Visual Analytics

Communicating data-driven insights through data visualization techniques and useful dashboards

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0. Introduction

0.1 Key points

- **Data driven**: as seen in Onieva's and Lorenzo's lectures
- **Insights**: que usen las características gráficas
- **Data visualization techniques**: para obtener las los insights
- **Dashboards**: as *situattion awareness* tools

Tableau Desktop para práctica r

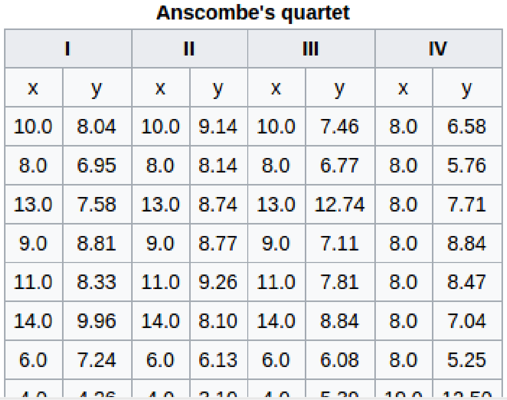
0.2 Why use visualization

- Sight is our most developed sense
- The visual system provides a very high-bandwidth channel to our brains
- A significant amount of visual information processing occurs in parallel at the preconscious level
- The human brain is *trained* to identify visual patterns
- Summary statistics have the intrinsic limitation of data loss

Speaker notes

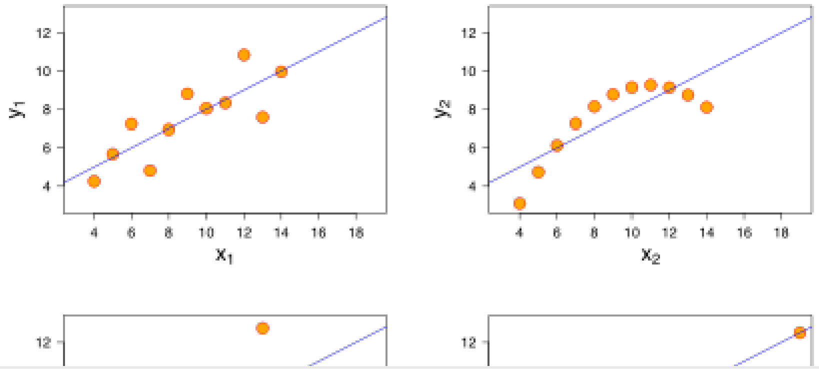
Implications of visual perception relevant to visualization design on next section

0.2 Why use visualization



Anscombe's quartet

I		II		III		IV	
x	y	x	y	x	y	x	y
10.0	8.04	10.0	9.14	10.0	7.46	8.0	6.58
8.0	6.95	8.0	8.14	8.0	6.77	8.0	5.76
13.0	7.58	13.0	8.74	13.0	12.74	8.0	7.71
9.0	8.81	9.0	8.77	9.0	7.11	8.0	8.84
11.0	8.33	11.0	9.26	11.0	7.81	8.0	8.47
14.0	9.96	14.0	8.10	14.0	8.84	8.0	7.04
6.0	7.24	6.0	6.13	6.0	6.08	8.0	5.25
4.0	4.26	4.0	3.10	4.0	5.39	19.0	12.50



Speaker notes

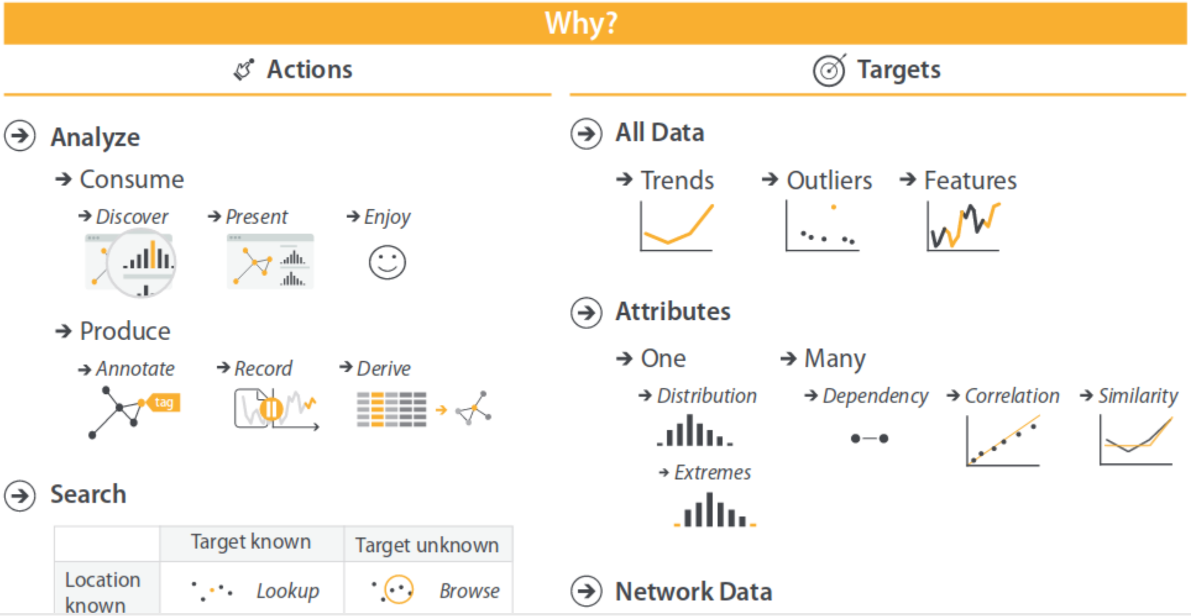
Traditional summary statistics can be misleading. These datasets share almost identical mean, variance, correlation and linear regression lines.

1. Shows *normal* distribution
2. There is correlation, but it's not linear
3. There is correlation, it IS LINEAR, but different from what emerged from the data
4. No relationship whatsoever. Outlier is enough for *apparent* correlation

Bottom line: summary statistics, although very sensitive to outliers, are important, but plotting the data (visualization) is also a necessary step during the first stages of the data analytics process, before making any assumptions.

Munzner 2014 p.8

0.3 What to use visualization for



Speaker notes

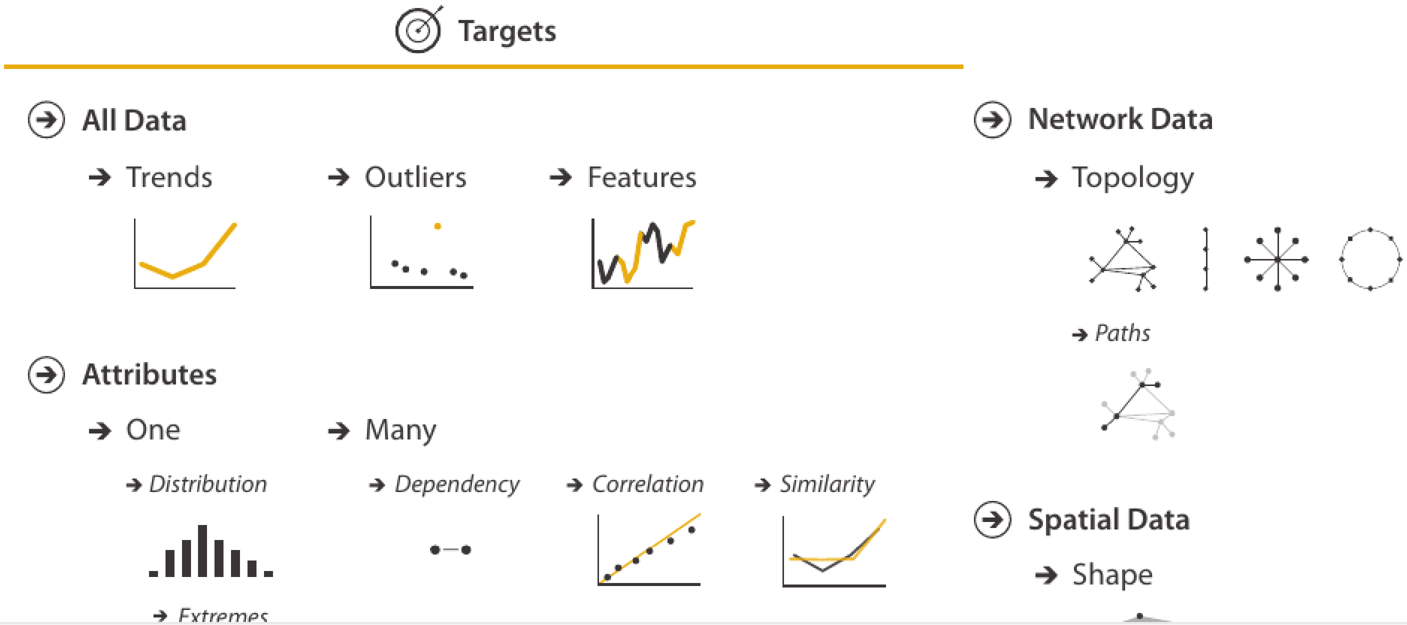
What are we using visualization for?

Important to answer to this question in an **abstract form**, instead of domain-specific.

We are going to divide into

- *targets* = nouns
- *actions* = verbs

0.3 What to use visualization for



Targets

All Data

→ Trends → Outliers → Features

Attributes

→ One → Many

→ Distribution → Dependency → Correlation → Similarity

→ Extremes

Network Data

→ Topology

→ Paths

Spatial Data

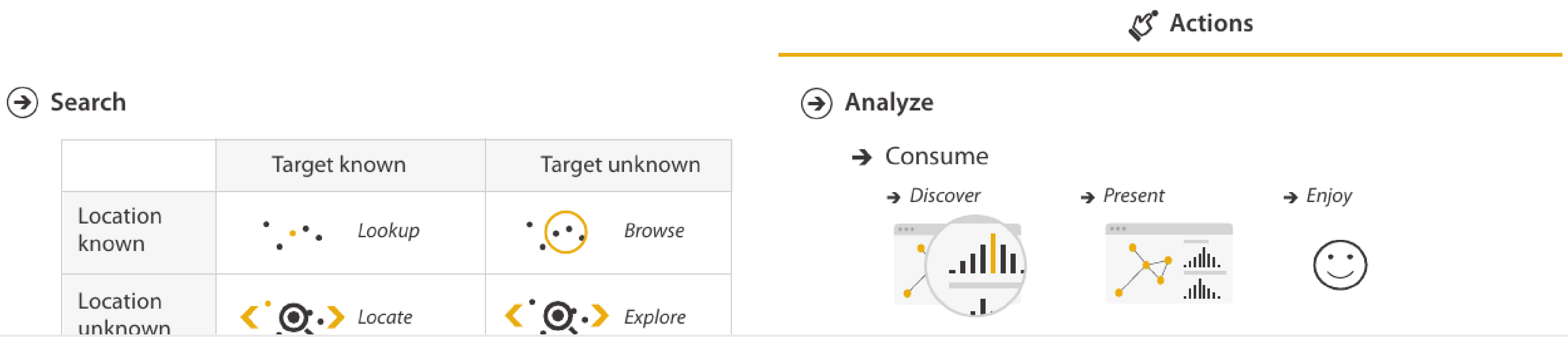
→ Shape

Speaker notes

- Very broadly relevant for all kinds of data: trends, outliers, features
- One attribute/variable: find an individual value, distribution of all values, find extremes
- Many attributes: dependency, correlation, similarity
- The rest (network/spatial) are specific to certain types of datasets

The abstract task of understanding **trends, outliers, distributions and correlations** are extremely common reasons to use data visualization.

0.3 What to use visualization for



Actions

Search

	Target known	Target unknown
Location known	Lookup	Browse
Location unknown	Locate	Explore

Analyze

Speaker notes

- Search for an element of interest (based on knowledge of identity & location)
  - lookup: humans in tree vis of species of mammals
  - locate: where are rabbits? lagomorphs – not rodents
  - browse: when users don’t know exactly what they’re looking for but have an idea of characteristics
  - explore: not sure of either one
- Once a target or set of targets is identified, query those at one of 3 scopes (progression from one to many to all targets)
  - identify (US election map example)
  - compare, more difficult, requires more sophisticated idioms
  - summarize = overview (extremely common)
- Analyze data:
  - consume (most common use case): discover, present (known info, i.e. insights), enjoy (for the fun of it)
  - produce: annotate, record (capture steps), derive (produce new data elements)

0.3 What to use visualization for

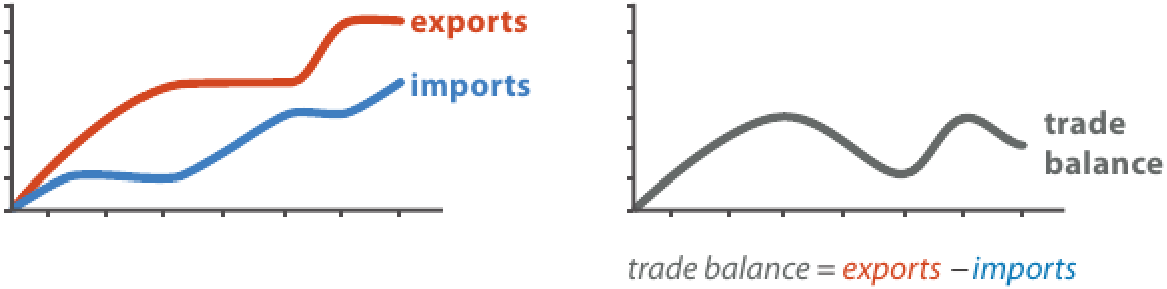
> *There is a **strong relationship** between the form of the data (the attribute/variable and dataset types) and what kinds of vis[ualization] idioms are effective at displaying it. (…) Don't just draw what you are given; decide what the right thing to show is, create it with a series of **transformations** from the original database, and draw*

