



DATA DRIVEN VALUE CREATION

DATA SCIENCE & ANALYTICS | DATA MANAGEMENT | VISUALIZATION & DATA EXPERIENCE

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AMLD EPFL 2022

WORKSHOP

Designing Effective Visualisations to Communicate Data Stories



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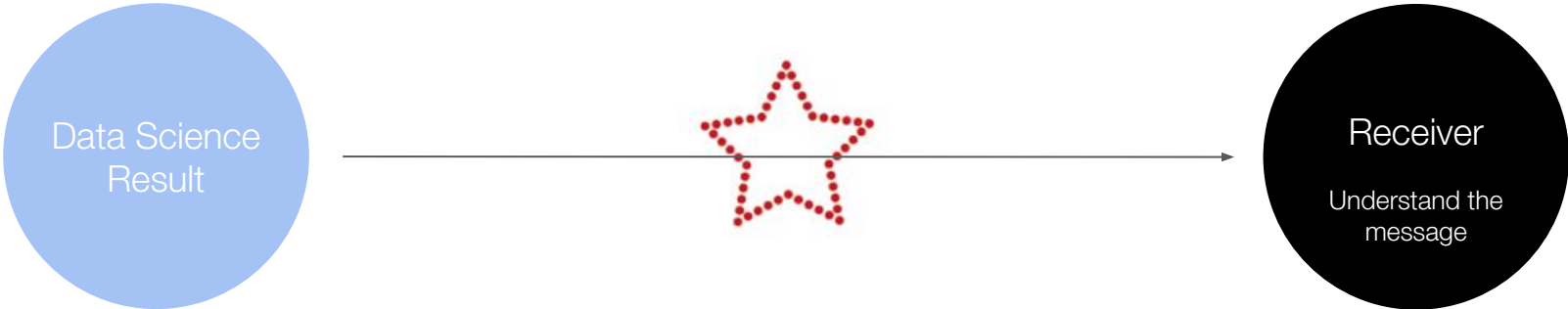
Jacqueline Stählin

10:00-16:00, March 26

D | ONE

WE MAKE SENSE.

Data Stories communicate insights to decision makers



Data storytelling is the process of translating data analyses into understandable terms in order to facilitate a business decision or action.

adapted from: <https://searchcio.techtarget.com/definition/data-storytelling>

1 - Introduction

Set-up check and links

- Your live support and access to all links: <https://tlk.io/amld-2022-viz>
- Preset (register [here](#))
- Github <https://github.com/jastaehl/amld2022-designing-effective-visualisations>
- Mybinder
<https://mybinder.org/v2/gh/jastaehl/amld2022-designing-effective-visualisations/HEAD>
- [Results](#)



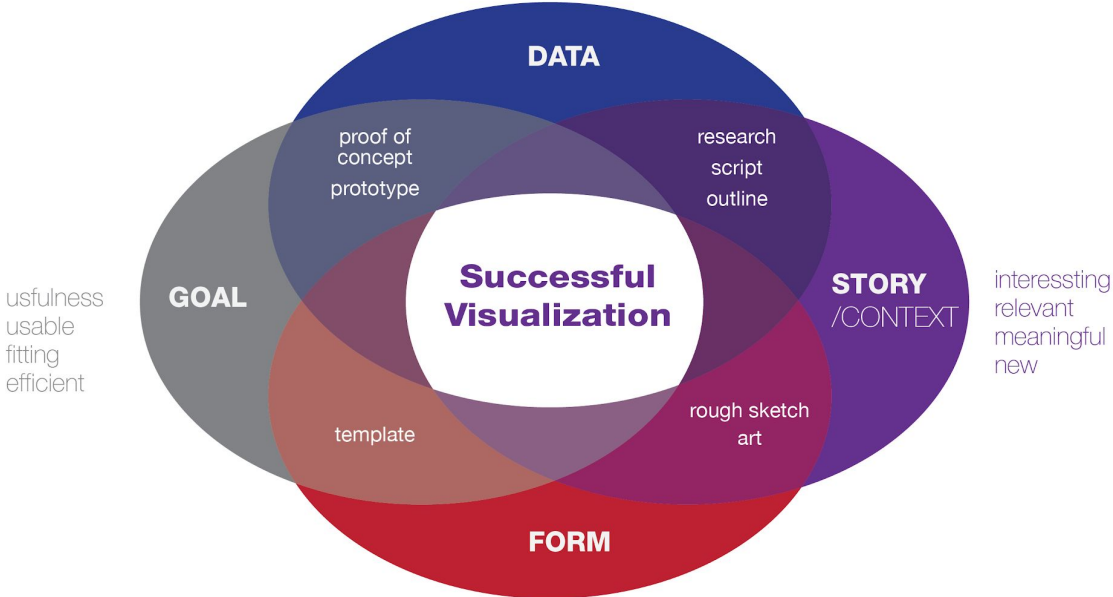
«Making sense of data
is the winning competence
in all industries.»



