

IF 4061

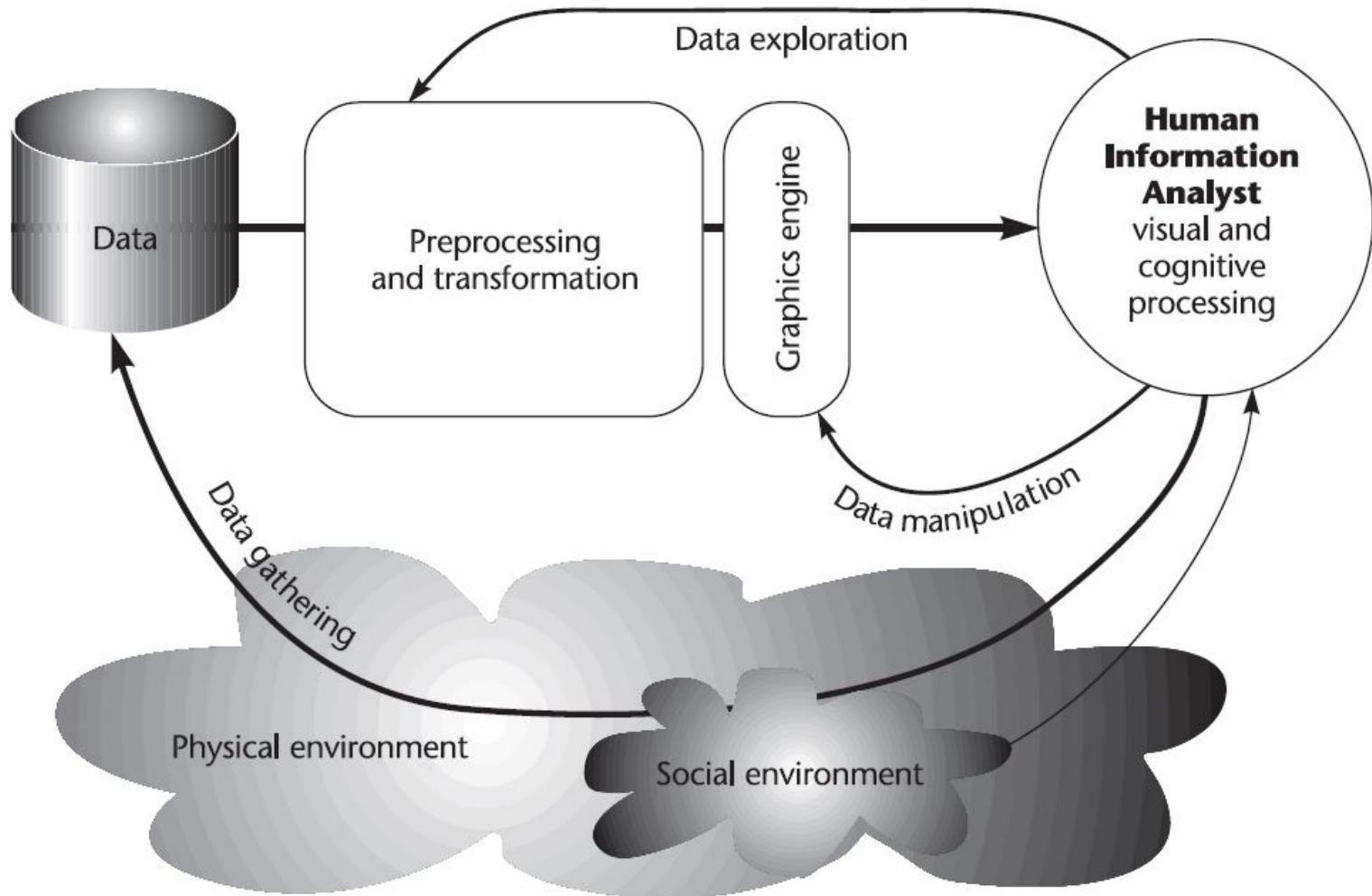
Data and Information Visualization:

**Data Viz Methodology:  
Define Purpose and Parameters**

Semester 2 2018/2019

School of Electrical and Informatics Engineering

# Data Visualization Process



# Methodology

1.  
Purpose &  
parameters

2.  
Prepare &  
explore data

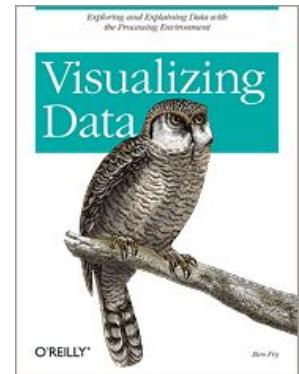
3.  
Formulate  
questions

4.  
Design  
concepting

5.  
Construct &  
launch

# 7 Stages of Visualizing Data

(Fry, 2008), pp. 5



1. **Acquire**: Obtain **the** data.
2. **Parse**: Provide some structure for the data's **meaning**, and order it into categories.
3. **Filter**: Remove all but the data of **interest**.
4. **Mine**: **Apply** methods from statistics or data mining as a way to discern patterns or place the data in mathematical context.
5. **Represent**: **Choose** a basic visual model, such as a bar graph, list, or tree.
6. **Refine**: Improve the basic representation to make it **clearer** and more visually engaging.
7. **Interact**: Add methods for **manipulating** the data or controlling what features are visible.

Note: stages are often iterative and may have a flexible order or even be omitted in some projects.

# Clarifying the purpose of the project (1)

## 1. The reason for existing

Recognizing the trigger behind the project or the origin from where it emerged.

- the scope and context
- how much creative control we might have
  - Asked by someone (there is an outline of the requirements)
  - Decided to do something yourself (a completely self-defined)

# Clarifying the purpose of the project (2)

## 2. The intended effect

You will inevitably:

- start to form a vision in your mind of what you might be about to create
- how it might look,
- and *what it might do*

# COLOR EMOTION GUIDE

**OPTIMISM** CLARITY  
**FRIENDLY** WARMTH  
**EXCITEMENT** CHEERFUL  
**CREATIVE** CONFIDENCE  
**TRUST** YOUTHFUL  
**PEACEFUL** BOLD  
**BALANCE** IMAGINATIVE  
DEPENDABLE  
GROWTH  
HEALTH  
NEUTRAL  
CALM



# DO STUDENTS EAT LIKE PRISONERS?

Hopefully you haven't gotten the chance to taste prison cuisine, but if you're a product of the American school system, you probably have childhood memories of standing in line for gray meatloaf patties, half-cooked mystery meat, and slimy canned peaches. How do the trays measure up?

## TYPICAL PRISON MEAL

Although prison food is not regulated by the U.S. Food and Drug Administration, most prisons serve a standardized menu that seeks to maintain a moderate level of nutrition.

