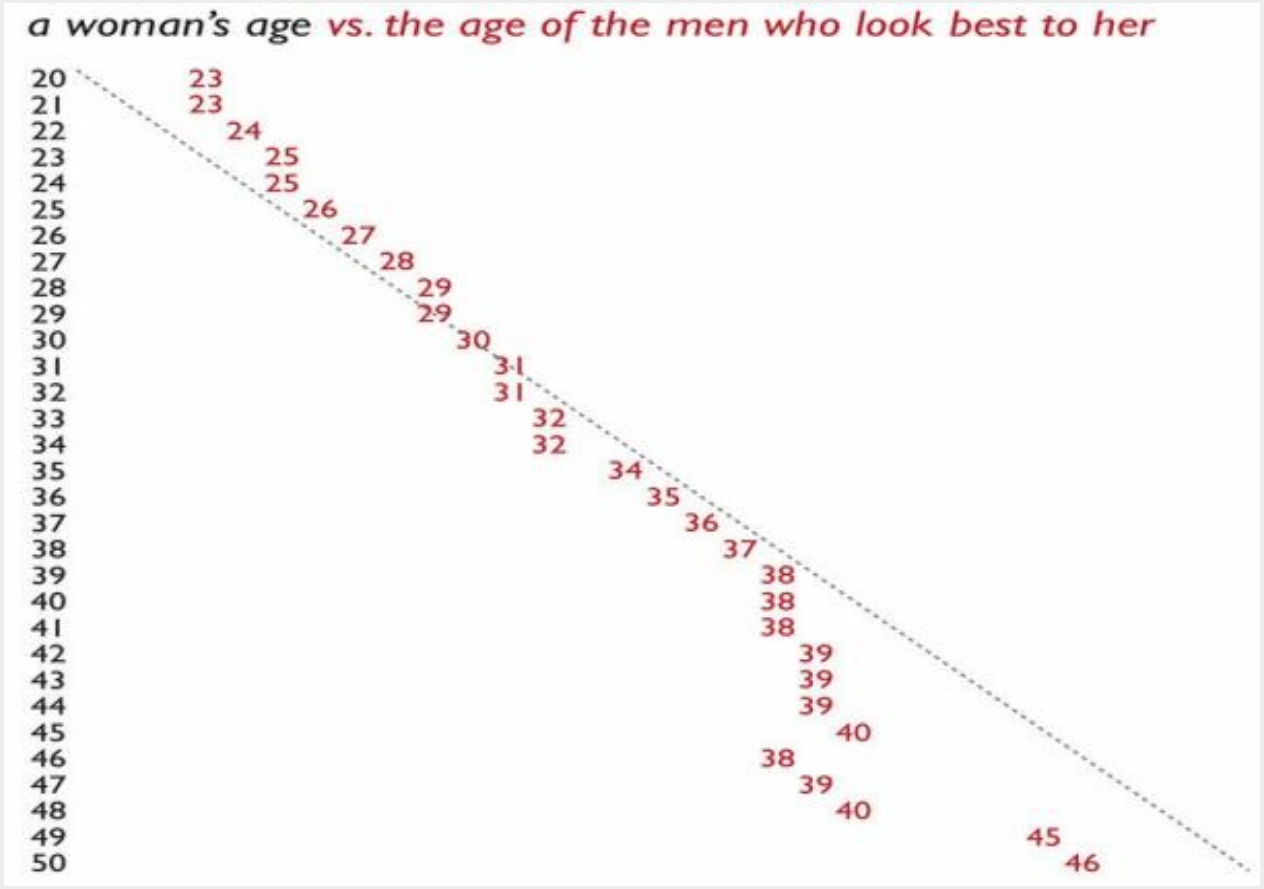
- The number of information carrying dimensions should not exceed the number of dimensions in the data