Speaker notes

Transformation (=derive) may be required depending on the desired type of insight – derived attributes/variables extend the original dataset

- in some cases, the same data with a change of type (temperature *vs.* "hot" or "cold")
- in other cases, access to additional info is required (geo: city name to lat/lon)
- created through arithmetic, logaritmic or statistial operations (i.e. diff field)

0.3 What to use visualization for



trade balance = *exports* − *imports*

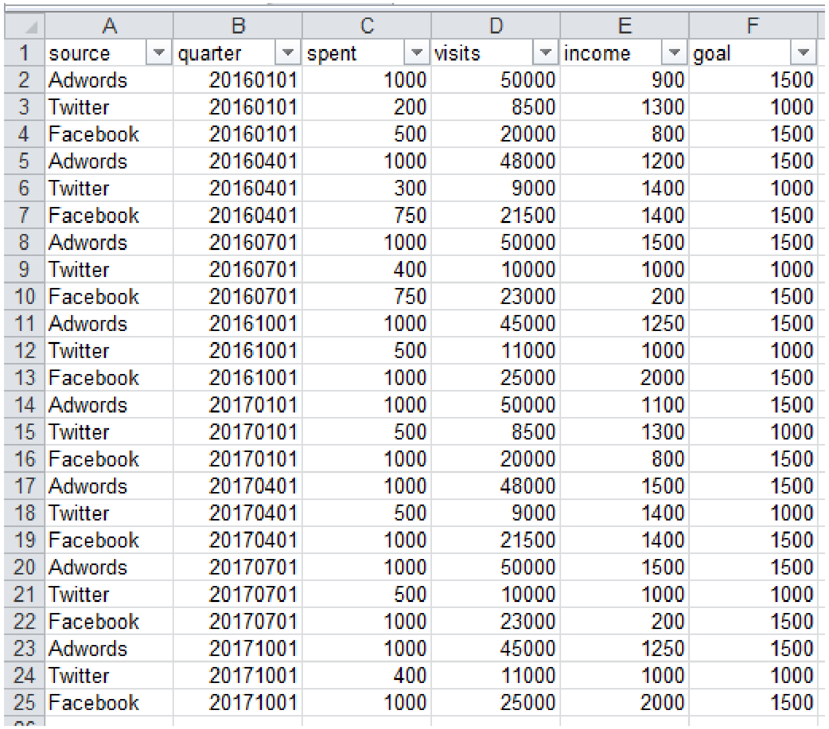
Original Data

Derived Data

Derived attributes can be directly visually encoded. Munzner 2014, p.52

Practice: meet our sample data

Download and open `data.xls` from Google Drive: fake data for online marketing goals and tools



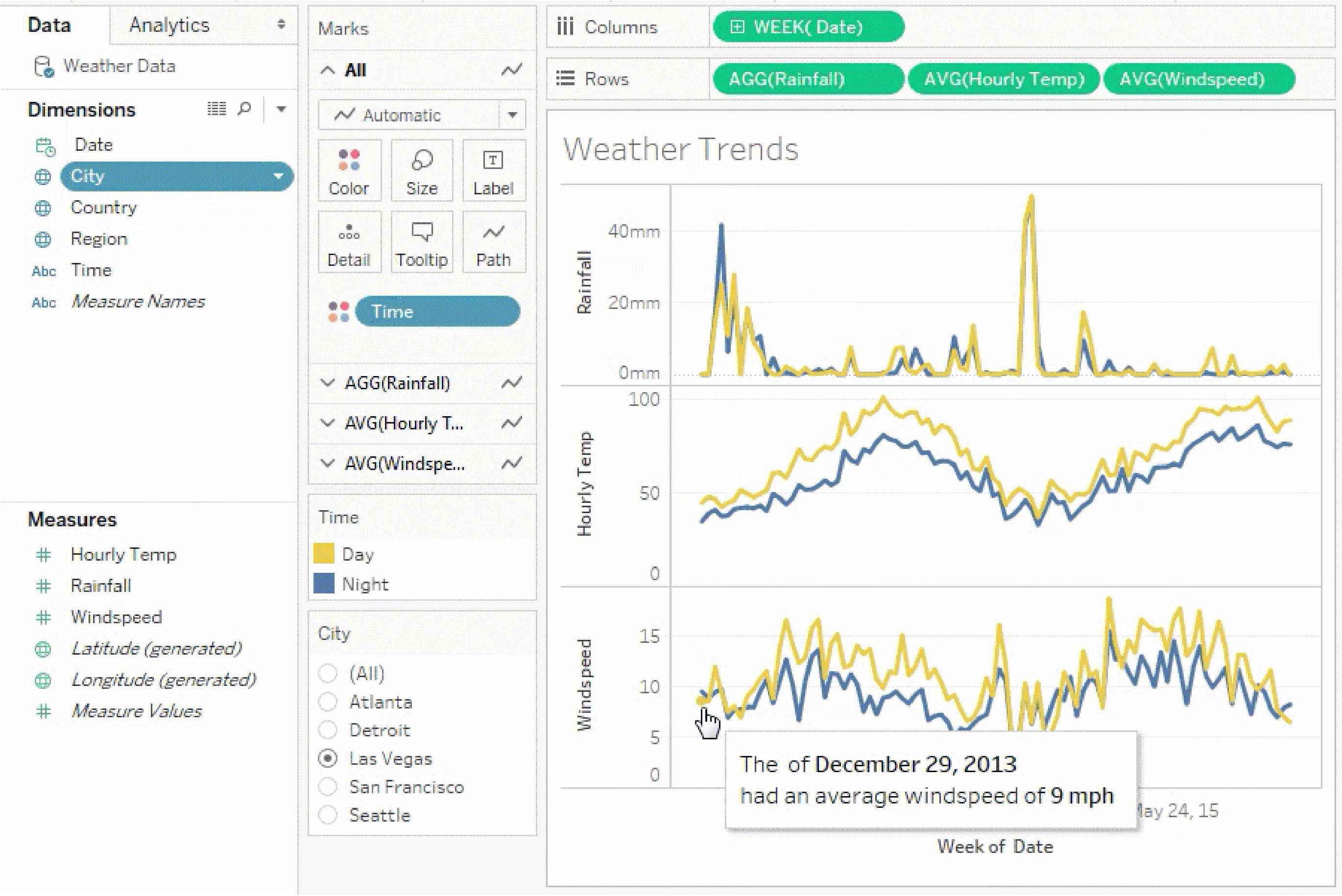
	A	B	C	D	E	F
1	source	quarter	spent	visits	income	goal
2	Adwords	20160101	1000	50000	900	1500
3	Twitter	20160101	200	8500	1300	1000
4	Facebook	20160101	500	20000	800	1500
5	Adwords	20160401	1000	48000	1200	1500
6	Twitter	20160401	300	9000	1400	1000
7	Facebook	20160401	750	21500	1400	1500
8	Adwords	20160701	1000	50000	1500	1500
9	Twitter	20160701	400	10000	1000	1000
10	Facebook	20160701	750	23000	200	1500
11	Adwords	20161001	1000	45000	1250	1500
12	Twitter	20161001	500	11000	1000	1000
13	Facebook	20161001	1000	25000	2000	1500
14	Adwords	20170101	1000	50000	1100	1500
15	Twitter	20170101	500	8500	1300	1000
16	Facebook	20170101	1000	20000	800	1500
17	Adwords	20170401	1000	48000	1500	1500
18	Twitter	20170401	500	9000	1400	1000
19	Facebook	20170401	1000	21500	1400	1500
20	Adwords	20170701	1000	50000	1500	1500
21	Twitter	20170701	500	10000	1000	1000
22	Facebook	20170701	1000	23000	200	1500
23	Adwords	20171001	1000	45000	1250	1500
24	Twitter	20171001	400	11000	1000	1000
25	Facebook	20171001	1000	25000	2000	1500

Speaker notes

Shows results of campaigns in three different sources, per quarters (trimester). Money spent in each source, number of visits got from that campaign, income generated, and goal income for each source.

Takes for granted many things, such as validity/reasonability of goals, of spent money per goal…

Tableau Software



The of December 29, 2013
had an average windspeed of 9 mph

Tableau Software

Tableau

1. Load data

Speaker notes

- Possible to *merge* more sources (or **Connections**), only one for our practice – might require to define `New Union` to determine how merge takes place
- Shows the only sheet in the file, may be more
- `Connection > Live/Extract`, first one allows to modify source file and update work accordingly

Interprets the `source` field as `Abc`, rest as # (well done). Only, we would rather improve the `quarter` interpretation as `Date` instead of `Number`

Green & blue: **blue fields** are discrete, **green fields** are continuous. We'll see implications of this later on. For now, it's all good

Rename, hide… fields

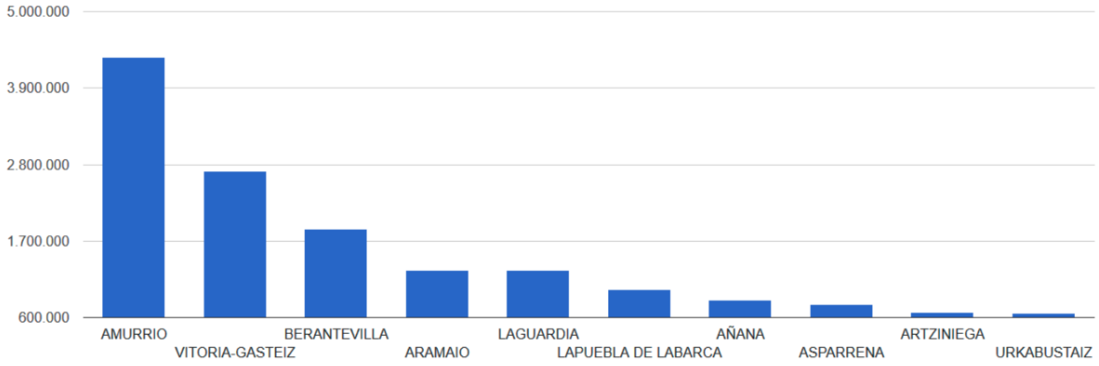
The Excel > Tableau convert is quite straightforward (does a good job), more complex sources may require more manipulation at this point

This screen allows to preview how Tableau is interpreting our dataset: we are not allowed to change values, only variable interpretations

The source file (`data.xls`) is never modified

1. Graphics

```
ABERASTURI;1025880,88
ABETXUKO;1626,20
ABEZIA;183184,81
ABORNIKANO;54530,28
ACEBEDO;13519,09
ACOSTA;64930,00
ADANA;53139,42
AGIÑAGA;314344,94
ALAITZA;75534,95
ALBENIZ;61152,16
ALCEDO;21313,54
ALDA;27922,86
ALEGRIA-DULANTZI;142607
3,93
```



Speaker notes

Dataset showing town name and amount of subsidies (funds) received in a given year. How do you think we could visualize this?

- visualization requires *mapping* or *translation* from *data* to *visual language* (idioms)
- this can be done in many ways

1. subsidy amount = bar height, color irrelevant
2. to show in map **transformation is required** (not possible directly)

- color IS relevant (subsidy amount = color saturation)
- comparison is more difficult: not *ordered* (althoug not impossible)
- allows for more direct insight (if context - knowledge of the area): Vitoria-Gasteiz not getting the higher amount

3. anything else? (i.e. pie chart, treemap…)

1.1 Reminder: variable types

- Quantitative
  - Continuous
  - Discrete
- Qualitative
  - Categorical
  - Ordinal

A question of time

Spatial and time/hour variables are special variable types. **Time variables** are specially complex:

- are there 365 days in every year? 30 days in every month? 24 hours in every day?
- *timezones* make it even more complex to use hours or time of day

Time may be used as a continuous or as a qualitative variable.