AVERAGE CALORIES SERVED TO INMATES (PER MEAL)

1,300  
1,450



AVERAGE COST TO FEED A PRISONER (PER DAY)

\$2.62

2009 FEDERAL BUDGET FOR PRISON FOOD

\$205 MILLION



### NUTRALOAF BIOPOLITICS

In 2008, inmates at a Vermont prison filed a class-action lawsuit against the state after one in five of their meals featured "nutraloaf," a mixture of whole wheat bread, non-dairy cheese, vegetables, tomato sauce, powdered milk, and dry potato flakes. They argued that the food was used as punishment rather than nourishment.

1 A MEAL普通监狱餐食, according to the Federal Bureau of Prisons. 2 Elementary school lunch meal, according to the Healthy Hunger-Free School Environment Toolkit (U.S. Department of Agriculture) (U.S. Department of Health and Human Services) (Center for Nutrition Policy and Program).

## TYPICAL SCHOOL CAFETERIA MEAL<sup>1</sup>

USDA-regulated lunches served at elementary schools are required to include all food groups, but many students are served highly processed, unhealthy meals. Under pressure from a growing movement for school lunch reform, in 2010 Congress passed the Healthy Hunger-Free Kids Act, which seeks to make cafeteria food more balanced and nutritious.

ONE BREAD ITEM

8 OUNCES OF MILK

1.5 TO 2 OUNCES OF MEAT



1,400

AVERAGE CALORIES SERVED TO STUDENTS (PER MEAL)

\$2.68

AVERAGE COST TO FEED A STUDENT (PER DAY)

\$11 BILLION

AVERAGE YEARLY FEDERAL BUDGET FOR SCHOOL FOOD PROGRAMS

Percent of school food expenditures that meet the recommended standard for substance in their meals.

LESS THAN ONE THIRD

### WORSE THAN FAST FOOD.

Chain such as McDonald's and Burger King sell their greasy beef burgers for less money than the USDA meals do!

A COLLABORATION BETWEEN GOOD AND COLUMN FIVE

# Intentions behind creating a visual representation of data

Lookup	Persuade	Creative technique
Learn/increase knowledge	Answer questions	
Change behaviour	Conduct analysis	Monitor signals
Play with data	Tell story	Trigger questions
Contextualise data		Enlighten
Serendipitous discoveries		Find patterns/no patterns
Shape opinion		Familiarise with data
Present arguments	Emphasize issues	Inspire
Art/Aesthetic pleasure	Grab attention	Assist decisions
	Experimentation	
		Shock/Make an impact

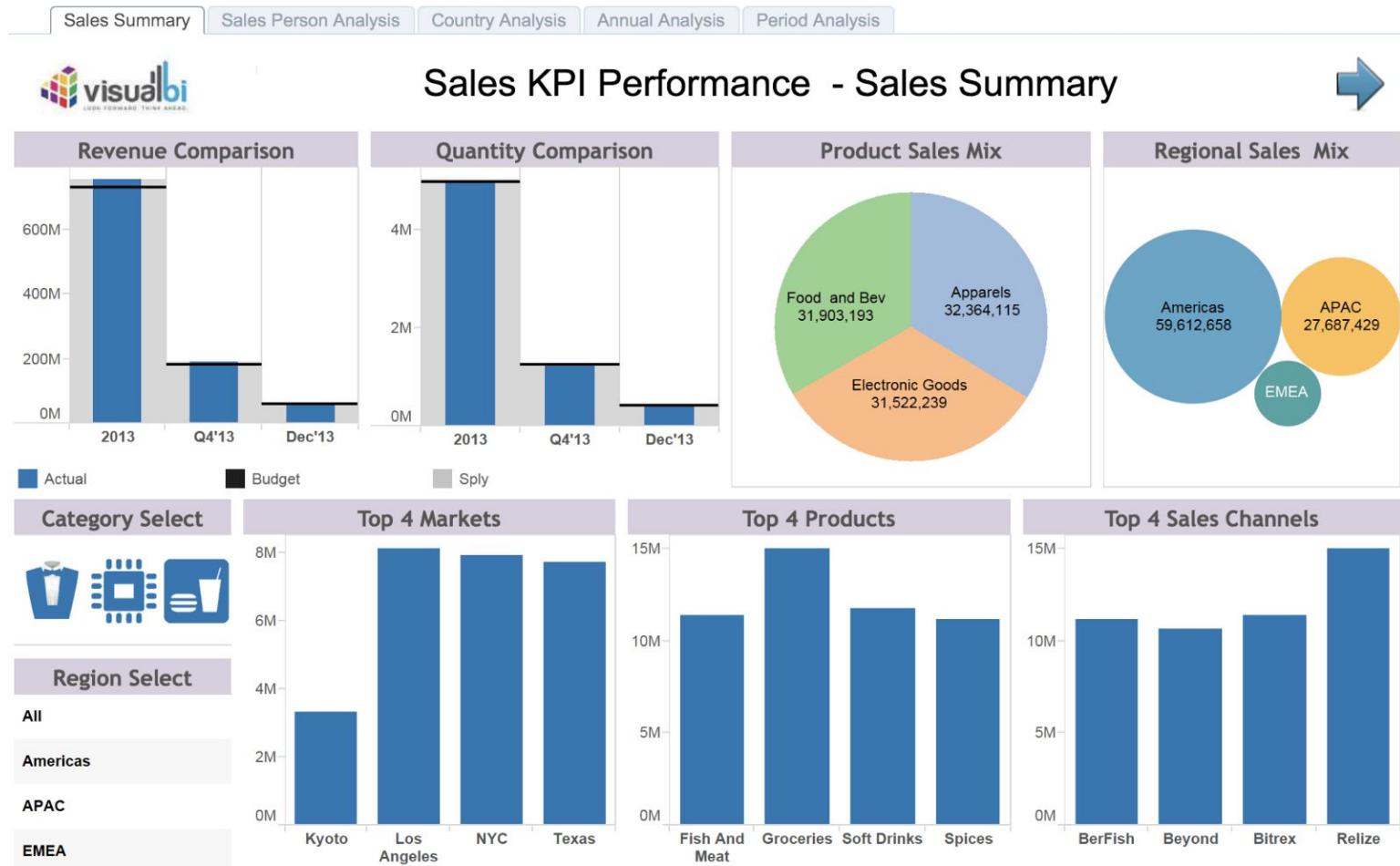
# The Users

- a boardroom environment
  - a small collection of senior colleagues who have existing domain subject knowledge
- a one-to-one exchange with a manager
- large range of customers
  - covering all social demographics but potentially representing a captive audience for the subject matter
- a completely global
  - undefined audience with no influencing characteristics—in a sense no specific target, just anyone and everyone
- an entirely personal engagement between you and data