2 - Data Storytelling

Successful Viz Framework

clean
consistent
complete
current
compliant
collaborative



Why is it essential?

Data Viz is everywhere

“Last mile”

I(n)tera(c)tion is key



STORYTELLING Why is it that compelling?



We love stories

We learned to learn with stories.

Empathy enables us to experience stories as if they were our own.

Stories are structured ways

- to pass on knowledge
- to share experiences
- to convey norm and values

Data stories are efficient and credible because they rely on numbers and because they feed our curiosity.



STORYTELLING Structure



Stories structure

Context

Subject - when, where, who (hero)
Treasure - what does the character want?
Obstacle - what or who stands in the way?

Action

What happens to the character (hero)?
Conflicts, ups and downs, setbacks, implications

Result

What happens in the end?
Lesson - what's the moral of the story?
Conclusion - why is the story being told?

Plot

Challenge
Desired outcome

Action

Detailed issues/background
Discuss options, highlight yours
Remind the audience *they* can act

Call to action

Recap initial issue and advised solution
Put emphasis on the action to be taken



Stories narratives

Chronological or Reversed

The underdog: overcome a challenge, the focus is on the success

Redemption: bring hope for the future, the focus is on changes leading to new opportunities

Betrayal: highlight a threat, the focus is on the threat and its impact

Victory: celebrate the success, the focus is on the success

Tragedy: focus on something bad that happened, focus on the issue



STORYTELLING How to



The context

Who is the audience?

- Roles, level of understanding & engagement

Who are we? What is our goal?

How do we deliver our visualization?

- In-person, online, print, email
- Daily, weekly, etc.

What is expected?

- Does a prototype or an older version already exist?
- What are the expected results?
- What question shall we answer/address?



Get to the bottom of things

5-Why-Method

Problem: The vehicle is not starting..

Why is the vehicle not starting?

→ The battery is dead.

Why is the battery dead?

→ The alternator is not functioning.

Why is the alternator not functioning?

→ The alternator belt has broken.

Why did the alternator belt break?

→ The alternator belt was beyond its useful service life and not replaced

Why was the alternator belt not replaced?

→ **The vehicle was not maintained according to the recommended service schedule.**



Get to the bottom of things

Laddering Method

What is Red Bull?

What is Red Bull?

A drink with Taurine & Caffeine

What is Taurine?

Taurine, or 2-aminoethanesulfonic acid, is an organic compound that is widely distributed in animal tissues.

Why Taurine & Caffeine?

It makes you less tired

→ It's an energy drink.

Why is that important?

You can stay longer

→ It gives you wings.

Why is that important?

You don't miss out, you are part of the game

→ You are the party animal.



STORYTELLING Tips and tricks



Storytelling tips

- Repetition is key
- Structure is key
- Keep it simple
- Sound like yourself
- The story is for the audience
- If the story is boring, work on the data
- Prepare a 1 sentence version of your story as well as a 3 minutes version



Launch Check

1. **Is the why clear?**

Understand the importance of the context.
Context is the foundation of the story.

2. **Is the audience hooked?**

Provoke desire.
Make clear statements.

3. **Is the story relatable?**

What do you want to achieve with the audience? What is conclusive for them?