Speaker notes

- continuous variables can take on infinite/uncountable values (time, real numbers)

- discrete variables can take a finite/countable number of values (periods of time, integers)

- categorical/nominal: two or more categories, any order (gender, political party…). Cannot be quantified, do not allow arithmetic operations, cannot be assigned any order

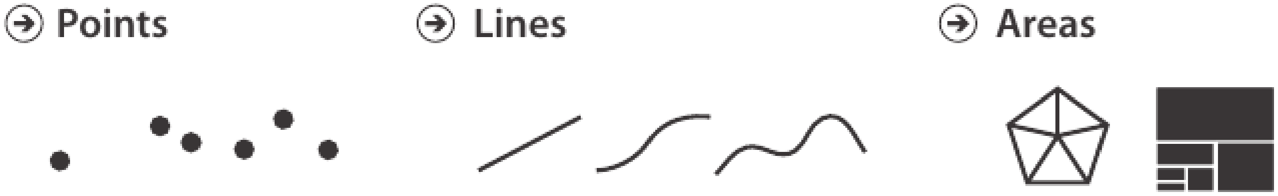
- ordinal: allows for rank order (1st, 2nd, 3rd…). Can be dichotomous (yes/no, right/wrong, sick/healthy…) or non-dichotomous (spectrum of values: completely agree, mostly agree, mostly disagree, completely disagree)

1.2 Mapping variables to graphs

Understanding **marks and channels** provides the building blocks for analyzing visual encodings (Munzner 2014, p.95)

1.2.1 Marks

A **mark** is a basic graphical element in an image



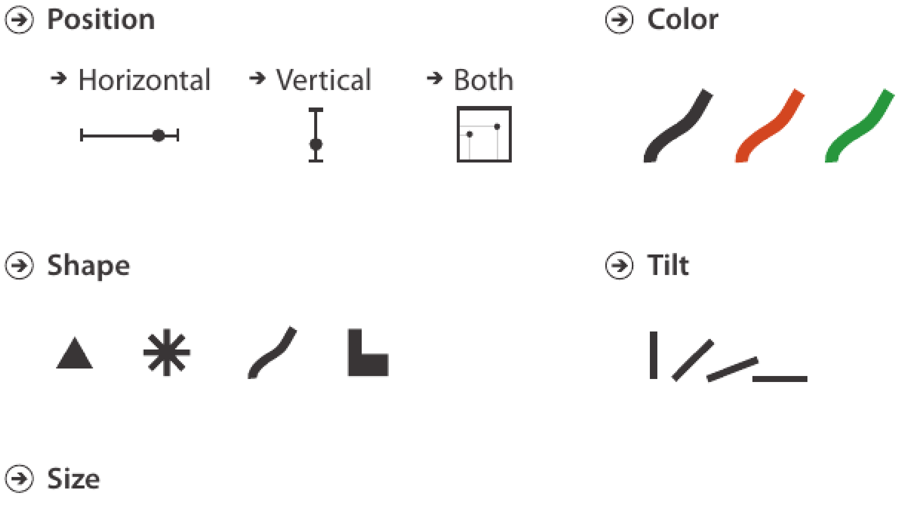
Marks are geometric primitives (Munzner 2014, p.96)

Speaker notes

- a zero-dimensional (0D) mark is a point
- a one-dimensional (1D) mark is a line
- a two-dimensional (2D) mark is an area
- a three-dimensional (3D) mark is possible but not frequently used (will see why)

1.2.2 Channels

A visual **channel** is a way to control the appearance of marks



Speaker notes

- spatial position (*where*)
- color, with three distinct aspects: hue, saturation, luminance (more in the next slide)
- size, one for each added dimension: length 1D, area 2D, volume 3D
- angle/tilt/slope
- others are shape, curvature

1.2.2 Channels

One and only one attribute/variable should be used per channel.

Multiple channels per attribute are possible (**redundant encoding**), but this approach has limitations.

Speaker notes

more channels are “used up”, so less attributes can be encoded in total,

BUT the attributes that are shown will be very easily perceived (i.e. color of political party for bar charts)

1.2.2 Channels

The **size** and **shape** channels cannot be used on all types of marks, but most combinations are still possible:

- lines have two *size channels*: length + width
- points refer to location but can be *size* and *shape* coded

Speaker notes

Area marks cannot typically be size or shape coded: state or country already has a certain size and shape

- lines: if length is *taken* by a variable, it can't be used for another one, but width can be used to size code. They can be made wider on an individual basis to encode an additional attribute, or an entire set of bars can simply be made wider in a uniform way to be more visible
- points: intrinsically convey information only about position and are exactly the vehicle for conveying additional information through area and shape (and color!)

1.2.3 Channel types

Two kinds of sensory modalities:

1. **Identity**: what, where
2. **Magnitude**: how much

It does not make sense to ask magnitude questions for shape, color hue. We can ask about magnitudes with length, area or volume; color luminance or saturation; and angle/tilt/slope.

Speaker notes

> *The human perceptual system has two fundamentally different kinds of sensory modalities. The **identity** channels tell us information about what something is or where it is. In contrast, the **magnitude** channels tell us how much of something there is (Munzner 2014, p.99).*

1.2.4 Using marks and channels

All channels are not equal.

The selection of marks and channels should be guided by

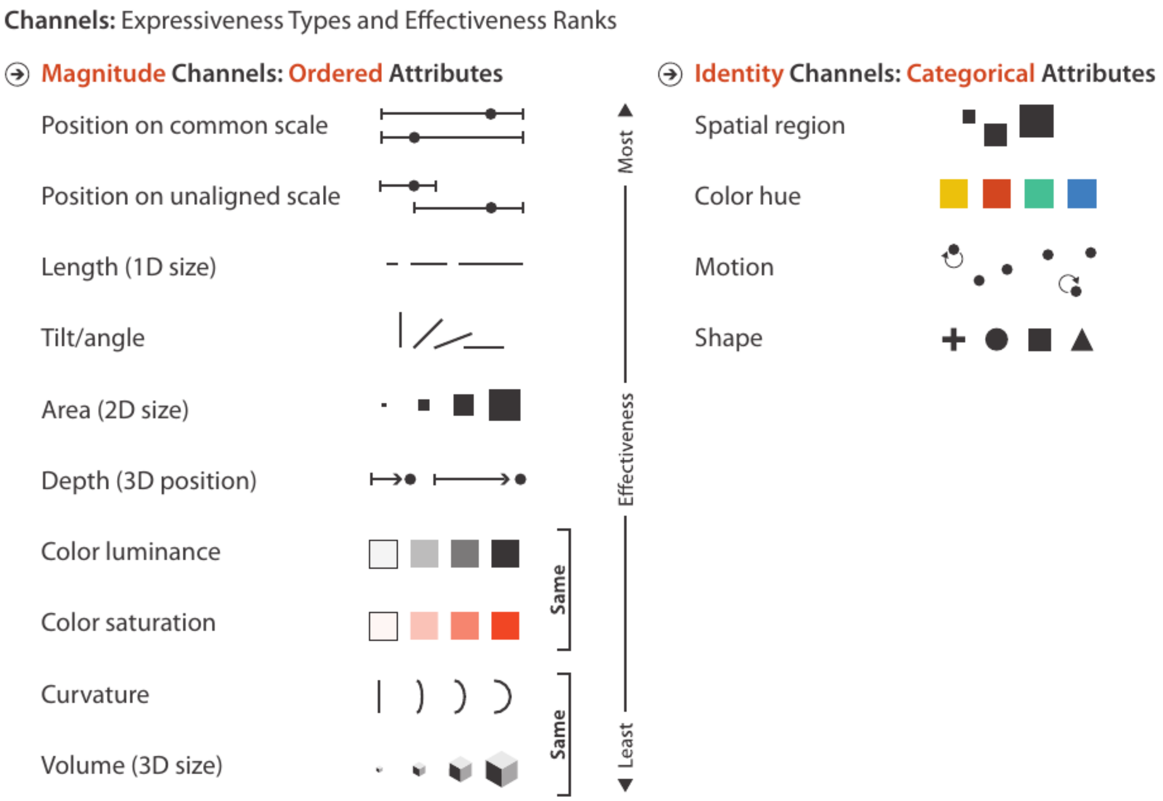
Speaker notes

> *the same data attribute encoded with two different visual channels will result in different information content in our heads after it has passed through the perceptual and cognitive processing pathways of the human visual system (Munzner 2014, p.100)*

- expresiveness: the visual encoding should express all of, and only, the information in the dataset attributes. Ordered data should be shown in a way that we perceive as ordered; unordered data SHOULD NOT be shown in a way that implies an ordering that does not exist.
- effectiveness: the importance of the channel (task abstraction, targets and actions) should match its salience, how noticeable it is. The most important attributes/variables should be encoded with the most effective channels, and less important attributes can be matched with less effective channels.

These can be combined to create a ranking of channels according to the type of data that is being visually encoded.

1.2.4 Using marks and channels



Speaker notes

Channels related to spatial position are at the top of both lists, and they are the only ones appearing on both lists (none of the others are effective for both data types). This primacy applies only to 2D positions, 3D depth is a much lower-ranked channel

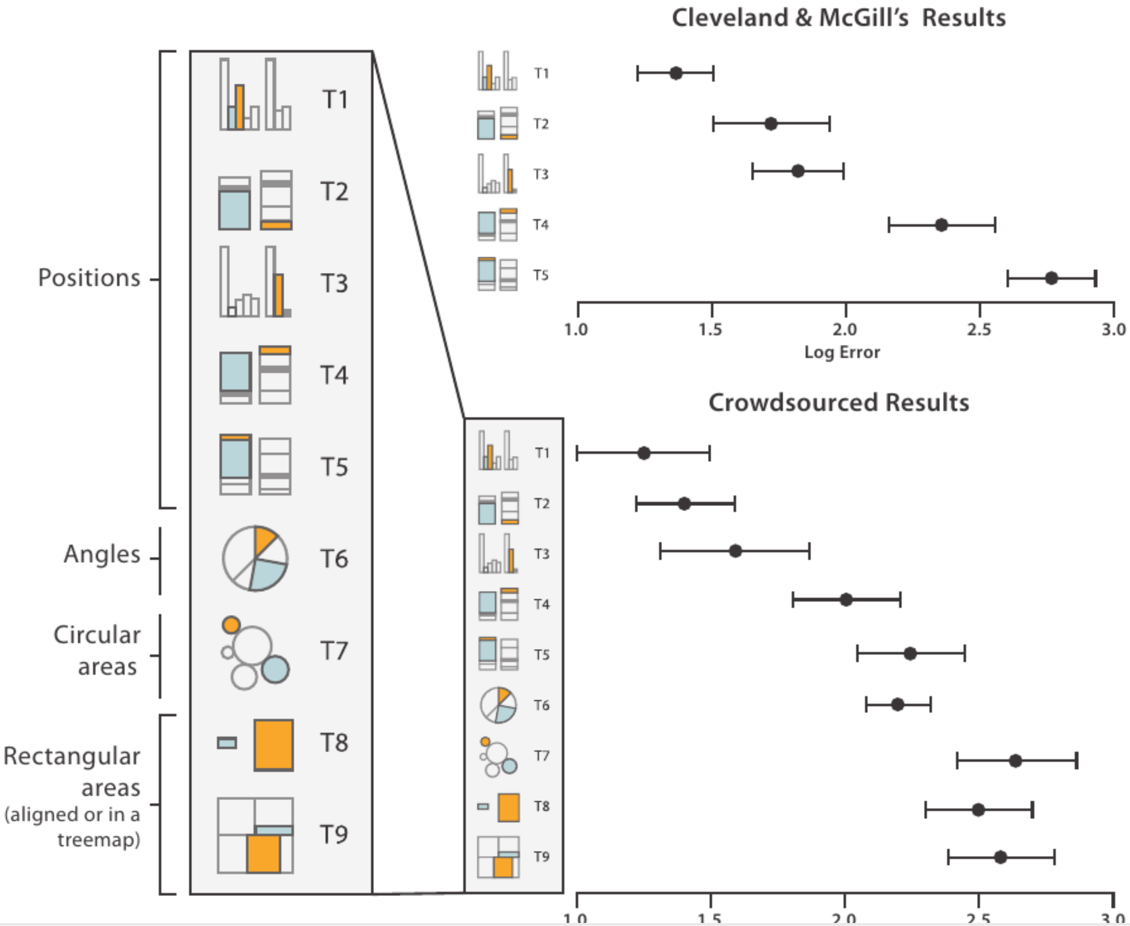
1.2.4 Using marks and channels

The choice of **which attributes/variables to encode with position** is the most central choice in visual encoding.

Speaker notes

the attributes encoded with position will dominate the user’s mental model –their internal mental representation used for thinking and reasoning– compared with those encoded with any other visual channel.

1.2.4 Using marks and channels



Speaker notes

Perceptual accuracy of each channel type: how accurate is the interpretation made by users depending on the type of channel used to represent certain data

1.3 So, which graph?

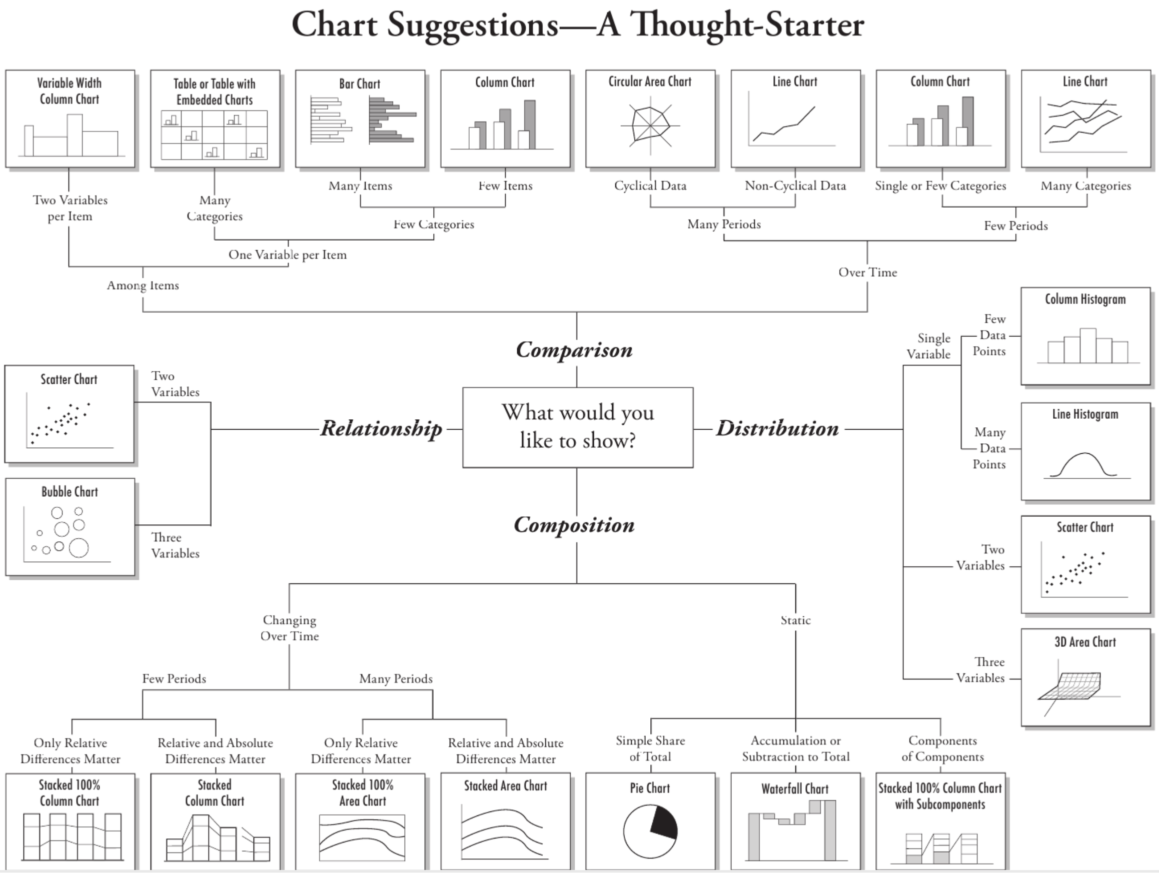


Chart Suggestions—A Thought-Starter

What would you like to show?