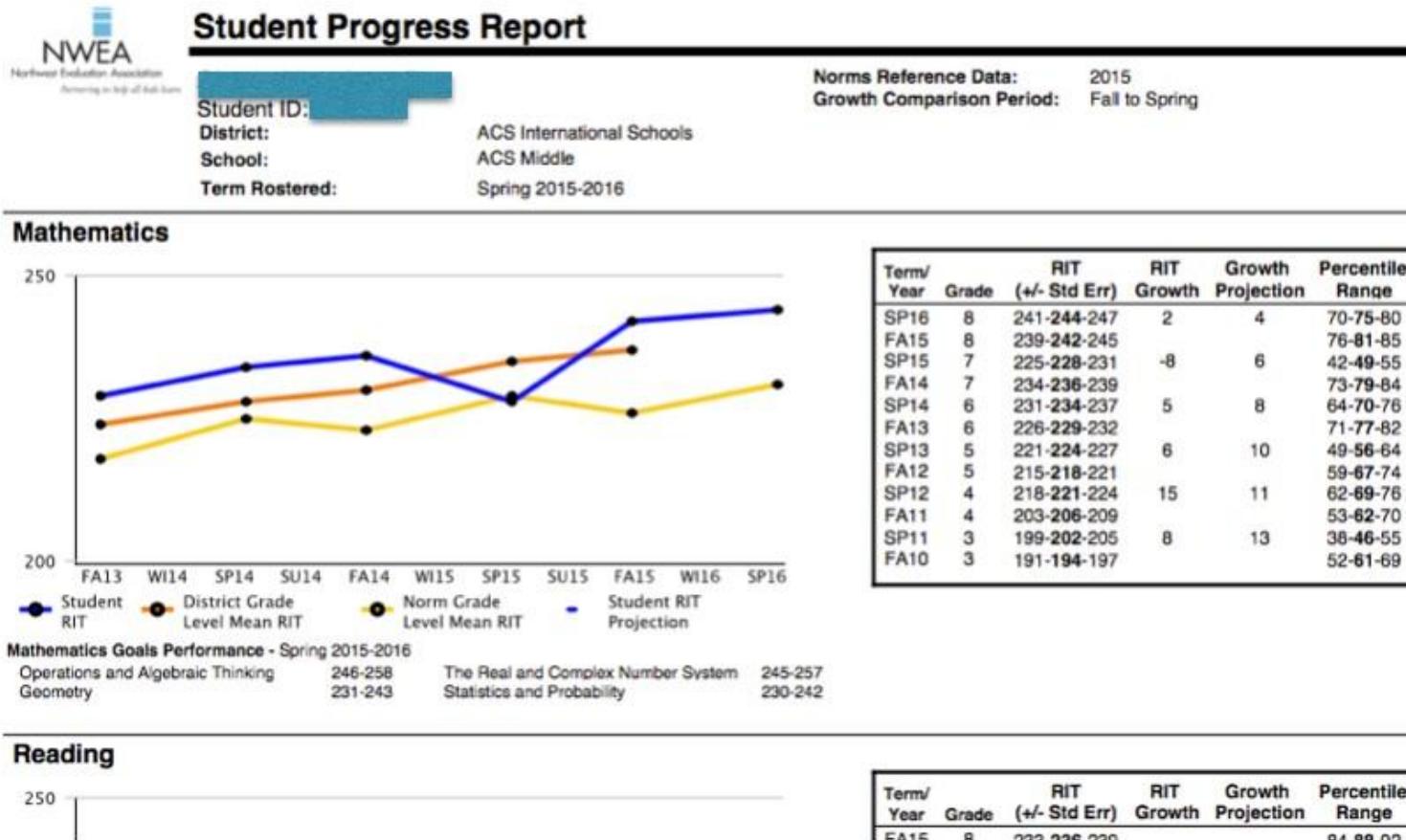
---

a desire to learn about and explore data yourself

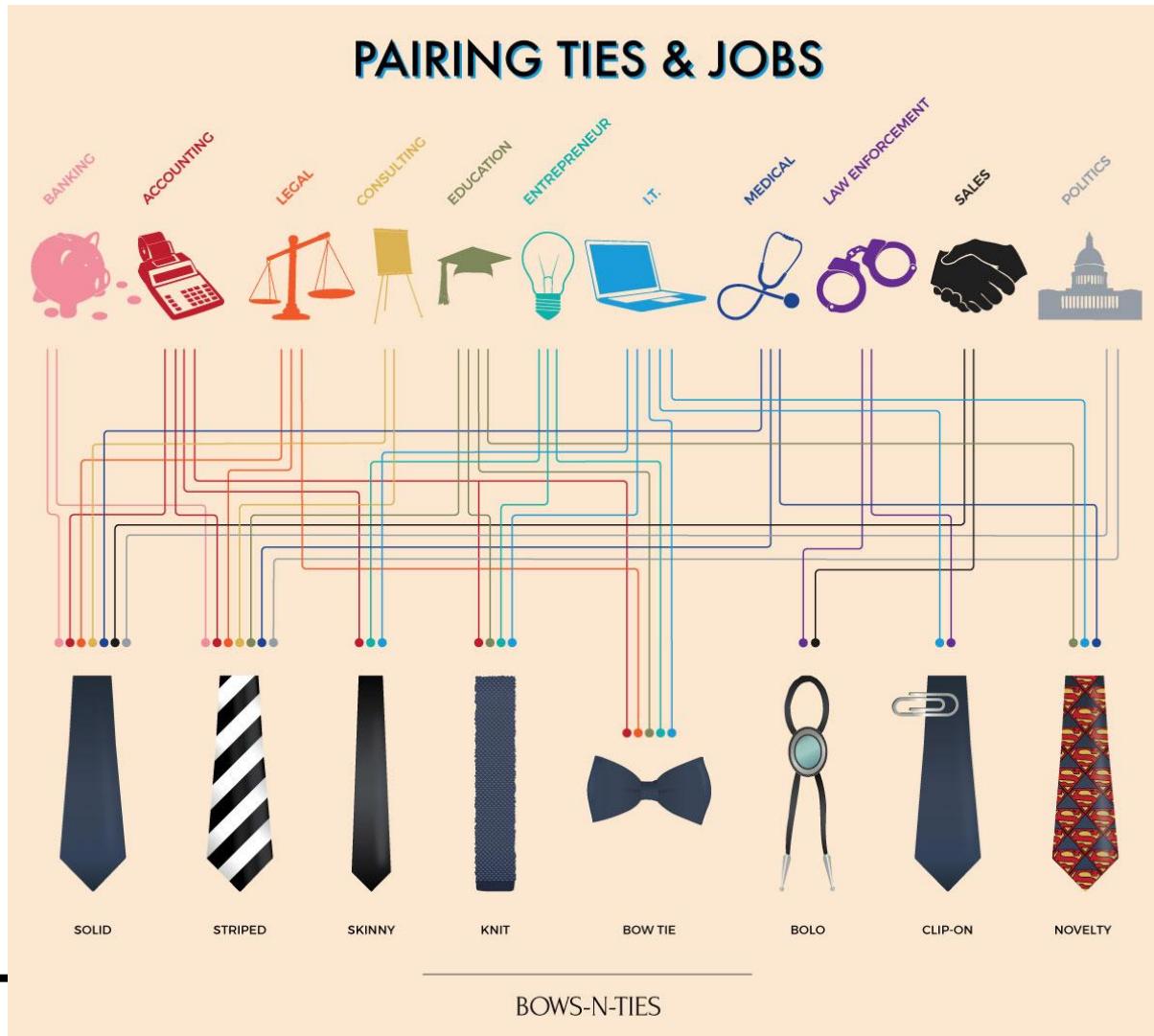
# The Users - Boardroom Environment



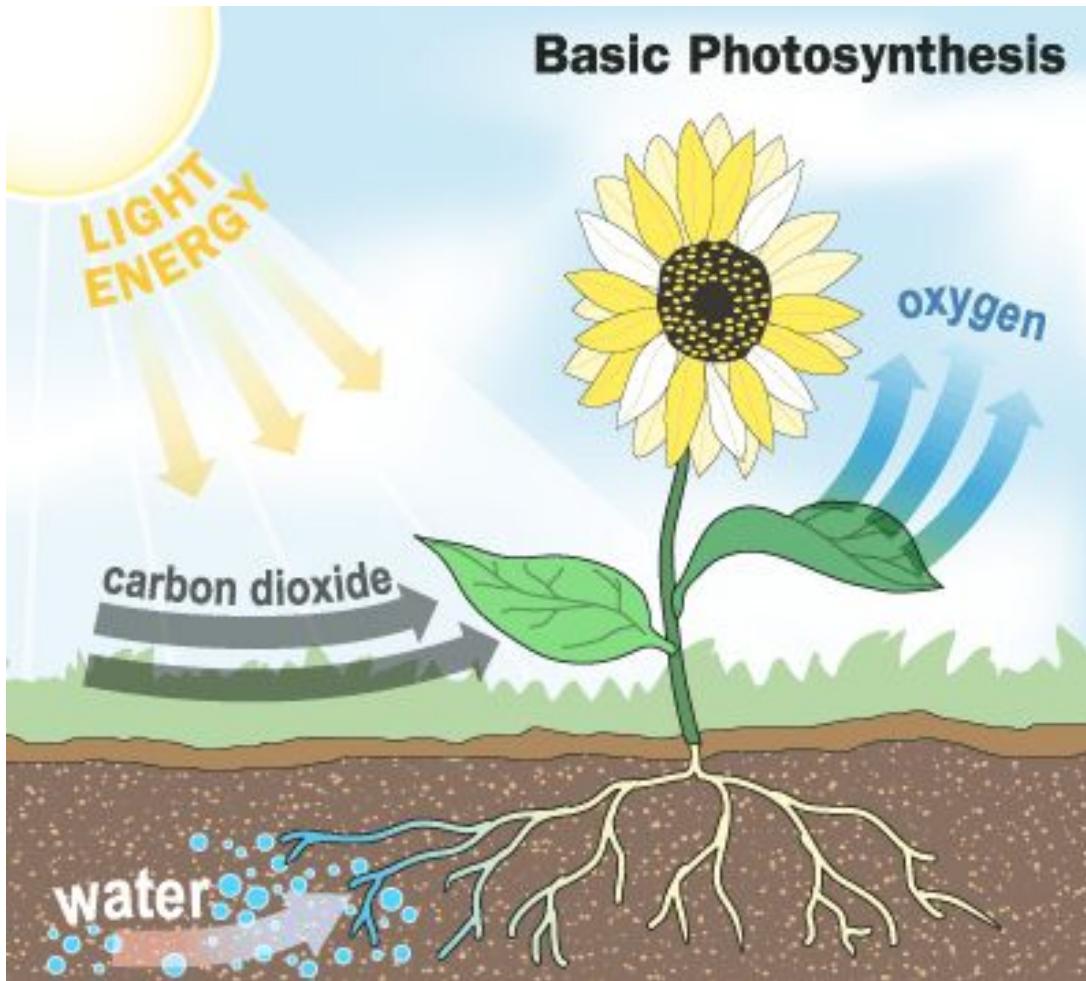
# The Users - One-to-One Exchange



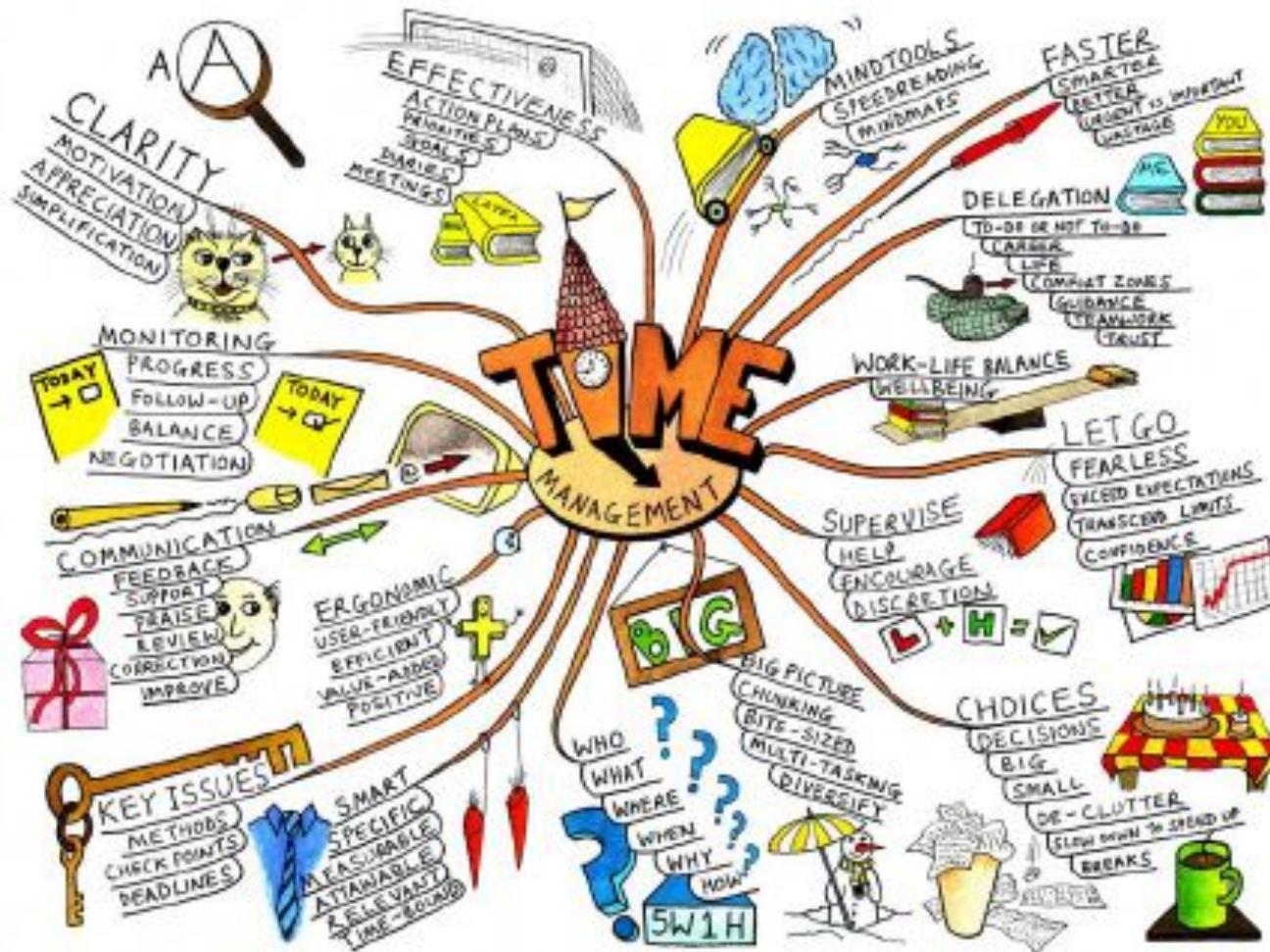
# The Users - Large Range of Customer



# The Users - A Completely Global



# The