Going beyond bars and lines: effective, non-standard data visualisation

Direction Access to and Reuse of Public Information

Unit EU Open Data and CORDIS

Sector EU Open Data
What’s ISA2?

ISA2 supports the development of digital solutions enabling public administrations, businesses and citizens in Europe to benefit from interoperable cross-border and cross-sector public services.

How OP is involved in ISA2?

OP is aiming at improving open services in the areas of:

- Data visualisation
- Linked open data
- Persistent identification
### Upcoming training & workshop sessions

<table>
<thead>
<tr>
<th>Topic</th>
<th>Type of session</th>
<th>Bxl.</th>
<th>Lux.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Making data viz like a pro - D3.js</td>
<td>Workshop</td>
<td>-</td>
<td>25/09</td>
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<tr>
<td>Telling your story through data visualisation</td>
<td>Training</td>
<td>2/10</td>
<td>22/10</td>
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<tr>
<td>Making great online visualisations without coding</td>
<td>Workshop</td>
<td>4/10</td>
<td>23/10</td>
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<tr>
<td>Applying data visualisation in use cases</td>
<td>Workshop</td>
<td>-</td>
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</tr>
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</table>
Upcoming webinars

Learn more details on webinar and registration on Joinup:

Learn more details on webinar and registration on Joinup:

e-mail: op-odp-contact@publications.europa.eu
Conference EU DataViz in 2019

e-mail: op-eu-dataviz@publications.europa.eu
Agenda

09:00  Introduction  
Creative with dots, tool: RAWGraphs

10:30  Coffee break

Creative with bars, tool: Charticulator

12:00 - 13:00  Lunch
Time and hierarchy
Multidimensional data, tool: Data Illustrator

14:30  Coffeebreak

Networks and uncertainty
Introducing new charts to readers

16:30  Q&A
1. INTRODUCTION
Participants

Institution/DG and role?
What data do you work with?
Experience in data visualisation?
Expectations for today?
Introduction

Xenographics

Why are some charts weirder than others?

We are only familiar with what the tools we use are offering.
“As knowledge increases amongst mankind, and transactions multiply, it becomes more and more desirable to abbreviate and facilitate the modes of conveying information from one person to another, and from one individual to the many.”
Introduction

Xenographics

William Playfair
“It remains only for me to request that those who do not, at the first sight, understand the manner of inspecting the Charts, will read with attention the few lines of directions, after which they will find all the difficulty entirely vanish.”
“Readers often have the unrealistic expectation that any graphic should be understandable without effort. We designers have fed that expectation, and we must stop.”
Introduction

Dataviz catalogues

Dataviz Project
## Visual vocabulary

Designing with data

There are so many ways to visualise data – how do we know which one to pick? Use the categories across the top to decide which data relationship is most important in your story, then look at the different types of chart within the category to find some solid ideas about what you might do. (And remember, design is not a trade, nor a recipe, but is a useful starting point for making informative and meaningful data visualizations.)

ft.com/vocabulary
Introduction

Dataviz catalogues

Data Visualisation Catalogue
**Introduction**

**Tool catalogue**

**Chartmaker Directory**

[Image of a tool catalogue chart with various chart types and tool compatibility indicators.]

<table>
<thead>
<tr>
<th>Chart Type</th>
<th>Amazon QuickSight</th>
<th>ArcGIS</th>
<th>ChartJS</th>
<th>D3.js</th>
<th>Datawrapper</th>
<th>FusionCharts</th>
<th>Gephi</th>
<th>Google Charts</th>
<th>Highcharts</th>
<th>Instagram</th>
<th>JetPack Data</th>
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<td>Bubble chart</td>
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</tbody>
</table>
2. CREATIVE WITH DOTS
Creative with dots
Dot plot

Unidimensional scatter plot

Example: EU regional GDP

Alternative to grouped bar chart
Creative with dots
Dot plot
Handling overlap: transparency
Creative with dots

Dot plot

Handling overlap: jittering
Creative with dots
Dot plot

Handling overlap: strips

Aka barcode plot

Example: FT US election poll tracker
Creative with dots

**Beeswarm plot**

Dots are “stacked”

Better visualisation of distributions

Example: [Summer Olympics medal tally](#)
Creative with dots
Beeswarm plot
Variation: map value to radius of dots

China and India are not displayed to scale.
Tool
RAWGraphs
rawgraphs.io

“The missing link between spreadsheets and data visualisation”

Demo
Exercise
RAWGraphs
Make a beeswarm plot, following the RAWGraphs tutorial
Creative with dots