Comparison

Among Items

Two Variables per Item: Variable Width Column Chart

One Variable per Item

Many Categories: Table or Table with Embedded Charts

Few Categories

Many Items: Bar Chart

Few Items: Column Chart

Over Time

Many Periods

Cyclical Data: Circular Area Chart

Non-Cyclical Data: Line Chart

Few Periods

Single or Few Categories: Column Chart

Many Categories: Line Chart

Relationship

Two Variables: Scatter Chart

Three Variables: Bubble Chart

Distribution

Single Variable

Few Data Points: Column Histogram

Many Data Points: Line Histogram

Two Variables: Scatter Chart

Three Variables: 3D Area Chart

Composition

Changing Over Time

Few Periods

Only Relative Differences Matter: Stacked 100% Column Chart

Relative and Absolute Differences Matter: Stacked Column Chart

Many Periods

Only Relative Differences Matter: Stacked 100% Area Chart

Relative and Absolute Differences Matter: Stacked Area Chart

Static

Simple Share of Total: Pie Chart

Accumulation or Subtraction to Total: Waterfall Chart

Components of Components: Stacked 100% Column Chart with Subcomponents

Speaker notes

Variable types and insights (Munzner’s “targets”) as *ingredients*, which *recipes* can be used to *cook* data visualization?

There are many tools for this, represented only one.

Left column, `Data` tab:

- dimensions contain qualitative values
- measures contain numeric, quantitative values (you can apply calculations to them and aggregate them)

Reminder (blue *vs.* green, learn more):

- green = continuous. Its values are treated as an infinite range. Generally, continuous fields add axes to the view.
- blue = discrete. Its values are treated as finite. Generally, discrete fields add headers to the view.

Mapping variables to graphs is done, in Tableau, by dragging items from the left column to either: `Columns/Rows`, or `Marks`.

`Show me` tab displays the most common graphs and the minimum requirement of data for each graph. If graphs = recipes, lets us know which ingredients are required to cook a certain recipe.

Also works the other way round: if I select my ingredients from the left bar, the `Show me` tab highlights the recipes available for those ingredients.

(test some graphs) - Source only > table - add spent > table, pie chart etc

Fields can be used more than once (redundant coding) for easier identification, by dragging to more than one place. barchart income (rows) + source (columns), source to colour

Options in `Show me` are different from the `Marks` box. Show me only allows graphs that *make sense*, very basic and tested graphs. Marks allows to *force* graphs in case we need more complex displays. USE WITH CAUTION, possible to create graphs that make no sense or are misleading (change to “line” in Marks box)

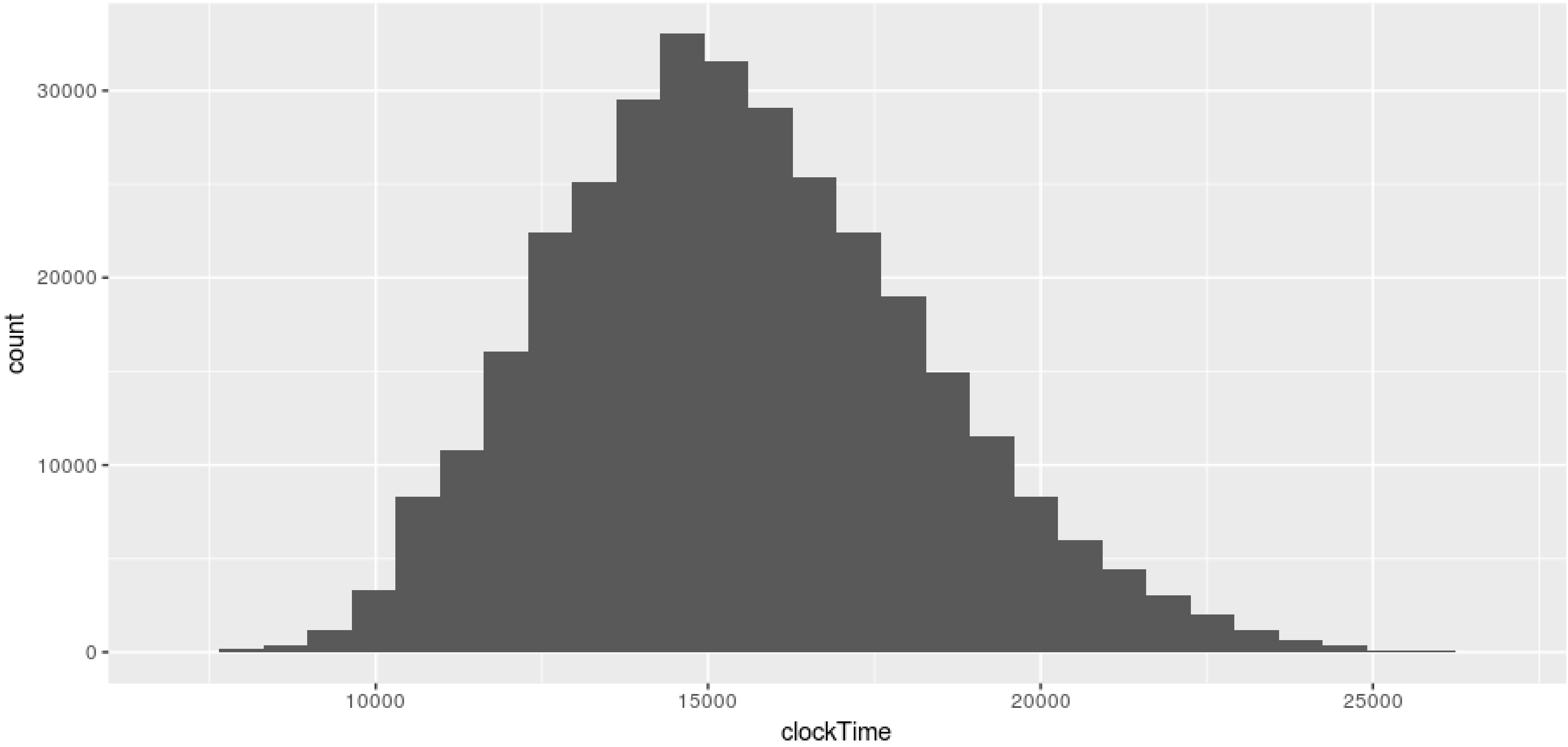
2. Provide easier analysis

Section outline

How can we enable easier insight through data visualization?

1. Change default settings
2. Make simpler graphs
3. Highlight observations
4. Add attributes as context
5. Add statistical information

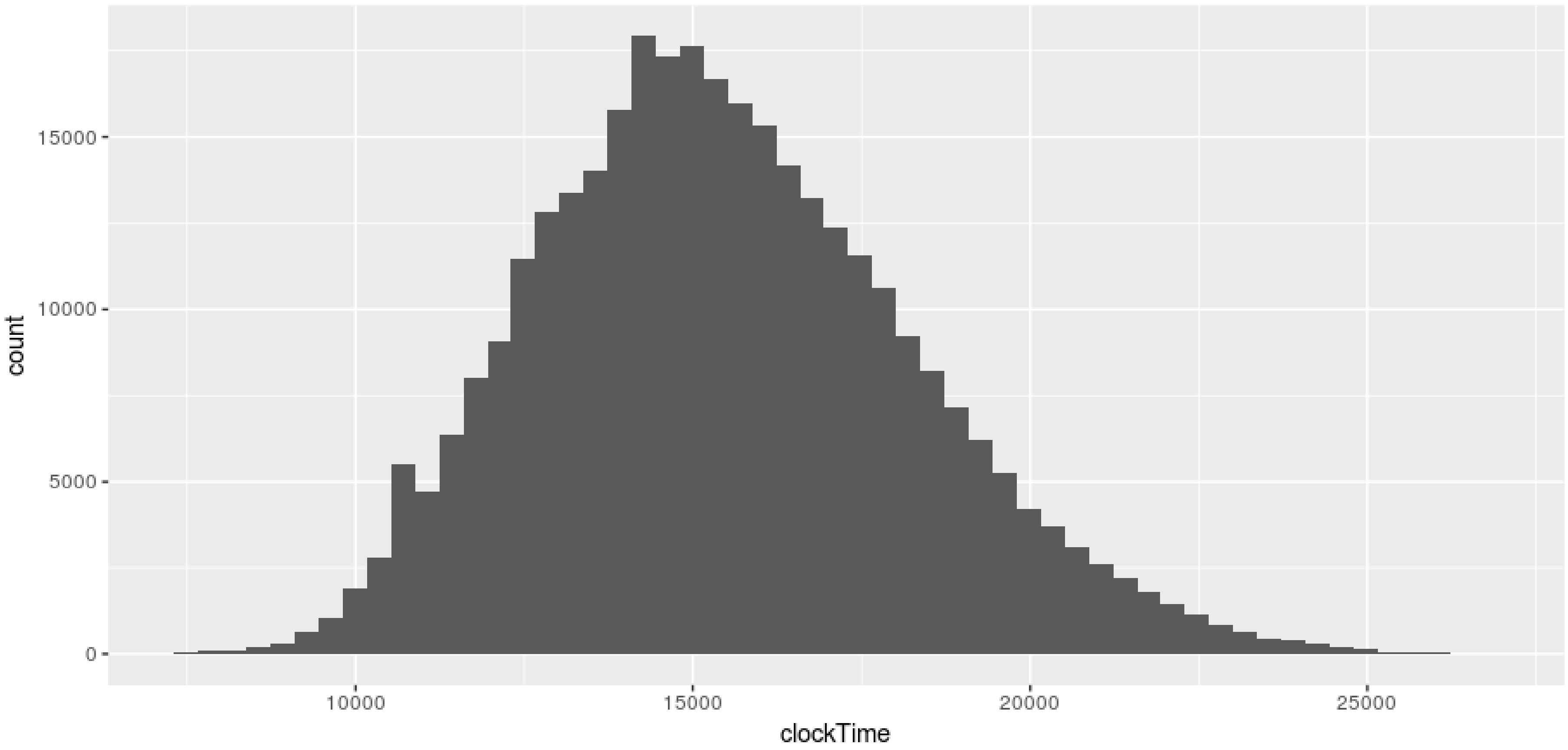
2.1 Change default settings



Speaker notes

Official results form the Berlin marathons. The default aggregation from the tool used to create this visualization presents an almost perfect normal distribution.