Users - Entirely Personal Engagement



# Establishing intent : Visualization's function

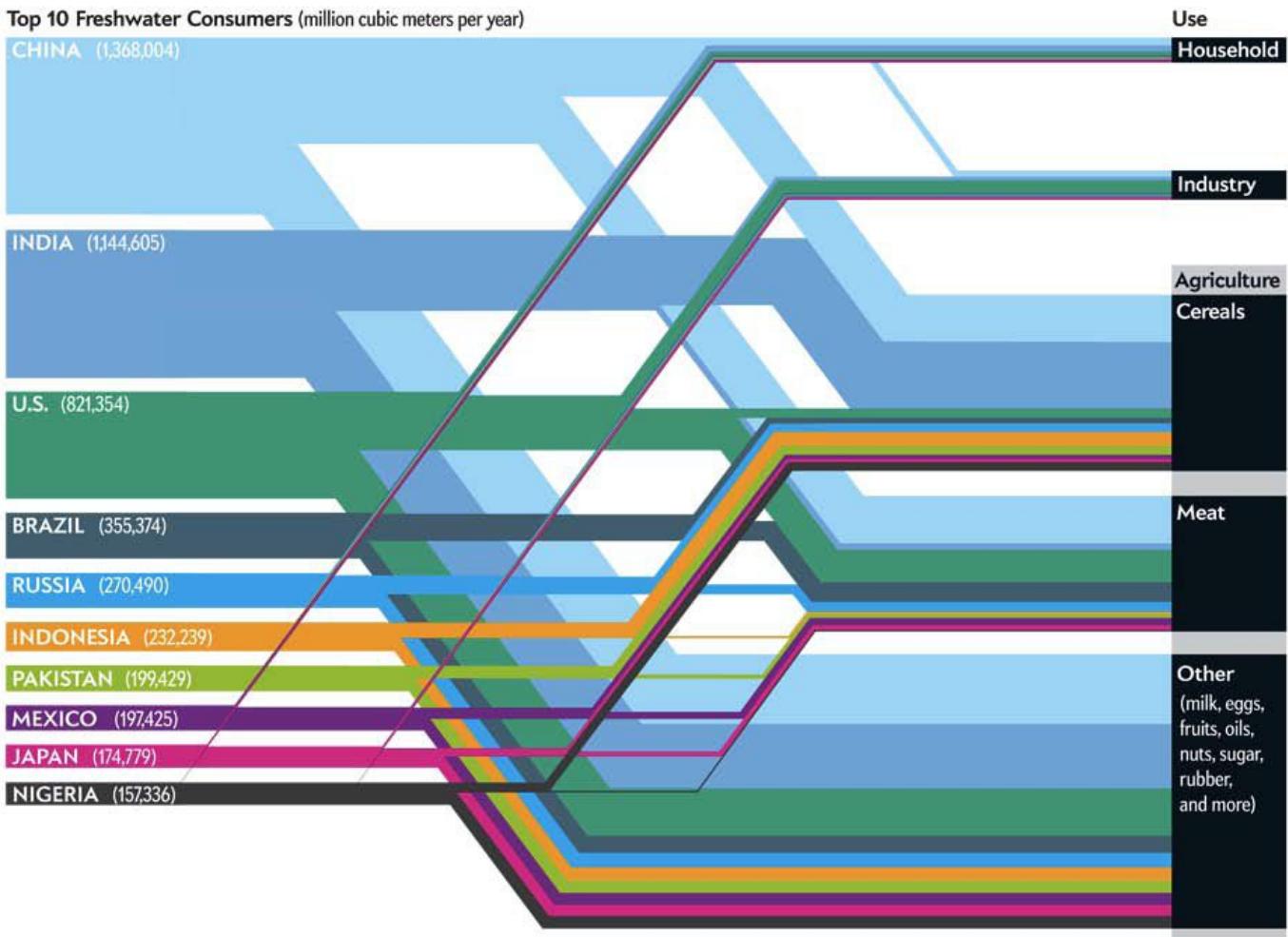
1. Convey an **explanatory** portrayal of data to a reader
2. Provide an interface to data in order to facilitate visual **exploration**
3. Use data as an **exhibition** of self-expression

# When the function is to explain

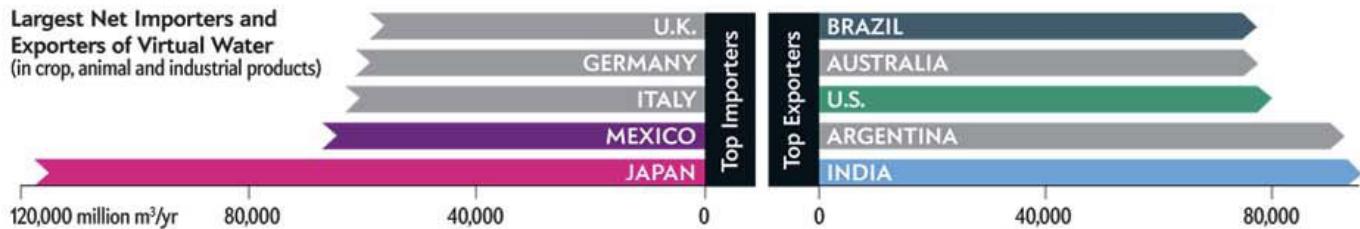
- Conveying information to a reader in a way that is based around a specific and focused narrative.
- Objective:
  - to create a graphical display made accessible through intuitive, visual design that clearly portrays the narrative you are seeking to impart.
- End result:
  - typically a visual experience built around a carefully constructed narrative.