**Dumbbell chart**

Good for showing gaps and ranges

Can be horizontal

Also known as connected dot plot

Example: [Gender Pay Gap](#)
Creative with dots

Dumbbell chart

Also good for changes over time
Creative with dots
Dumbbell chart
Variation: arrow chart

Examples:
Where the one percent have gained the most
EU passport ranking
Creative with dots

Bubble chart

Can show 5 dimensions

Example: [Gapminder](#)
“Enrich your stories with charts, maps and tables”

Demo

How to create a dot plot
How to create a range plot
How to create an arrow plot
How to create a scatter plot
3.
CREATIVE WITH BARS
Bars
Bullet chart
For showing progress and status
Bars

Bullet chart

For showing progress and status

Background fill colors that encode qualitative ranges such as bad, satisfactory, and good

Revenue 2005 YTD

(U.S. $ in thousands)

Quantitative Scale

Symbol marker that encodes the comparative measure

Bar that encodes the performance measure
Bars

Marimekko

Aka Mekko chart, Mosaic plot

Examples: Low skill jobs account for the largest proportion of immigrants

Worldbank: Population in poverty
“Create bespoke chart designs without programming”
Exercise
Charticulator

Make a marimekko chart of municipal waste treatment by country

Data: tinyurl.com/y3rkp3z5

Video tutorial: charticulator.com/gallery/food_supply_per_capita.html
4. CREATIVE WITH TIME
**Time**

**Slopechart**

Compare 2 moments in time

Alternative to paired bars
### Time Slopechart

#### Compare 2 moments in time

#### Alternative to paired bars

<table>
<thead>
<tr>
<th>City</th>
<th>In heel Vlaanderen</th>
<th>In de Vlaamse centrumsteden</th>
<th>Antwerpen 513.000 inwoners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gent</td>
<td>+1,9%</td>
<td>-0,3%</td>
<td>-3,4%</td>
</tr>
<tr>
<td>Brugge</td>
<td>+4,5%</td>
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<td></td>
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<tr>
<td>Leuven</td>
<td>-1,4%</td>
<td></td>
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<td>Mechelen</td>
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<td>Aalst</td>
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</tr>
<tr>
<td>Hasselt</td>
<td>+4,2%</td>
<td></td>
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<tr>
<td>Kortrijk</td>
<td>+2,6%</td>
<td></td>
<td></td>
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<tr>
<td>St.-Niklaas</td>
<td>+2,6%</td>
<td></td>
<td></td>
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<tr>
<td>Oostende</td>
<td>+3,7%</td>
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<tr>
<td>Genk</td>
<td>+4,6%</td>
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<tr>
<td>Roeselare</td>
<td>+2,6%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turnhout</td>
<td>+3,0%</td>
<td></td>
<td></td>
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</tbody>
</table>
Time Slopechart

Compare 2 moments in time

Alternative to paired bars
Time Horizon chart

Area charts with high data density
Time Horizon chart

Area charts with high data density
Hoe de kredietcrisis de beurs besmette

De kredietcrisis heeft alle handen in de ARK, Midcap (+) en Smalcap (-) zonder uitzondering getroffen. Ten opzichte van 2 januari 2007 toen waren alle handelsbeurzen in rood.

Van een internetzeepbel naar een terroristische aanslag in New York


Terroristische aanslag in New York


Opmerkingen

De terroristische aanslag in New York is een kijktje in de toekomst. Het is een koud, donker en rustig appartement. De terrorist kijkt naar buiten en ziet een vliegtuig dat op hij komt. Hij kijkt naar zijn telefoon en ziet een bericht: "Je bent de dader van de aanslag in New York."
**Time Connected scatterplot**

**Evolution of 2 numerical values over time**

**Examples:**
- The direction of your country
- How education, joblessness and earnings intersect
- Research

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**Driving Safety, in Fits and Starts**

Americans drive a staggering number of miles — close to three trillion every year, according to the government. (That is half a light-year, or 129 million miles around the world.) And although traffic accidents remain a major public safety problem, the biggest killer of people ages 3 to 34, vehicle travel is far safer than it was a few decades ago.

Several factors appear to account for the sharp decline in fatalities. Technology (like anti-lock brakes and airbags) and road behavior (like wearing seat belts and driving sober) have both improved, greatly since 1950.

Americans almost always drive more each year than the previous one — at least until recently, when the recession curtailed road habits. And the auto fatality rate has been decreasing since the 1990s, when cars with massive engines carried their unshackled passengers on primarily two-lane roads.