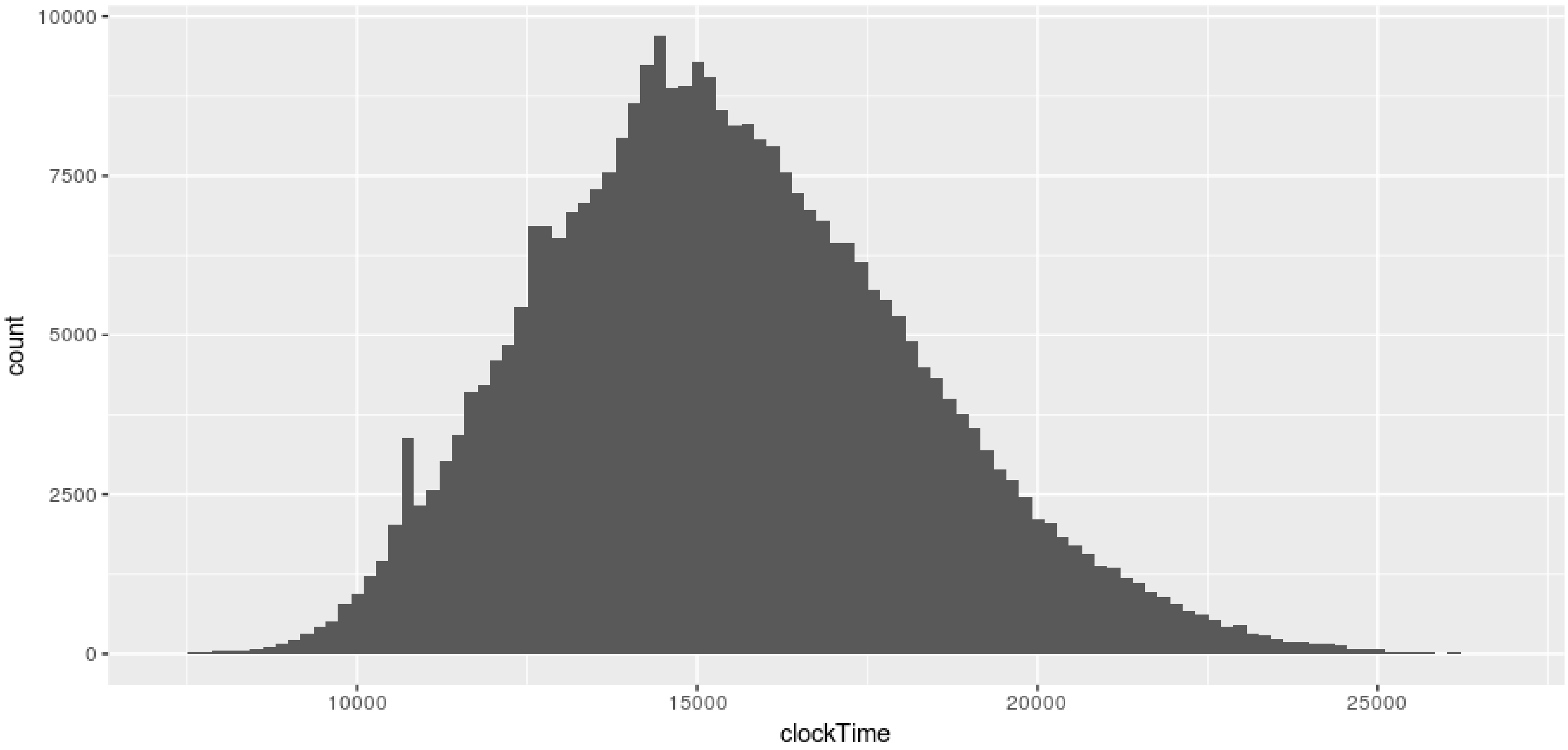
2.1 Change default settings



Speaker notes

More detail (less aggregation) allows to see some highlighted bars

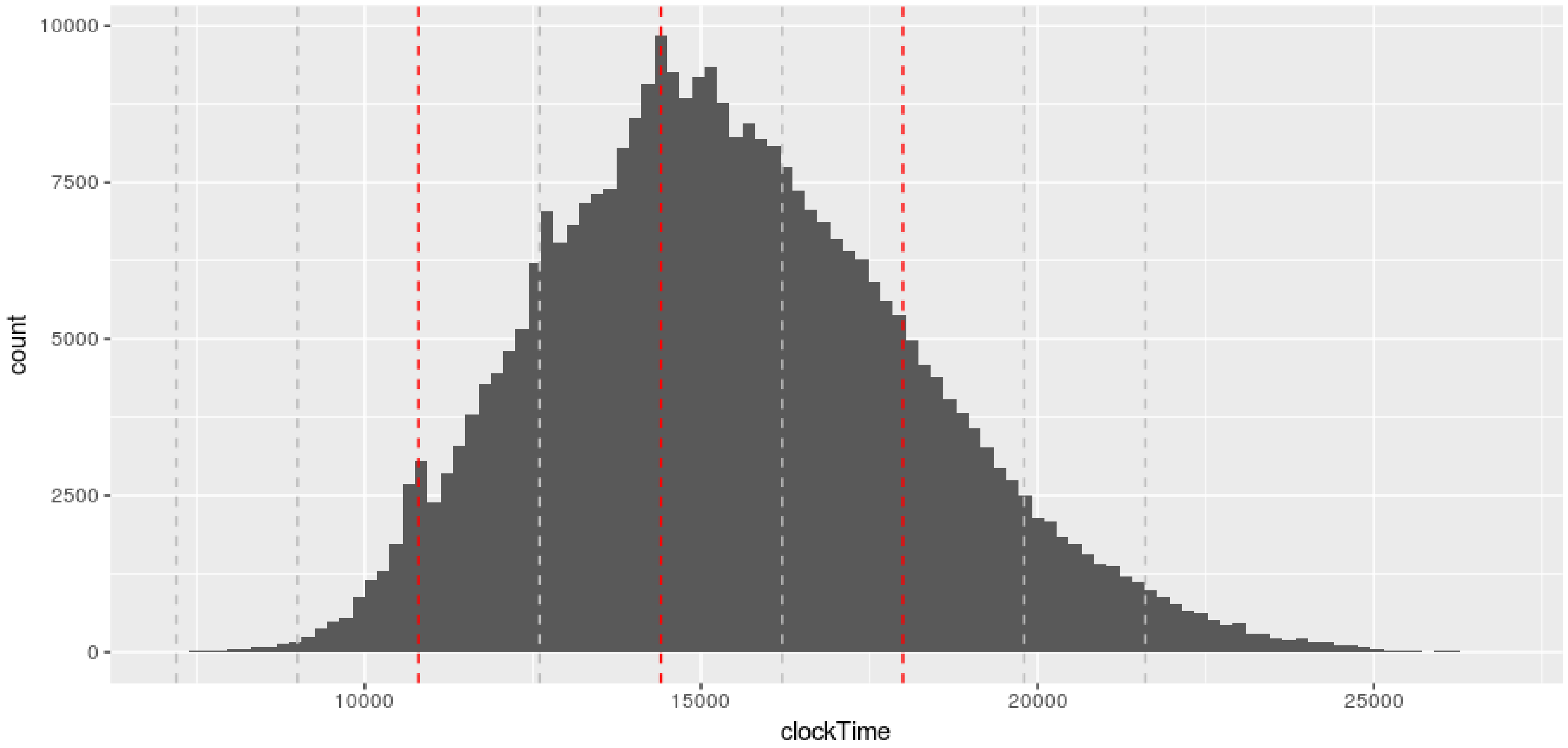
2.1 Change default settings



Speaker notes

Even more detail (less aggregation) makes those bars stand out more and new ones appear: what is happening here?

2.1 Change default settings



Speaker notes

vertical dashed lines show hour marks in red (3h, 4h, 5h, main goal times for marathon runners), half-hour marks in grey. People try to fit into their closest *rounded time*…

2.2 Make simpler graphs

> *Data-ink is the non-erasable core of the graphic, the non-redundant ink arranged in response to variation in the numbers represented.*

Speaker notes

we should remove all non-data-ink and redundant data-ink, within reason, to increase the data-ink-ratio and create a sound graphical design.

some redundancy is often more effective, however, most graphics don’t struggle with understatement. In fact, most contain a stunning amount of excess ink (or pixels). Rather than dressing our data up we should be stripping it down.

2.2 Make simpler graphs

Speaker Deck

Talk by Joey Cherdarchuk

Full Screen

Remove

to improve

(the **data-ink** ratio)

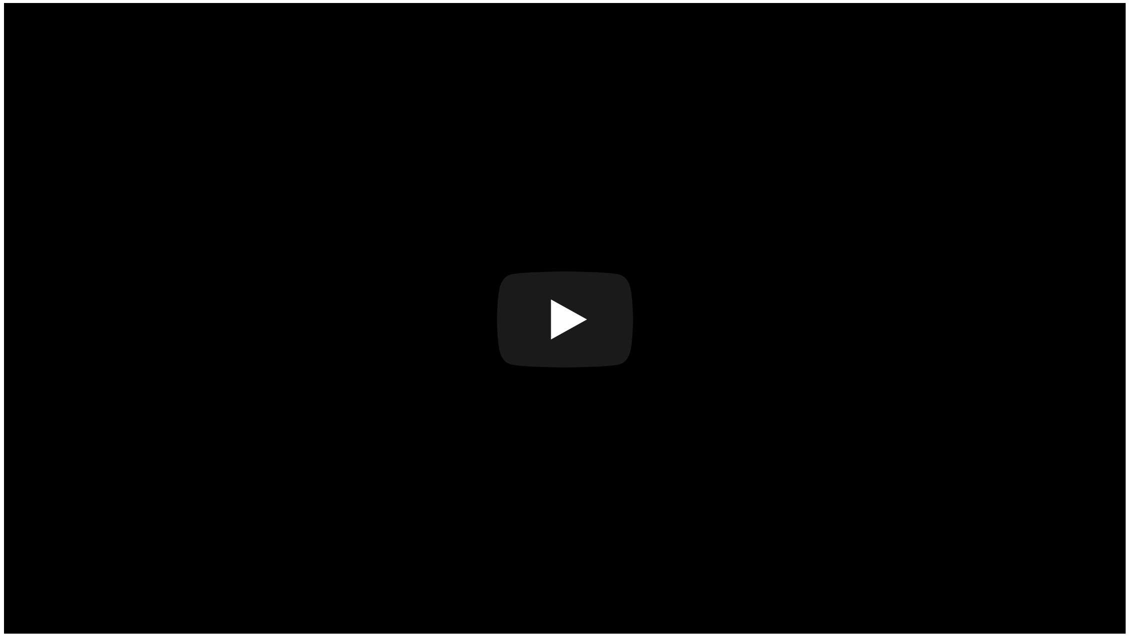
Speaker notes

In it we start with a chart, similar to what we’ve seen in many presentations, and vastly improve it with progressive deletions and no additions.

The next time you are trying to improve a chart, consider what you can take away rather than what you can add.

2.2 Make simpler graphs

More on decluttering:



Nussbaumer, Declutter Your Data Visualizations
]

2.3 Highlight observations

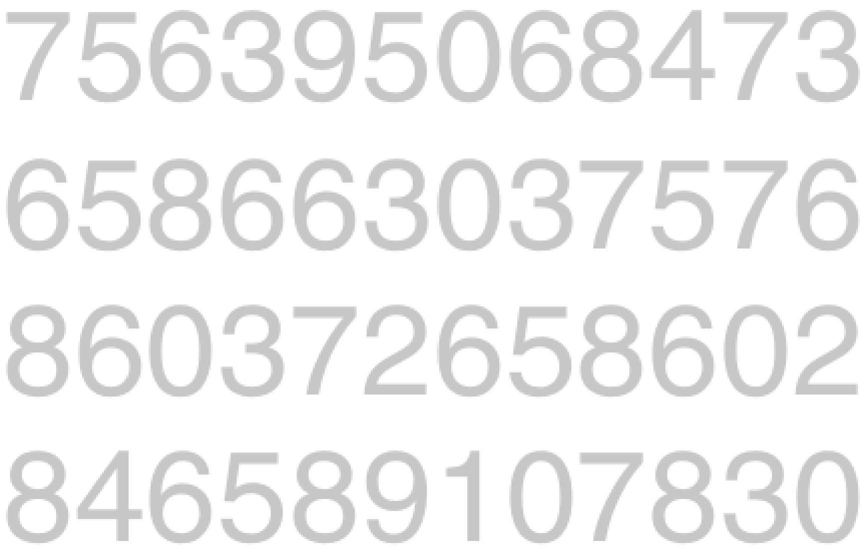
Through preattentive attributes:

- they are processed in spatial memory without our conscious action
- make it easier to understand what is represented through a design: saves from consciously processing data

Speaker notes

A preattentive visual property is one which is processed in spatial memory without our conscious action. In essence it takes less than 500 milliseconds for the eye and the brain to process a preattentive property of any image. These properties can be harnessed to make it easier for a user to understand what is presented through the design and save them from consciously processing all the data presented in short-term memory which requires more effort.

2.3 Highlight observations



756395068473
658663037576
860372658602
846589107830

FIGURE 4.2 Count the 3s example

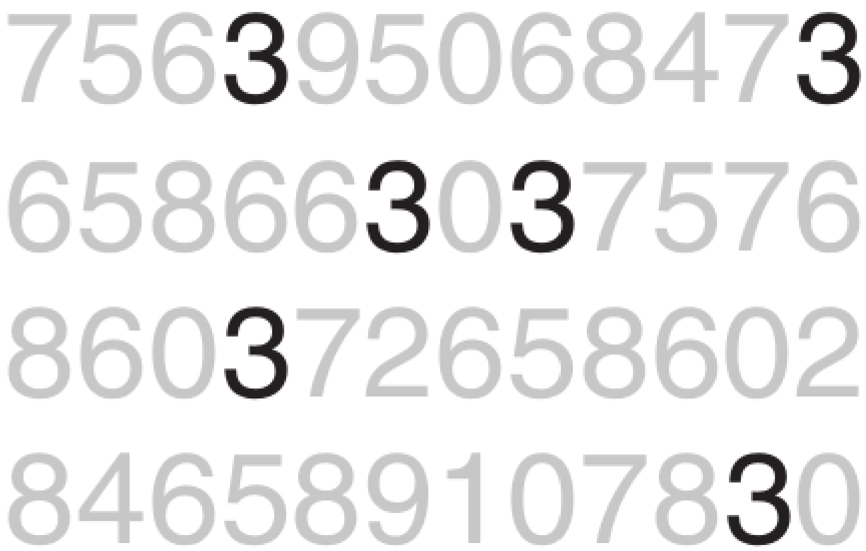
Nussbaumer 2015, p.103

Speaker notes

There are 6. No visual cues to help count. It makes this a challenging exercise, you have to hunt through the lines of text, looking for the number 3.

What happens when we make a single change to the block of numbers. Repeat the exercise of counting the number 3s.