# Explanatory Data Visualization Examples

- an information dashboard in a corporate setting, to convey the latest performance figures and highlighting the key issues requiring attention.
- a graphic in a newspaper, explaining the complexity and severity of the problems around the economic crisis.
- an animated design to display patterns of population migration over time.



Largest Net Importers and Exporters of Virtual Water  
(in crop, animal and industrial products)



Analysis of the top ten freshwater-consuming countries and the breakdown of its usage



# KNOW YOUR *Coffee*

ESPRESSO



ESPRESSO  
MACCHIATO



ESPRESSO  
CON PANNA



CAFFÈ LATTE



CAFÉ AU LAIT



CAFFÈ BREVE



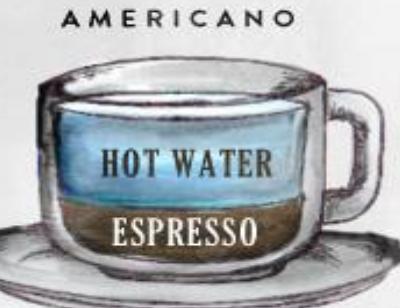
CAPPUCCINO



CAFFÈ MOCHA



AMERICANO

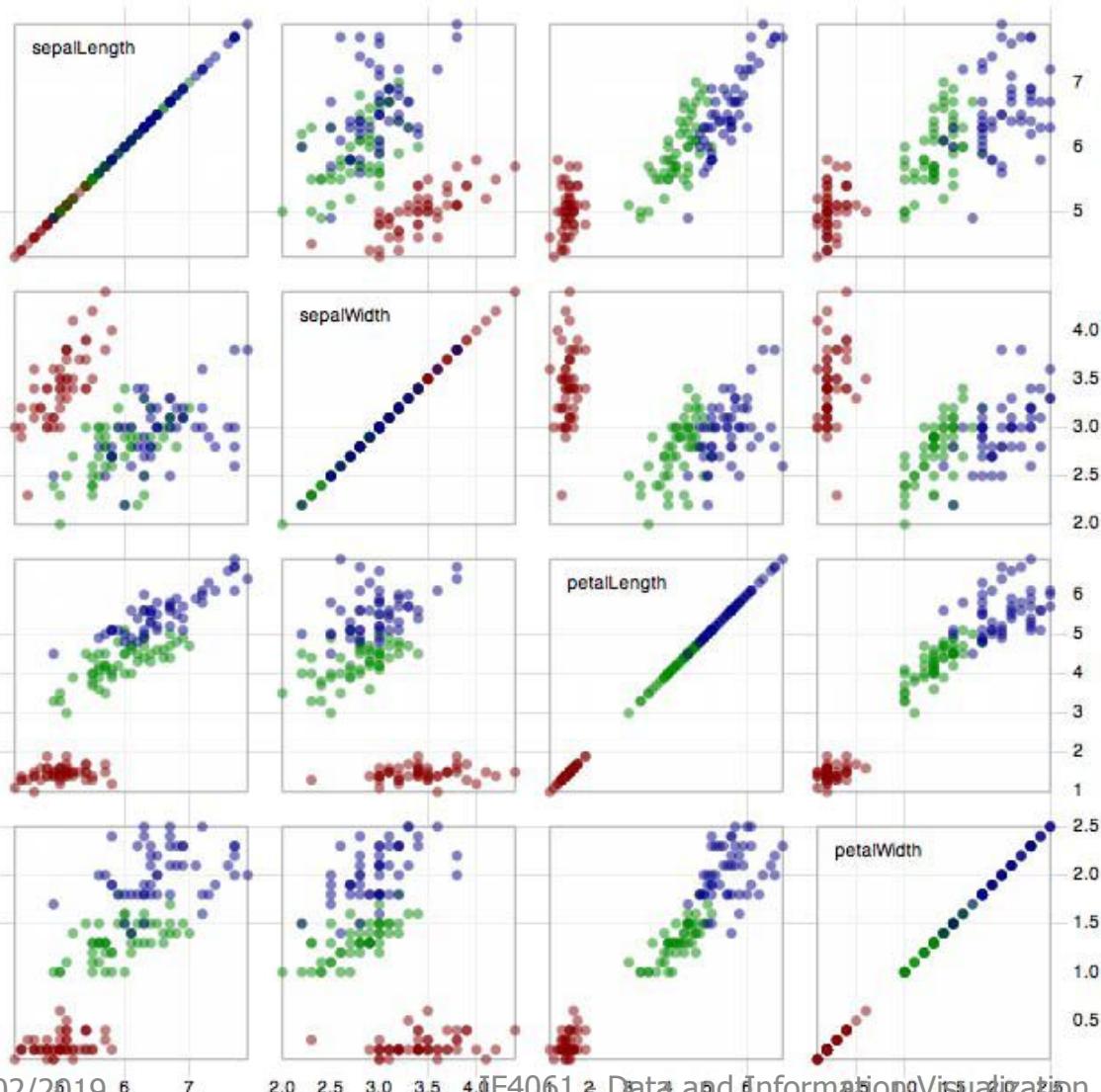


[WWW.MANNERANDLANE.COM](http://WWW.MANNERANDLANE.COM)