4. **Is the story clear?**

Eliminate noise and clutter.
Don't lose the focus- Gossips open the doors to (even unjustified) criticism



Visualize your story

Charts elements

The title should not describe the chart but inform about the story, summarize key aspects.

The data graph is supporting the evidence, the story. Use text and labels to put the story on the chart.

Text on the side (if title and labels are not enough) to write the story or a sentence to explain.

Graphic vocabulary

Pre-attentive attributes

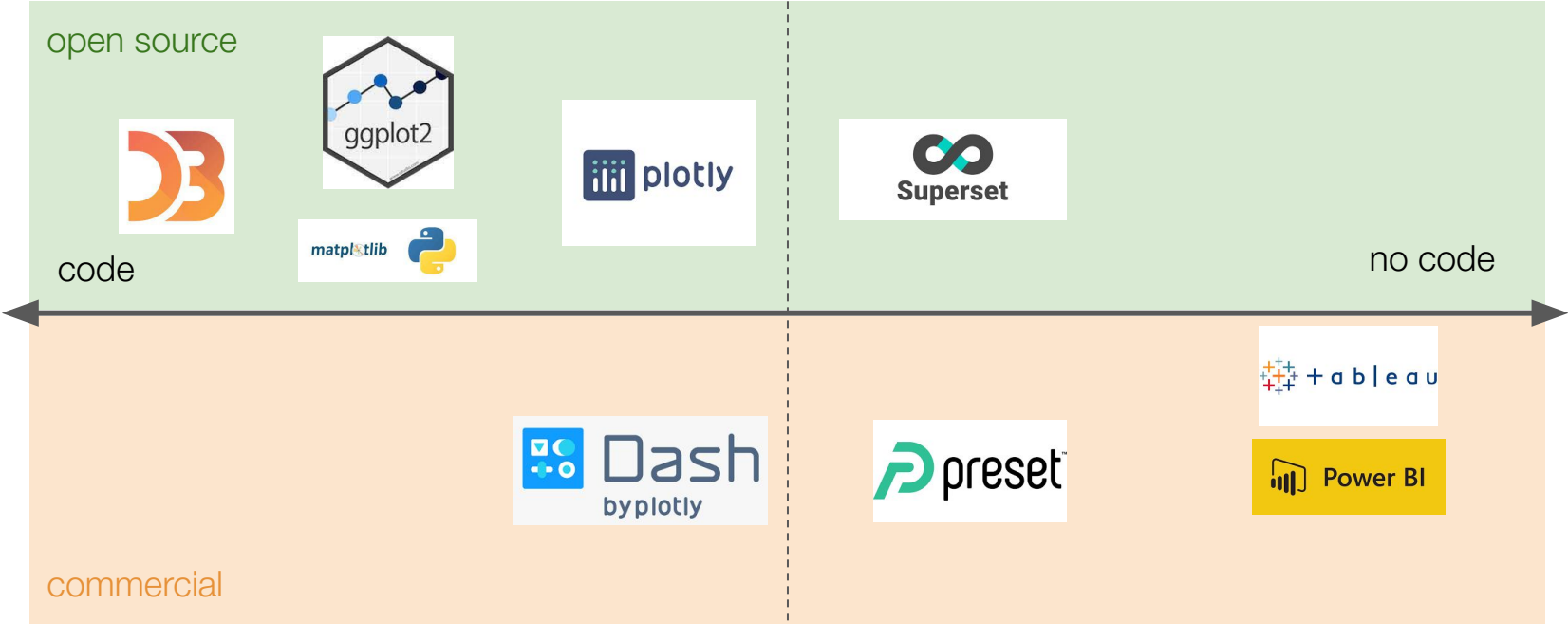
Colors

Chart types

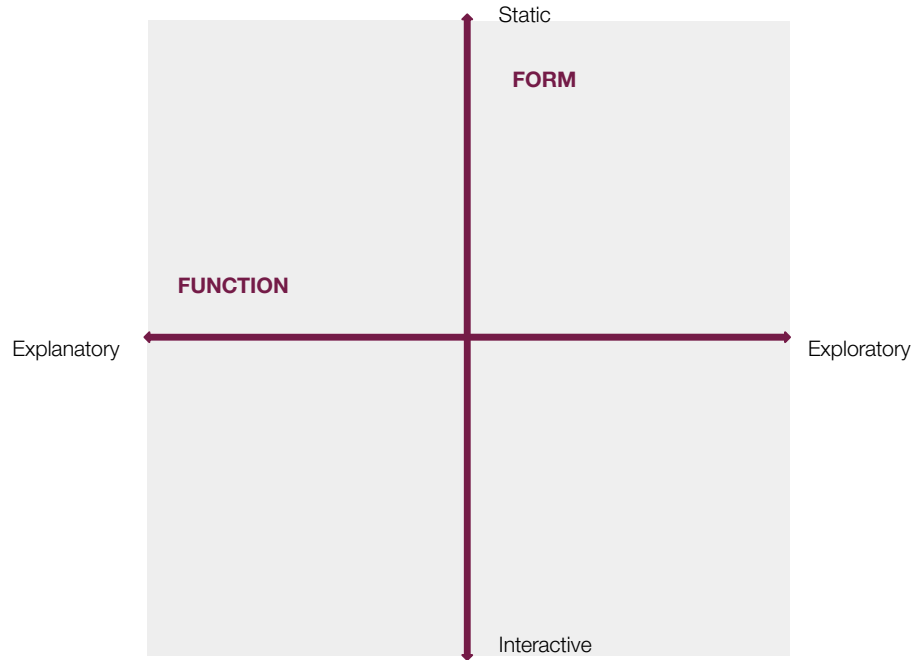


3 - Data visualisations 101

Many ways lead to a data visualisation...



Exploratory vs. explanatory: Form and function



FORM

Static: all information is provided at once

Interactive: transfer of information between the user/viewer and the interface

FUNCTION

Exploratory: for the users to find insights for themselves

Explanatory: convey the author's arguments

Gestalt Theory: Preattentive processing

Orientation

Length

Width

Size

Shape

Curvature

Added Marks

Enclosure

Contrast

Colour

Position

Spatial Grouping

Some attributes encourage **quantitative** interpretation.

As we combine different elements and perceive them as 1 single object, preattentive attributes help to:

- Draw attention to a specific element
- Create a hierarchy within the elements

← *Examples of preattentive attributes*

Colors



Use colors strategically

Colors have a function.

- Clarity
- Create order
- Connect
- Assign a type
- Create a relationship
- Signal



Cheatsheet

- Use a limited number of colors
- Stay consistent.
- 8% of men (0.5% of women) are colorblind.
- Embrace conventions.
- Colors do not represent quantities precisely.
- Color choice and normalization affects perception.

To select suitable tones and shades you can

- Leverage brand colors
- Use tools or websites to build your own color palette
 - <https://coolors.co/>
 - <https://colorbrewer2.org>



Maps



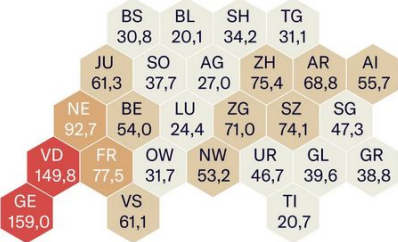
Our data is geographical, so let's use a map.

- We need to associate our values with the geographical information.
- Typically stored in shapefiles (*.shp) or *.geojson
- Defined format, e.g. a polygon defines outline of your shapes
- Beware of coordinate systems (Swiss vs. international)



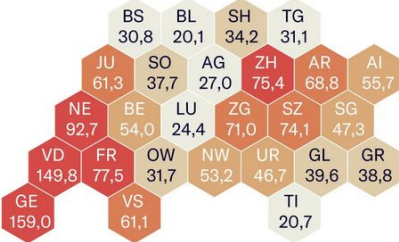
Colors and quantities, example

Gleich grosse Intervalle



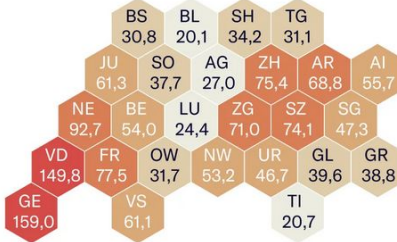
Es scheint, als wären nur Genf und das Waadtland stark betroffen.