2.3 Highlight observations



756**3**950684 7**3**

65866**3**0**3**7576

860**3**72658602

846589107 8**3**0

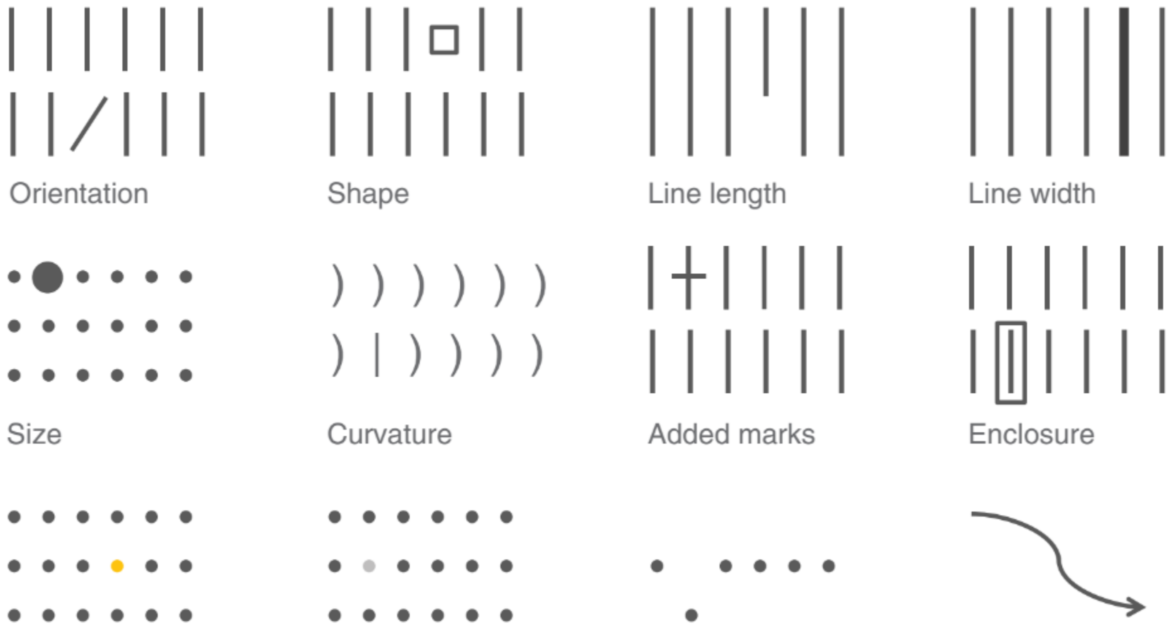
FIGURE 4.3 Count the 3s example with preattentive attributes

Nussbaumer 2015, p.104

Speaker notes

Note how much easier and faster the same exercise is. There is no time to blink, no time to think, no NEED to think. The preattentive attribute of intensity of color in this case, makes the number 3s stand out from the rest. Our brain is quick to pick them up without having to dedicate any conscious thought to it.

2.3 Highlight observations

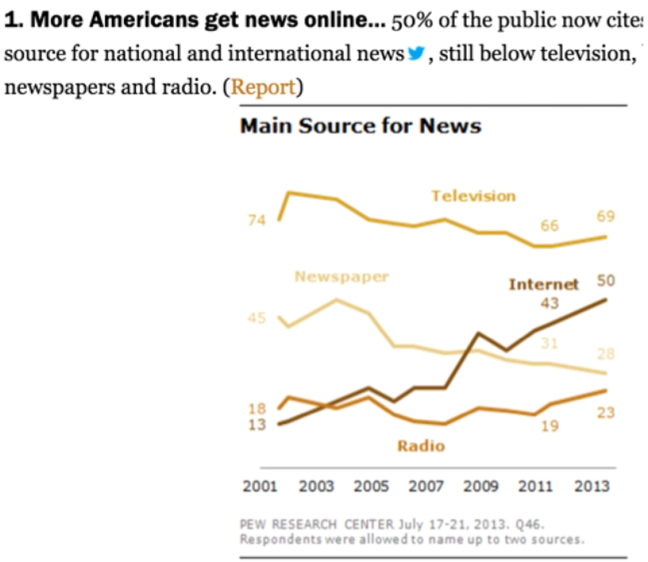


Speaker notes

your eye is drawn to the one element within each group that is different from the rest, you don’t have to look for it. Our brain is hardwired to quickly pick up differences we see in the environment.

NOTE that people tend to associate quantitative values to some of the preattentive attributes (length, width, size; not colour). This tells us which of the attributes can be used to code quantitative information (line length, spatial position, or to a more limited extent, line width, size, and intensity can be used to reflect relative value), and which should be used as categorical differentiators.

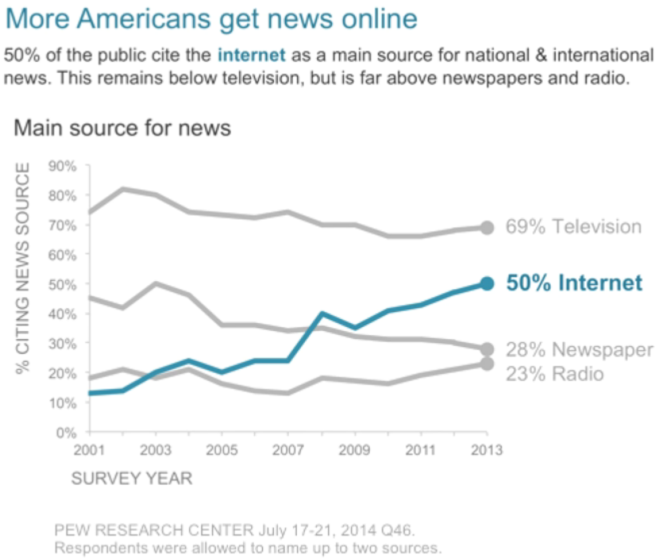
2.3 Highlight observations



1. More Americans get news online... 50% of the public now cite source for national and international news, still below television, newspapers and radio. (Report)

Main Source for News

PEW RESEARCH CENTER July 17-21, 2013. Q46.
Respondents were allowed to name up to two sources.



More Americans get news online

50% of the public cite the **internet** as a main source for national & international news. This remains below television, but is far above newspapers and radio.

Main source for news

PEW RESEARCH CENTER July 17-21, 2014 Q46.
Respondents were allowed to name up to two sources.

Source: http://www.pewresearch.org/fact-tank/2013/10/16/12-trends-shaping-digital-news/

storytelling with data

Speaker notes

After decluttering, more *channels* are available for highlight. This allows to

1. draw your audience's attention quickly to where you want them to look, and
2. create a visual hierarchy of information

2.4 Add variables (as context)

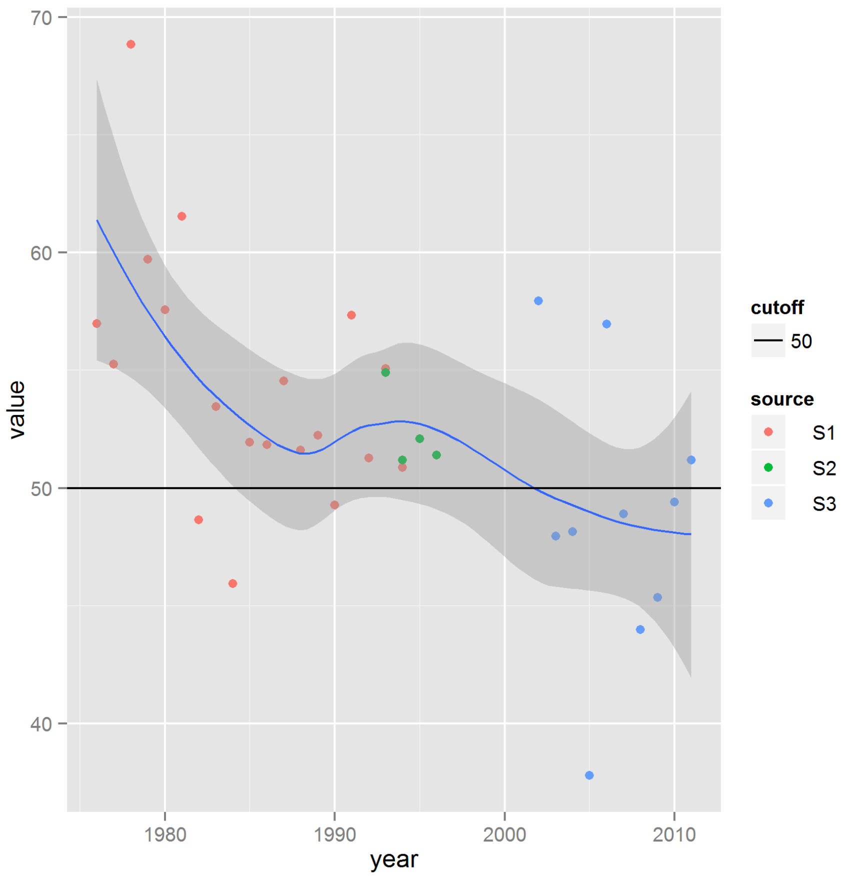
- Adding preexisting variables (in moderation)
- Creating conditional variables from preexisting variables
    - binaries or with few levels are best
    - example of calculated field or variable: weekend date

Speaker notes

useful only if addition conveys meaning / enables insight. In the graph, the colour coding is explanatory to the left, but it is not to the right.

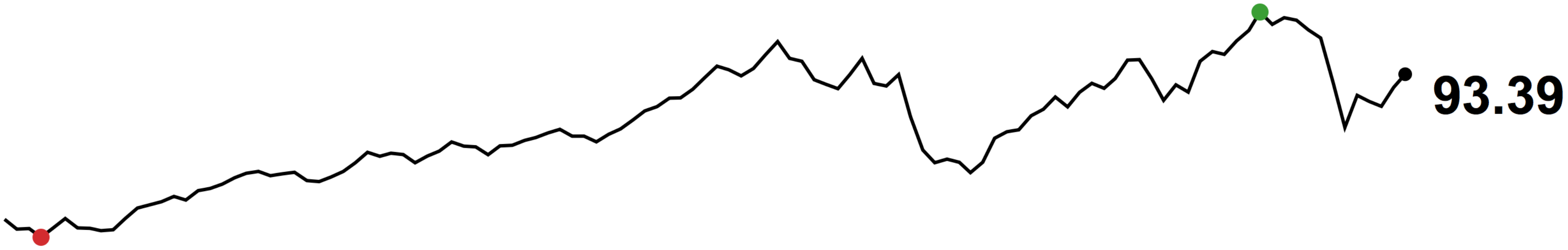
2.5 Add statistical information

- statistical summaries (mean, variance)
- models



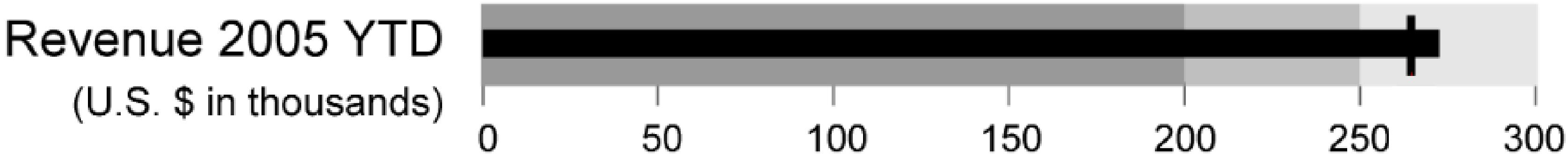
source

Tableau: (not so) basic graphs



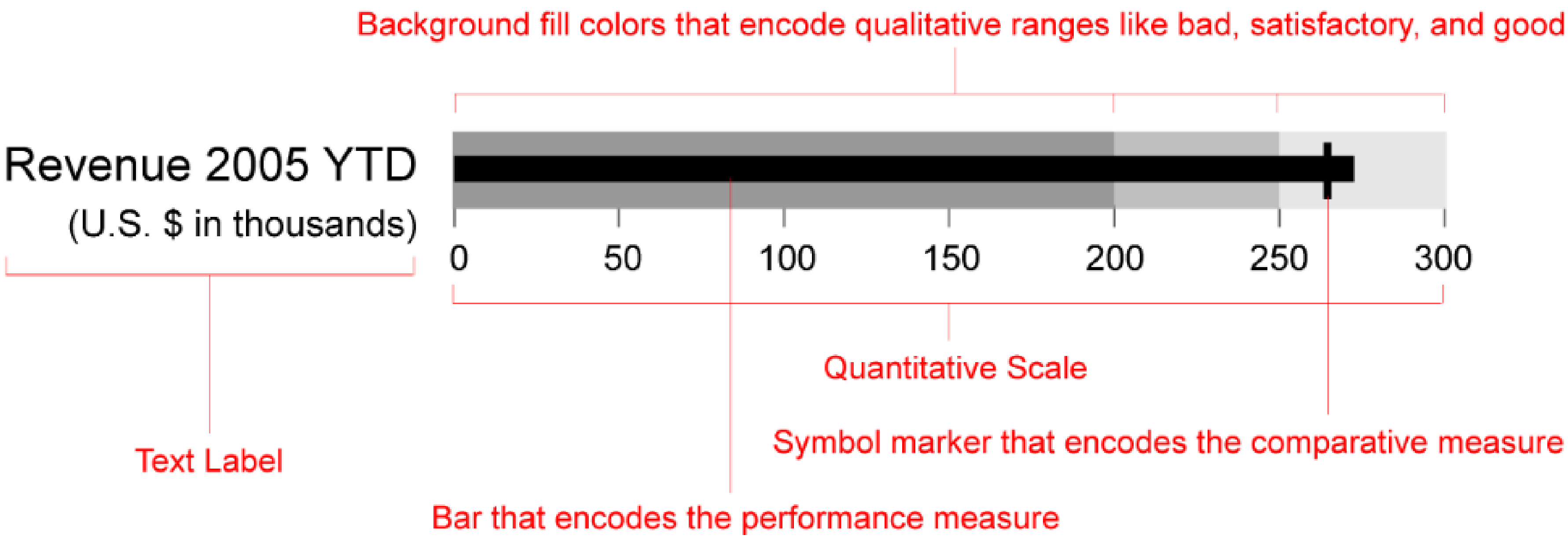
Sparklines (Tufte 2006)

Tableau: (not so) basic graphs



Bulletgraphs (Few 2007)

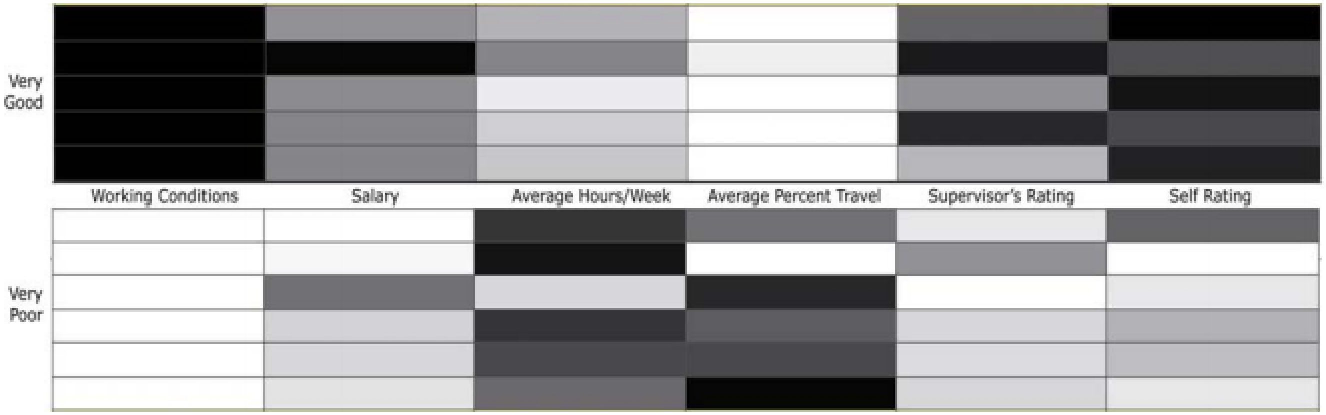
Tableau: (not so) basic graphs


Background fill colors that encode qualitative ranges like bad, satisfactory, and good
Revenue 2005 YTD
(U.S. $ in thousands)
0
50
100
150
200
250
300
Quantitative Scale
Symbol marker that encodes the comparative measure
Text Label
Bar that encodes the performance measure

A standard bullet graph with each of its parts labeled.