The safety data is usually charted as deaths per miles traveled. But what happens when the metrics are reversed? And familiar data is charted in an unfamiliar way? Plotting the two most important variables against each other — miles traveled versus deaths per 100,000 population — yields a pattern that looks like a plateau followed by a steep drop. It evokes the theory of punctuated equilibrium, proposed by the paleontologists Stephen Jay Gould and Niles Eldredge, which suggests that instead of continuous gradual evolution, change occurs abruptly after periods of virtual stasis.

“You see fatalities drop after a breakthrough in new technologies or behaviors, and then plateau until the next one,” said David L. Strickland, administrator of the National Highway Traffic Safety Administration. “It takes time for new safety technologies to work their way into the whole fleet of cars on the road.”

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**VISUALS | Hannah Fairfield**

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**Sources:** National Highway Traffic Safety Administration; Federal Highway Administration
Time
Connected scatterplot

Case: Uncovering tomorrow’s innovation hotspots
Time
Connected scatterplot

Case: Uncovering tomorrow’s innovation hotspots
Time
Connected
scatterplot

Case: Uncovering tomorrow’s innovation hotspots
Figure 1: Growth in VC deal activity, 2012-14 to 2015-17, 24 cities

The chart indicates the pronounced trajectory in deal activity of the top cities. Grey arrows indicate deal activity for the remaining 19 cities.

Source: Crunchbase, The Economist Intelligence Unit
5.

HIERARCHY
Components

Waterfall chart

Show net result

Examples:

Change in US federal budget

Evolution de la masse des glaciers
Hierarchy
Dendrogram
Available in RAWGraphs

Example: The 200+ beer brands of SAB Inbev
Hierarchy Treemap

Hierarchy (multi) + numbers

Available in RAWGraphs

Examples:
Every job in America
Inventur der Tiere
6. MULTIDIMENSIONAL DATA
#### Multidimensional Heatmap

**Examples:**

- Frequency of soccer results
- The impact of vaccines
- When fatal crashes happened
Multidimensional Matrix diagram

Scaled symbols, or categories

Sorting determines aspect

Can be one way or two way

(city distance, number of passengers between cities)
Multidimensional Parallel coordinates

Example: Marathon trainings
Tool
Data Illustrator
data-illustrator.com

“Create infographics and data visualisations without programming”

Demo
Exercise
Data Illustrator

Make a heatmap of EU unemployment rates
Data by age and sex: tinyurl.com/y4qmvjm9
Data by country: tinyurl.com/y24xoe9g
Video tutorial: vimeo.com/235782472

Make a slopechart of education levels vs obesity rate
Data: tinyurl.com/y2xeuezn
Video tutorial: vimeo.com/234522226
Multidimensional Alluvial plot
Aka Sankey diagram and parallel sets

Available in RAWGraphs

Camouflage spelling

Looking for an appartment in Paris, 2019
7. NETWORKS
Networks

Node-link

Nodes connected with edges

Example: Belgian listed companies and their directors
Networks
Node-link

Example: Electricity generation and connections in Europe
Networks
Node-link

Special case: adjacency matrix
8. **UNCERTAINTY**
Uncertainty

Fan chart

Communicate uncertainty
Uncertainty

Fan chart

Communicate uncertainty

Chart 1: Macroeconomic projections
(quarterly data)

Euro area real GDP
(quarter-on-quarter percentage changes)

Euro area HICP
(year-on-year percentage changes)

1) The ranges shown around the central projections are based on the differences between actual outcomes and previous projections carried out over a number of years. The width of the ranges is twice the average absolute value of these differences. The method used for calculating the ranges, involving a correction for exceptional events, is documented in New procedure for constructing Eurosystem and ECB staff projection ranges, ECB, December 2009, available on the ECB’s website.

2) Working day-adjusted data.
Uncertainty
Confidence bands

VVD — PVV — CDA — D66 — GL — SP — PvdA — CU — PvdD — 50PLUS — SGP — Denk — FvD

Schatting electorale steun (%)

8. INTRODUCING CHART TYPES TO READERS
Introducing charts

Add a ‘How to read this chart’ description

Add human readable axis labels

Add explanatory annotations
Introducing charts

Add chart elements sequentially
Introducing charts

Add chart elements sequentially
Introducing charts

Add chart elements sequentially
Introducing charts

Add chart elements sequentially
Introducing charts

Make a gif or video

How does a Hovmöller diagram work?
Q&A
Resources

Catalogues
Dataviz Project
Visual Vocabulary
Data Visualisation Catalogue
Chartmaker Directory
Xenographics

Tools
RAWGraphs
Charticulator
Data Illustrator