# When the function is to explore (1)

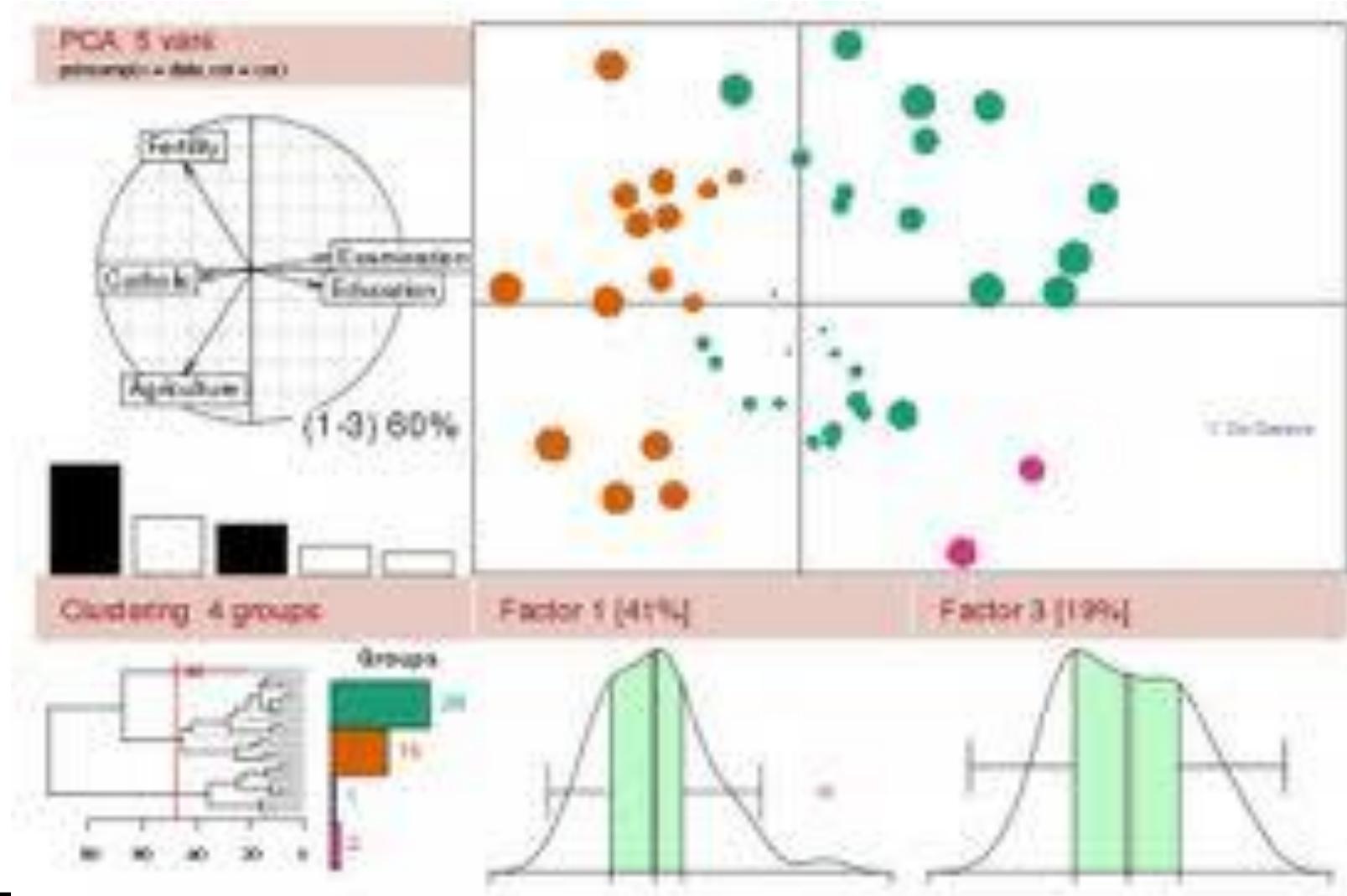
- Seeking to facilitate the **familiarization** and **reasoning of data** through a range of user-driven experiences.
- Objective:
  - to create a tool, providing the user with an interface to visually explore the data.

# Example: a scatterplot matrix visualization



A method used to reveal correlations across a multivariate dataset, enabling the eye to efficiently scan the entire matrix to quickly identify variable pairings with strong or weak relationships

# Example



# Features for Data Investigation

- Filtering
- Sorting
- Brushing (selecting or isolating certain data values)
- Variable adjustment
- View modification

*(will be discussed in Chapter 4, Preparing and Familiarizing with Data)*

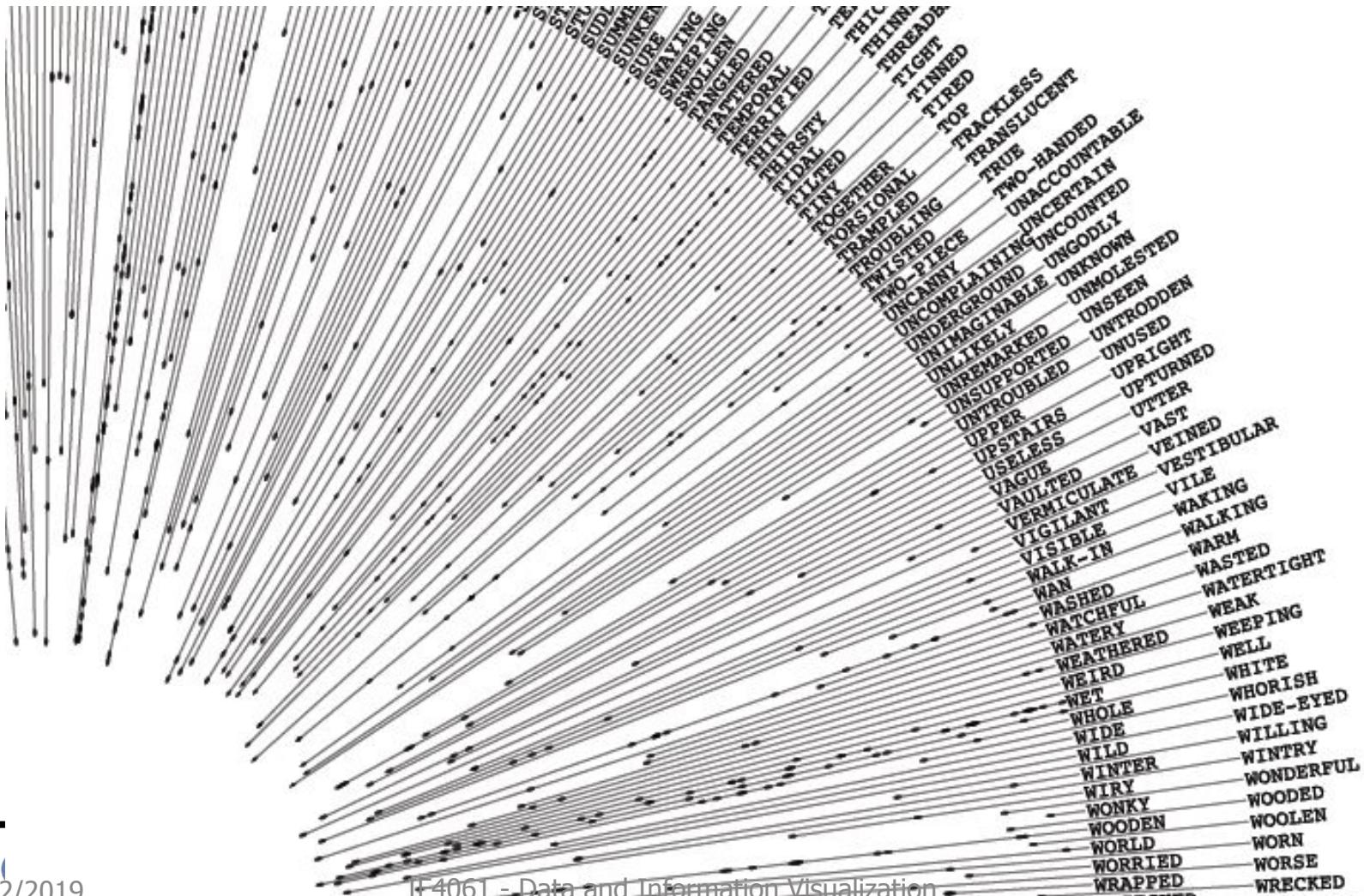
Explanatory	Exploratory
Based around a <b>specific</b> and focused narrative	<b>Lack</b> a specific, single narrative
More about visual <b>presentation</b> of data	More about visual <b>analysis</b>
Create a <b>clear portrayal</b> of the interesting stories and analysis from a dataset	Create a visualization to seek out <b>personal discoveries</b> , patterns, and relationships, thereby triggering and iterating <b>curiosities</b>
There will be one <b>specific finding</b> defined <b>beforehand</b>	Opens up the possibility for chance or <b>serendipitous findings</b> caused by forming different combinations of variable displays

# When the function is to exhibit data

- The intention is **removed from** a pure desire to inform.
- Objective:  
Form of exhibition or self-expression through data representation.
- This genre of work embodies the term "**data art**".