Gleich viele Einträge

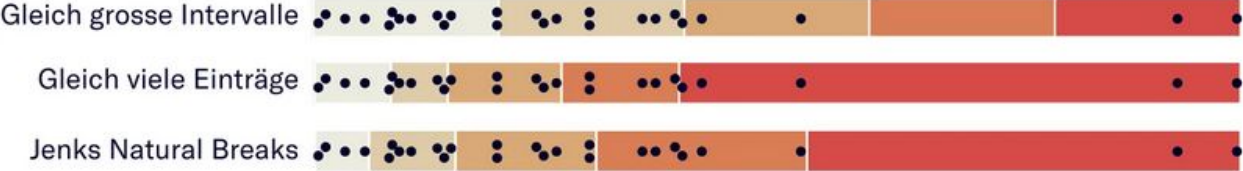


Es scheint, als sei Zürich genauso stark betroffen wie Genf.

Jenks Natural Breaks

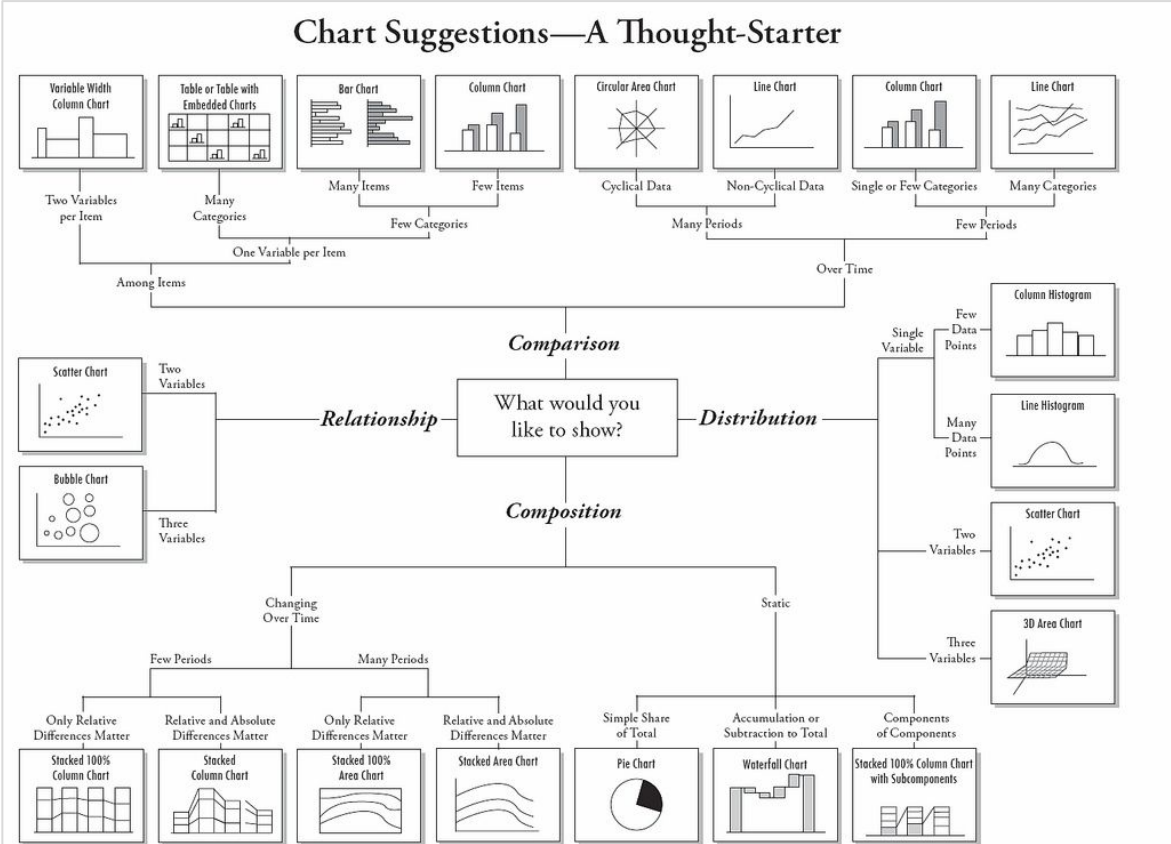


Die Wahrheit liegt eher dazwischen.