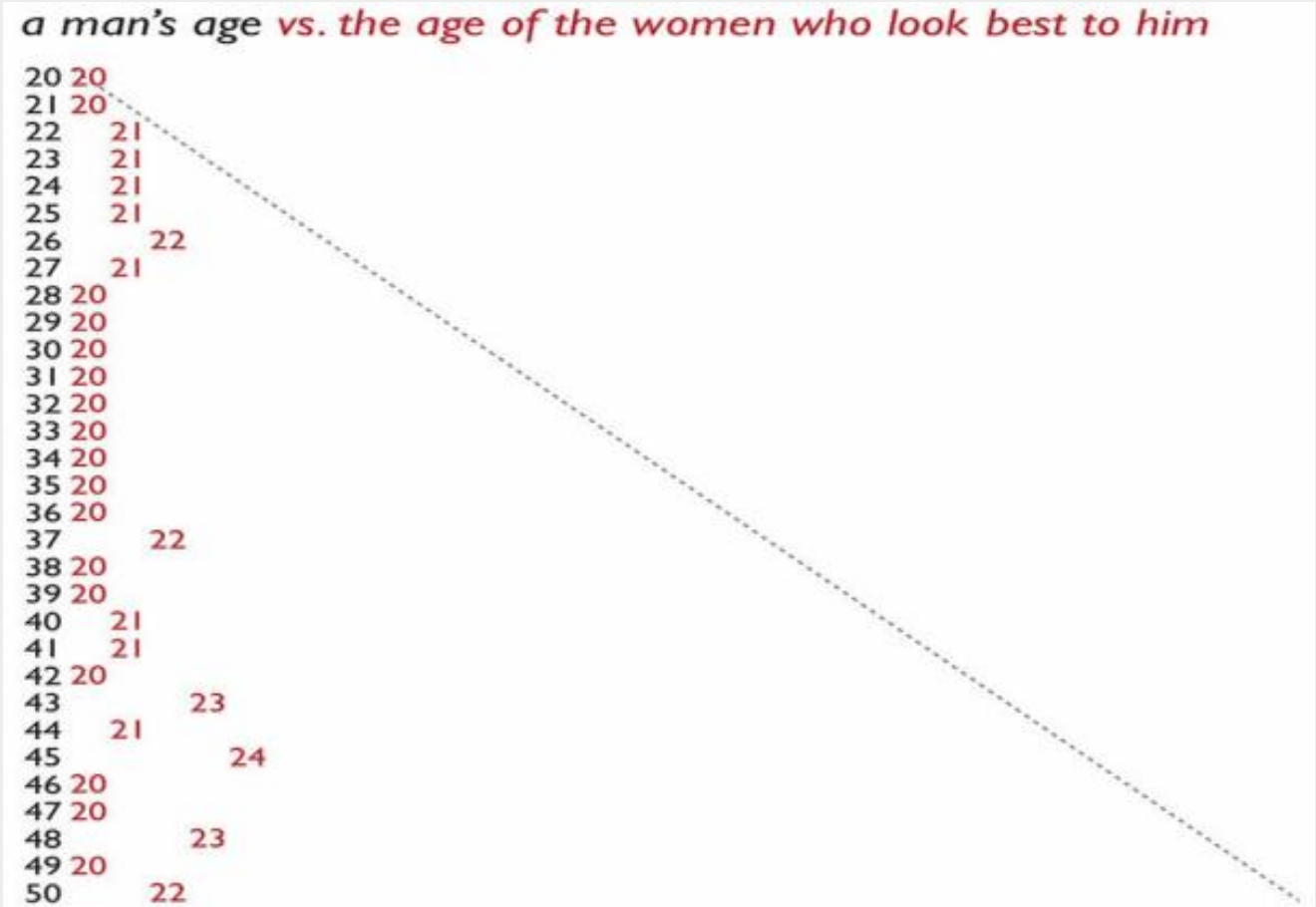
DIMENSIONALITY PRINCIPLE - EXAMPLE

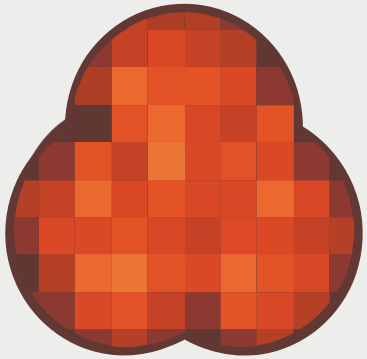


OKCUPID WOMEN VS MEN AGE PREFERENCES



OKCUPID WOMEN VS MEN AGE PREFERENCES





KulenDayz

IT Innovation Conference