# Example:

## Visualizes all the adjectives used in Cormac McCarthy's book *The Road*.



# Establishing intent: Visualization's tone (1)

- It concerns the type of stimulus or desired emotional response that you are trying to create
  1. Pragmatic or analytical portrayal
  2. Emotive or abstract concept
- It is important to be able to reason what sort of design will achieve that tone

# Establishing intent: Visualization's tone Example

- “We need chart to help monitor...”
  - The reaction of a **user reading**, for example, a dashboard full of bar charts and line charts to help monitor monthly performance will be quite analytical and pragmatic in style.
  - It is **unlikely** to involve or stir much emotion (unless things are suddenly and unexpectedly plummeting).

# Pragmatic Tonal Example: taken from a project analyzing Olympic results over the years



# Establishing intent: Visualization's tone Example

- "We need to present this in a way that persuades people..."
  - the **intended impact** of a presentation such that depicts how many lives could be saved if a charity was able to achieve a certain level of fundraising.
  - The setting and intent will be more about **persuasion** making it emotionally charged.
  - It will need to attempt to create an experience that is much more personal and more **impactive**.
  - effective if it evoked a suitably positive **emotional response** to the data story.

# Emotive and Abstract

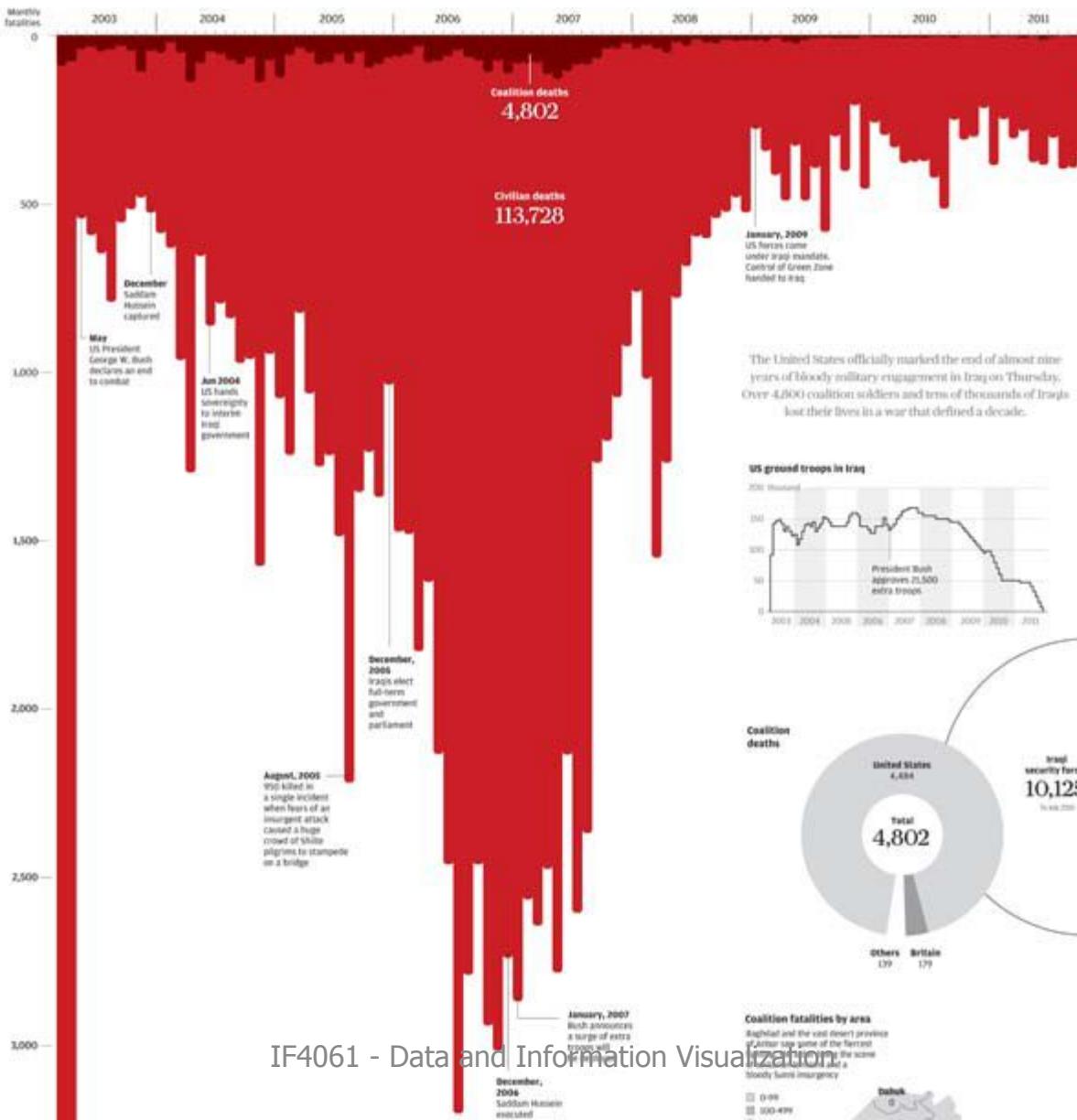
*"I have a fear that we aren't feeling enough, we aren't able to digest these huge numbers."*  
(Chris Jordan, TED2008)

- The tonal intent is much more **emotive** and/or **abstract** in form.
  - Sometimes you just want to and need to **move beyond** bars, straight lines, and right angles and **more towards** curves, circles, and other bendy things.
  - Abstract visualization, in terms of its tone, is more about creating an **aesthetic** that portrays a general story or sense of pattern.
- You might not be able to pick out every data point or category, but there is enough visual information to give you a feel for the physicality of the data.

# Example (1)



# Iraq's bloody toll





Initiator

Data Scientist

Journalist

Computer Scientist

Designer

Cognitive Scientist

Communicator

Project Manager

# Home works

- Read:
  - Key factors surrounding a visualization project and
  - The "eight hats" of data visualization design