For overviews of suitable chart types, use chart picker

Visual Vocabulary



4 - Preset demo

In business, people wouldn't code their own visualisation.



Why use Preset?

All in One Data Platform

Single platform for dynamic dashboarding, code free exploration, and deeper analysis through a SQL IDE

Integrates w/ Modern Sources

Query any data source - cloud data warehouses, data lakes, and SQL engines

Rich Visualizations & Dashboards

Wide variety of beautiful visualizations including advanced geospatial renderings

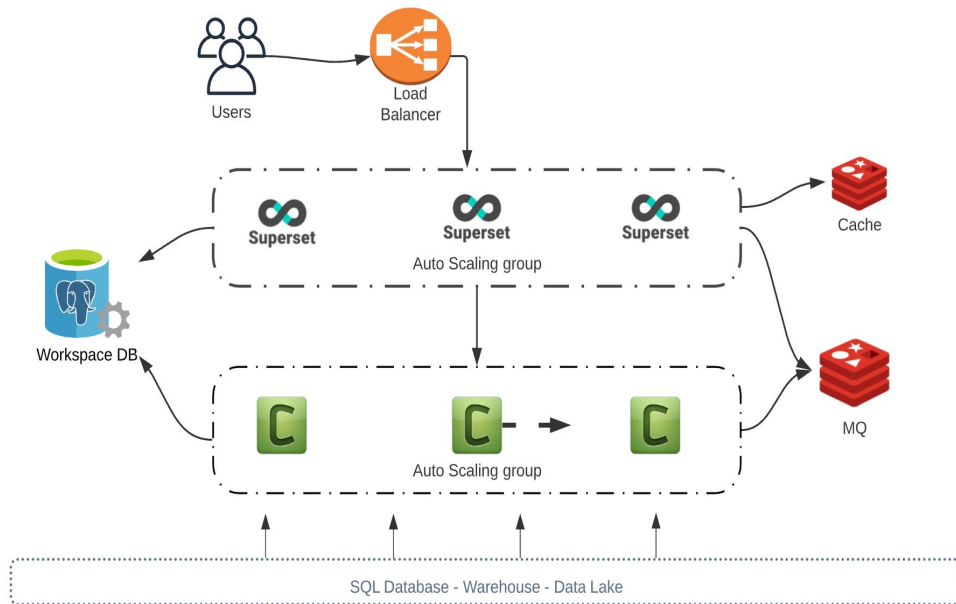
Extensible & Scalable

Cloud-native and leverages the power of your database at petabyte scale. Extend the platform with add-ons to meet your use case



Scalable, fast, and lightweight architecture

- Distributed architecture
- Cloud-native
- Lightweight and highly scalable
- Requires no data ingest
- Leverages the power of your existing datasource



Intro to Business Intelligence

Common Functionality of BI Tools

1 Get data, shape and prepare it

- Connect
- Transform
- Load
- Test
- Add data

3 Deploy / Publish

- Publish on server / in cloud
- Automate refresh
- Share securely

2 Build interactive Report / Dashboard

- Visualizations
- Filters
- Navigation

4 Consume Report / Dashboard

- Always the latest data
- Managed centrally (by business users!)
- Everyone sees what they are allowed to see (report or row-level security)
- Collaboration
- Automated insights



5 - Wrap up

IBCS: Intl. Business Communication Standards (aka "HICHERT")