DASHBOARDS

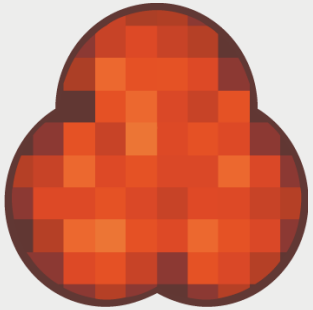
MSCommunity

OSIJEK SOFTWARE {ITY_

PMI Udruga Hrvatska

BIOS Poduzetnički Inkubator

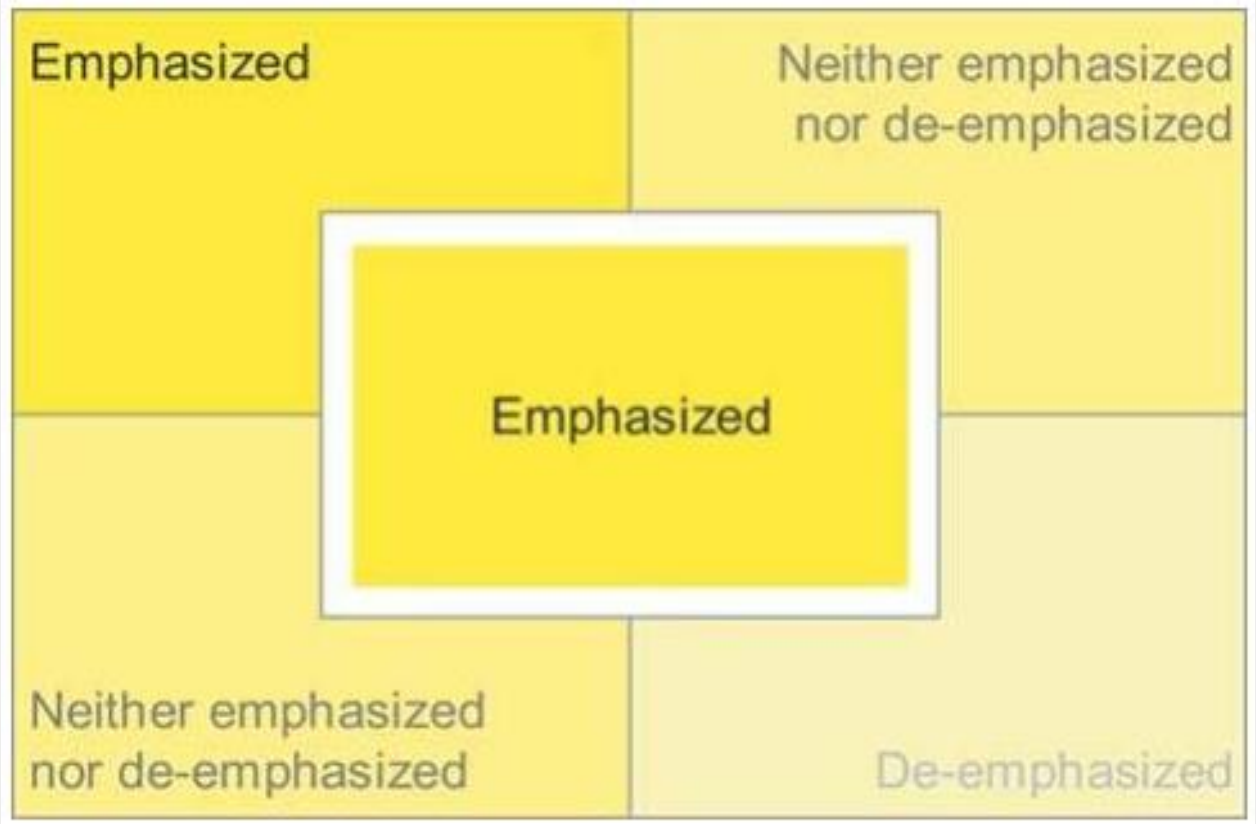
Akademija za umjetnost i kulturu u Osijeku