Bulletgraphs (Few 2007)

Tableau: (not so) basic graphs



Heatmaps (Few 2006)

3. Dashboards

3.1 Dashboards for *situation awareness*

> *The term "dashboard" refers to a single screen information display that is used to monitor what's going on in some aspect of the business.*

Few (2007), Dashboard Design

3.1 Dashboards for *situation awareness*

- Perception of own's environment
- Comprehension of it's meaning
- Projection of that understanding into the future

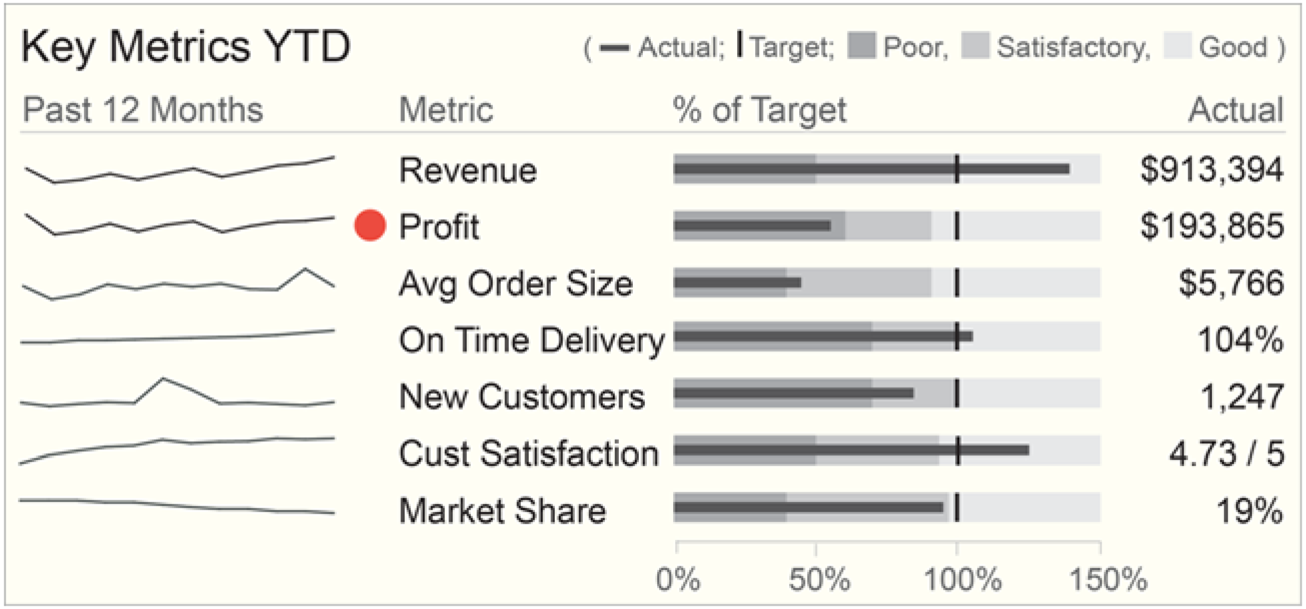
3.2 Dos: Principles you should follow

- Use flicker and sound to grab attention
- Encourage active thinking about the data, not just passive reaction to alarms
- Don't over-automate actions to the point where people become disengaged
- Provide smooth and simple means to respond
- Provide a common picture for the whole team
- Support projections for proactive responses
- Match the mental model

3.3 …and Don'ts: Design problems you should avoid

- Too much complexity
- Too many alert conditions
- Alerts that cannot be differentiated
- Overwhelming visuals
- Distracting visuals
- Inappropriate visual salience
- Mismatch between information and its visual representation
- Indirect expression of measures
- Not enough context

3.4 Few's few examples



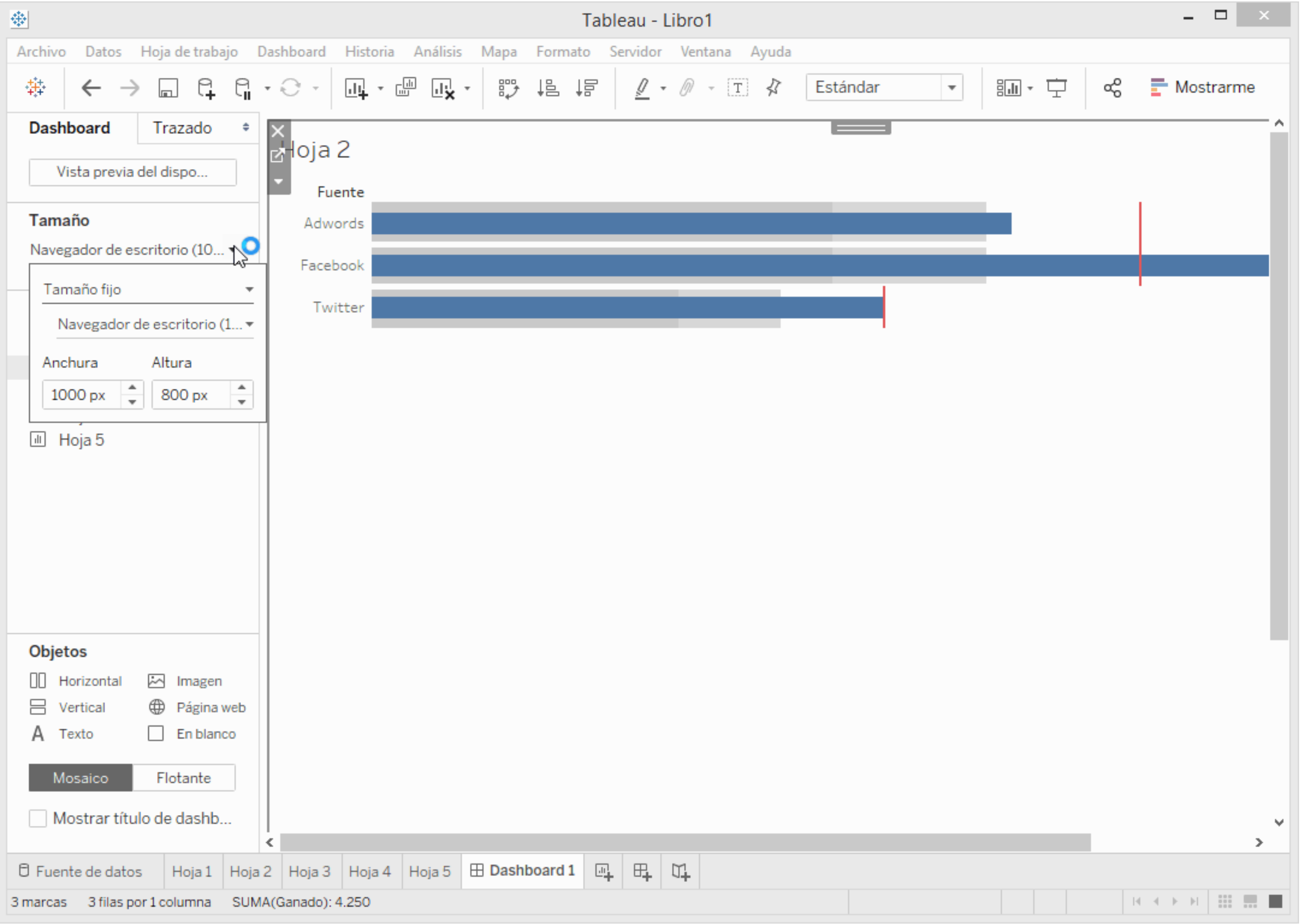
Key Metrics YTD

Past 12 Months	Metric	% of Target	Actual
	Revenue		$913,394
	● Profit		$193,865
	Avg Order Size		$5,766
	On Time Delivery		104%
	New Customers		1,247
	Cust Satisfaction		4.73 / 5
	Market Share		19%

Few 2007

Dashboards in Tableau

Tableau 2.1: basic dashboard



Tamaño fijo

Navegador de escritorio (1...