Poco Moto

Piano *pp*

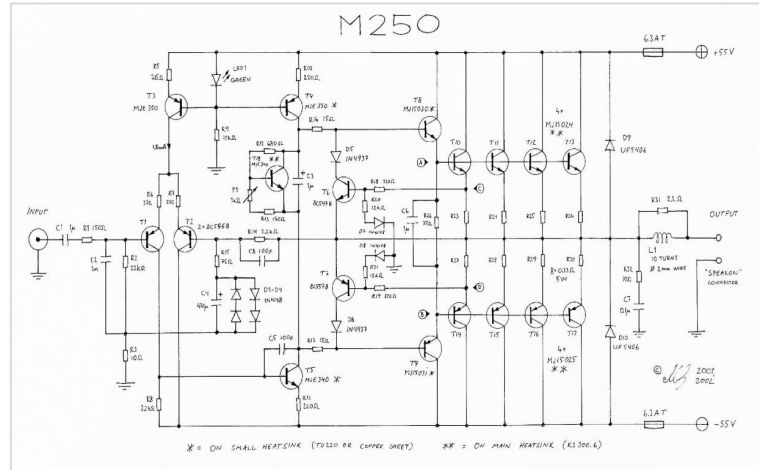
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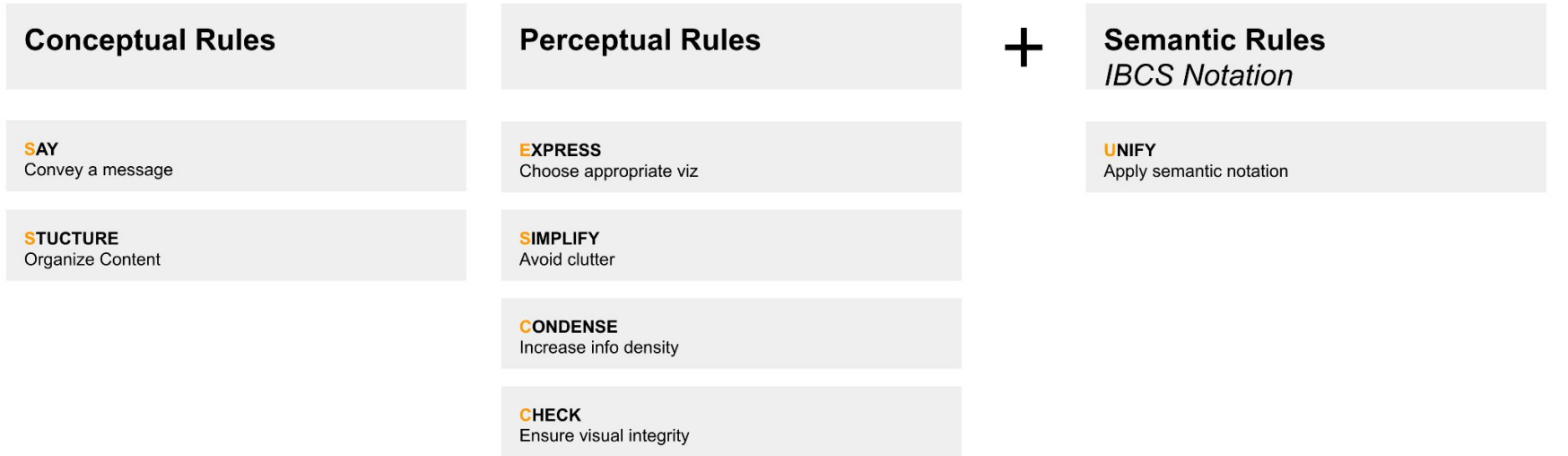
22

dim. *pp*

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IBCS is also a concise summary of literature relevant for storytelling with data, wrapped in a framework.



Derived from existing literature,
and summarized in a practical business-oriented
way

The “Soul” of IBCS,
i.e. the differentiator to other frameworks /
existing literature in the field



Check it out: The IBCS Standards are Publicly Available ([LINK](#)).