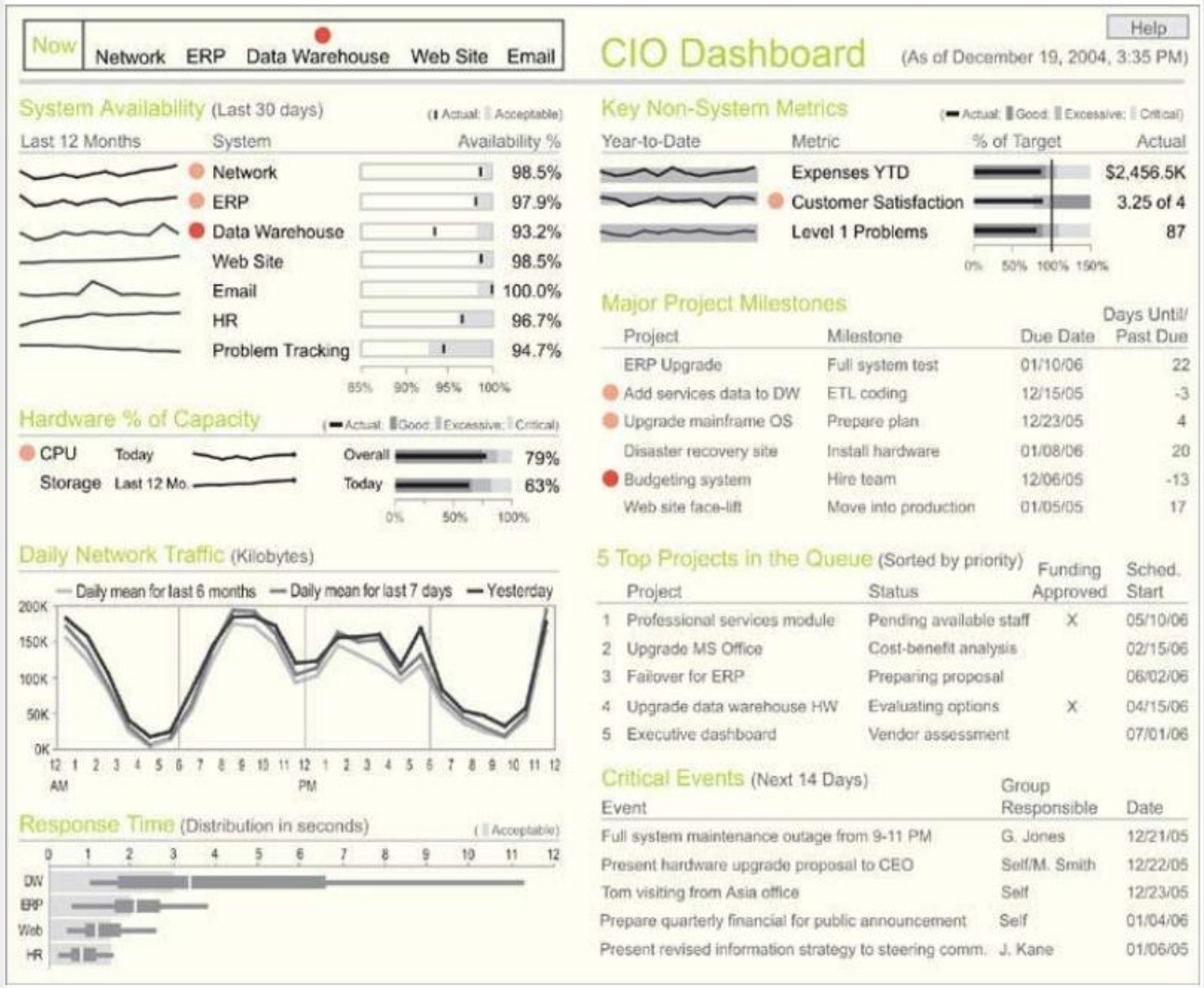
WHAT IS A DASHBOARD?

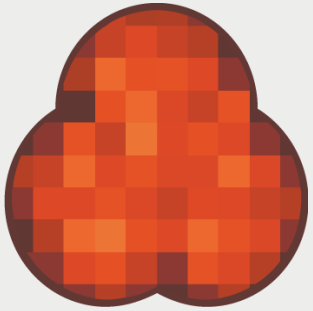
- Dashboards are visual displays
- Dashboards display the information needed to achieve specific objectives
- A dashboard fits on a single computer screen
- Dashboards are used to monitor information at a glance
- Dashboards have small, concise, clear, and intuitive display mechanisms
- Dashboards are customized
- **A dashboard is a type of display, a form of presentation, not a specific type of information or technology**

LOCATION, LOCATION, LOCATION



SAMPLE CIO DASHBOARD





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- Alberto Cairo - The Truthful Art. New Riders, 2016.
- Stephen Few - Information Dashboard Design - The Effective Visual Communication of Data. O'Reilly, 2006.