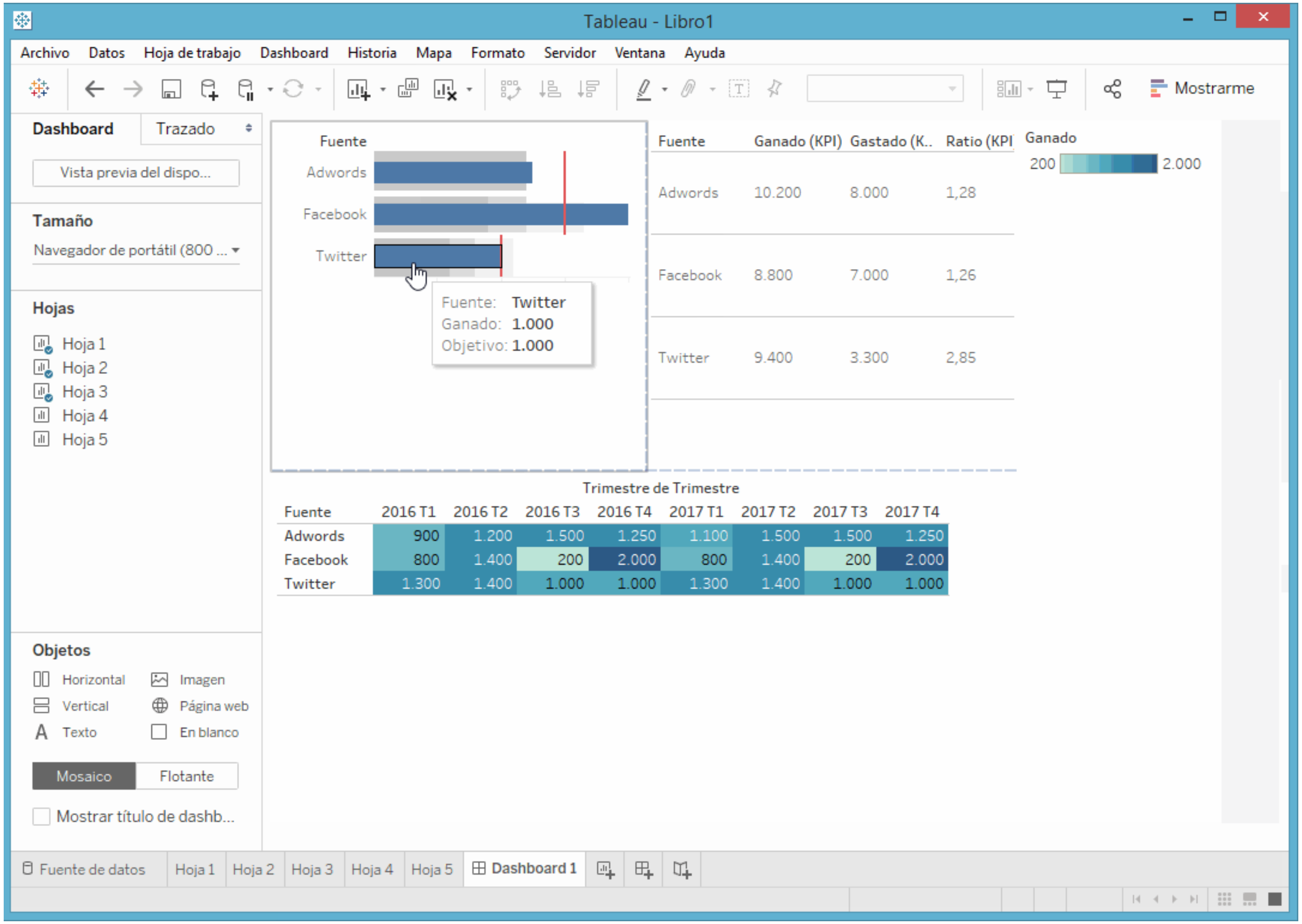
Anchura: 1000 px

Altura: 800 px

3 marcas   3 filas por 1 columna   SUMA(Ganado): 4.250

Basic dashboard

Tableau 2.2: basic formating



Fuente: Twitter
Ganado: 1.000
Objetivo: 1.000

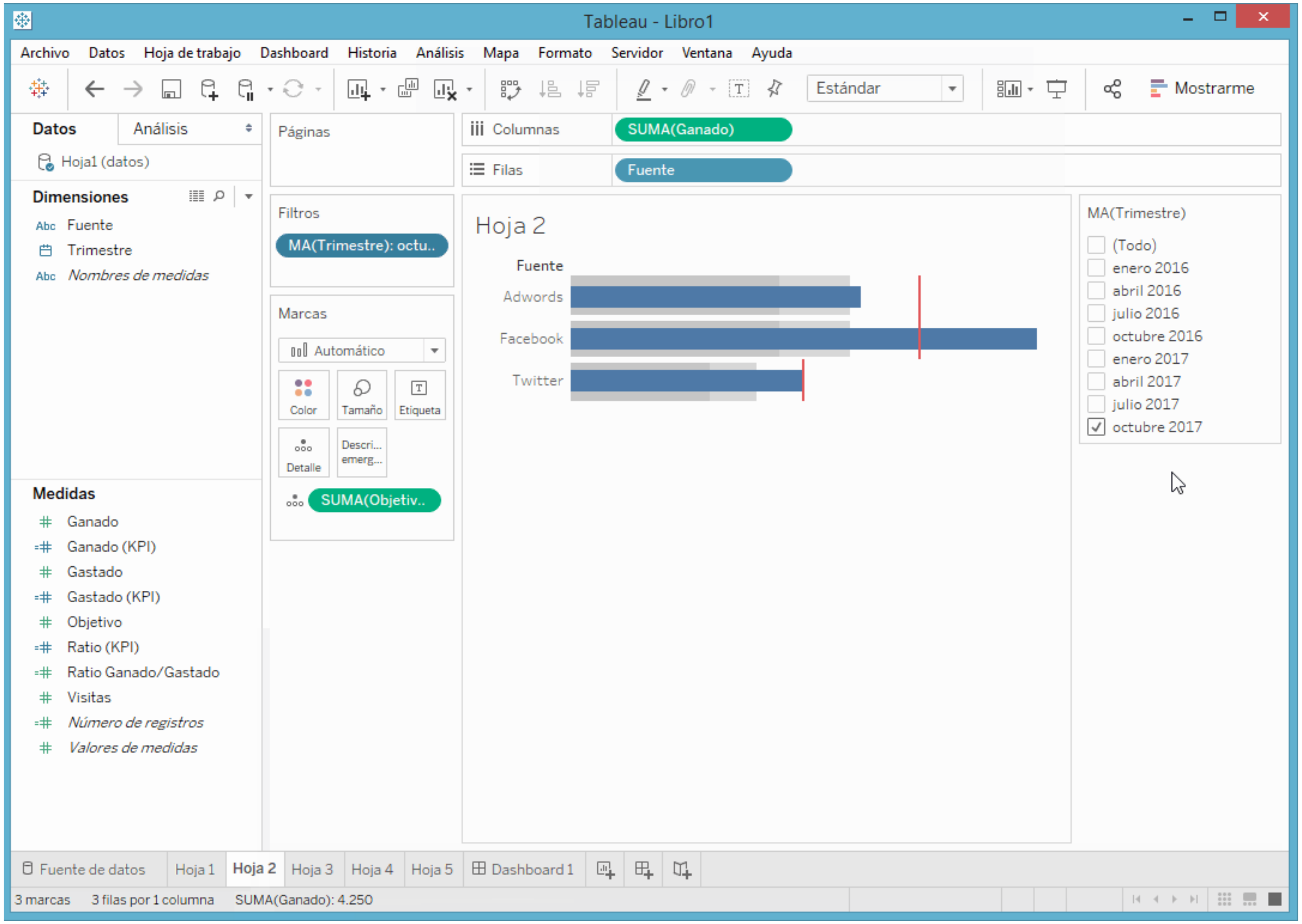
Fuente	Ganado (KPI)	Gastado (K..	Ratio (KPI
Adwords	10.200	8.000	1,28
Facebook	8.800	7.000	1,26
Twitter	9.400	3.300	2,85

Trimestre de Trimestre

Fuente	2016 T1	2016 T2	2016 T3	2016 T4	2017 T1	2017 T2	2017 T3	2017 T4
Adwords	900	1.200	1.500	1.250	1.100	1.500	1.500	1.250
Facebook	800	1.400	200	2.000	800	1.400	200	2.000
Twitter	1.300	1.400	1.000	1.000	1.300	1.400	1.000	1.000

Basic formating

Tableau 2.3: show filters



Columnas: SUMA(Ganado)

Filas: Fuente

Filtros: MA(Trimestre): octu..

Marcas: SUMA(Objetiv..

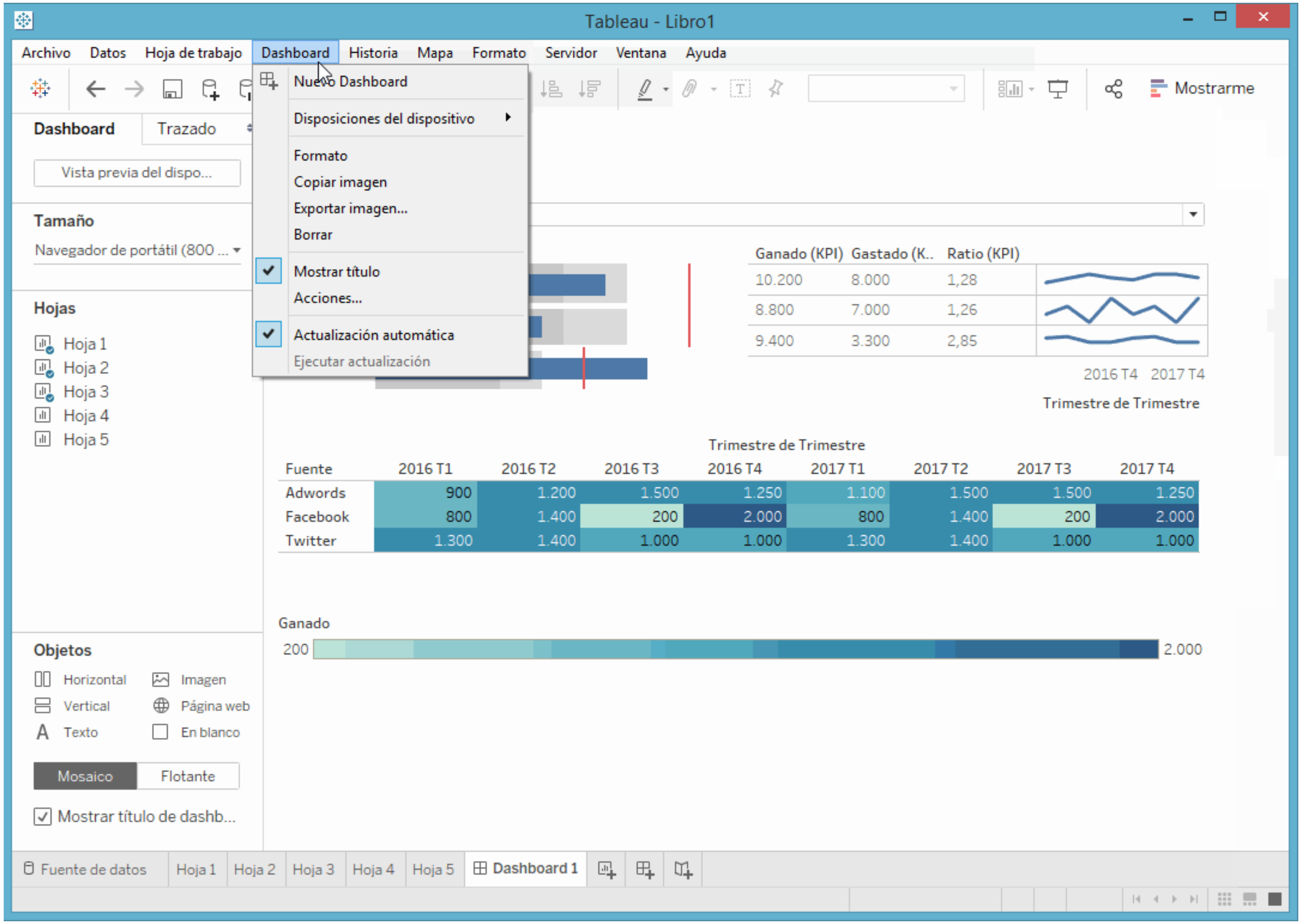
MA(Trimestre)

- ☐ (Todo)
- ☐ enero 2016
- ☐ abril 2016
- ☐ julio 2016
- ☐ octubre 2016
- ☐ enero 2017
- ☐ abril 2017
- ☐ julio 2017
- ☑ octubre 2017

3 marcas 3 filas por 1 columna SUMA(Ganado): 4.250

Show filters

Tableau 2.4: highlight action

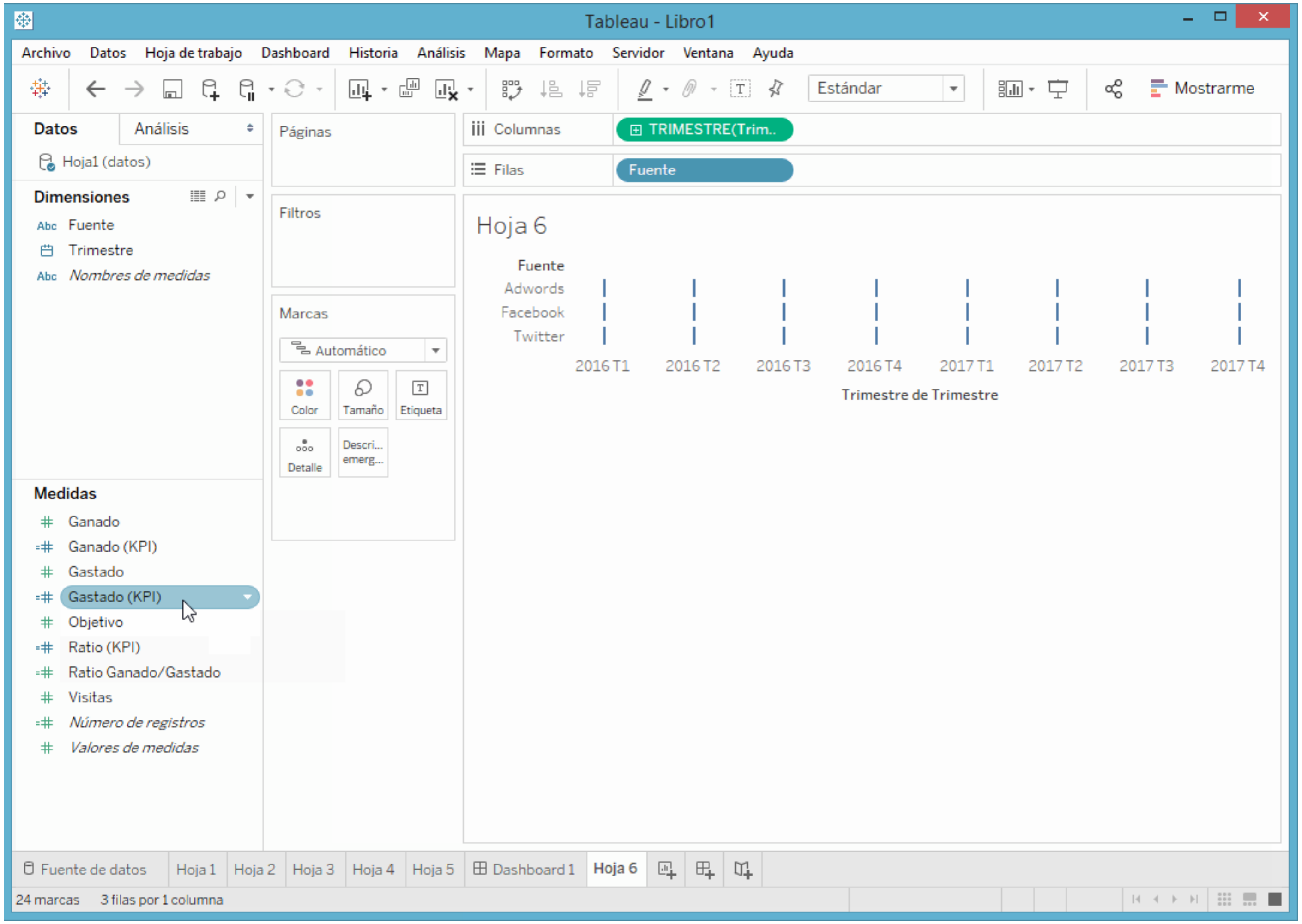


Ganado (KPI)	Gastado (K..	Ratio (KPI)
10.200	8.000	1,28
8.800	7.000	1,26
9.400	3.300	2,85

	Trimestre de Trimestre							
Fuente	2016 T1	2016 T2	2016 T3	2016 T4	2017 T1	2017 T2	2017 T3	2017 T4
Adwords	900	1.200	1.500	1.250	1.100	1.500	1.500	1.250
Facebook	800	1.400	200	2.000	800	1.400	200	2.000
Twitter	1.300	1.400	1.000	1.000	1.300	1.400	1.000	1.000

Highlight action

Tableau 2.5: filter action



Filter action

Epilogue

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Thank you!

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