CONCEPTUAL RULES 1

SAY –

CONVEY A MESSAGE 2

SA 1 Know objectives 2

- SA 1.1 Know own goals 2
- SA 1.2 Know target audience 2

SA 2 Introduce message 3

- SA 2.1 Map situation 3
- SA 2.2 Explain problem 3
- SA 2.3 Raise question 4

SA 3 Deliver message 4

- SA 3.1 Detect, explain, or suggest 4
- SA 3.2 Say message first 6

SA 4 Support message 6

- SA 4.1 Provide evidence 6
- SA 4.2 Use precise words 7
- SA 4.3 Highlight message 7
- SA 4.4 Name sources 7
- SA 4.5 Link comments 8

SA 5 Summarize message 8

- SA 5.1 Repeat message 8
- SA 5.2 Explain consequences 9

STRUCTURE –

ORGANIZE CONTENT 10

ST 1 Use consistent elements 10

- ST 1.1 Use consistent items 10
- ST 1.2 Use consistent types of statements 10
- ST 1.3 Use consistent wording 11
- ST 1.4 Use consistent visualizations 11

ST 2 Build non-overlapping elements 12

- ST 2.1 Build non-overlapping report structures 12
- ST 2.2 Build non-overlapping business measures 13
- ST 2.3 Build non-overlapping structure dimensions 13

ST 3 Build collectively exhaustive elements 13

- ST 3.1 Build exhaustive arguments 14
- ST 3.2 Build exhaustive structures in charts and tables 14

ST 4 Build hierarchical structures 15

- ST 4.1 Use deductive reasoning 15
- ST 4.2 Use inductive reasoning 15

ST 5 Visualize structure 16

- ST 5.1 Visualize structure in reports 16
- ST 5.2 Visualize structure in tables 16
- ST 5.3 Visualize structure in notes 17

PERCEPTUAL RULES 19

EXPRESS –

CHOOSE PROPER VISUALIZATION 20

EX 1 Use appropriate object types 20

- EX 1.1 Use appropriate chart types 20
- EX 1.2 Use appropriate table types 39

EX 2 Replace inappropriate chart types 59

- EX 2.1 Replace pie and ring charts 59
- EX 2.2 Replace gauges, speedometers 59
- EX 2.3 Replace radar and funnel charts 60
- EX 2.4 Replace spaghetti charts 61
- EX 2.5 Replace traffic lights 61

EX 3 Replace inappropriate representations 61

- EX 3.1 Prefer quantitative representations 62
- EX 3.2 Avoid text slides in presentations 69

EX 4 Add comparisons 62

- EX 4.1 Add scenarios 63
- EX 4.2 Add variances 63

EX 5 Explain causes 63

- EX 5.1 Show tree structures 64
- EX 5.2 Show clusters 64
- EX 5.3 Show correlations 64

SIMPLIFY –

AVOID CLUTTER 66

SI 1 Avoid unnecessary components 66

- SI 1.1 Avoid cluttered layouts 66
- SI 1.2 Avoid colored or filled backgrounds 66
- SI 1.3 Avoid animation and transition effects 67

SI 2 Avoid decorative styles 67

- SI 2.1 Avoid borders, shades, and pseudo-3D 67
- SI 2.2 Avoid decorative colors 68
- SI 2.3 Avoid decorative fonts 68

SI 3 Replace with cleaner layout 69

- SI 3.1 Replace grid lines and value axes with data labels 69
- SI 3.2 Avoid vertical lines by right-aligning data 69

SI 4 Avoid redundancies 69

- SI 4.1 Avoid superfluous extra words 70
- SI 4.2 Avoid obvious terms 70
- SI 4.3 Avoid repeated words 70

SI 5 Avoid distracting details 71

- SI 5.1 Avoid labels for small values 71
- SI 5.2 Avoid long numbers 71
- SI 5.3 Avoid unnecessary labels 72

CONDENSE –

INCREASE INFORMATION DENSITY 73

CO 1 Use small components 73

- CO 1.1 Use small fonts 73
- CO 1.2 Use small elements 73
- CO 1.3 Use small objects 74

CO 2 Maximize use of space 74

- CO 2.1 Use narrow page margins 74
- CO 2.2 Reduce empty space 75

CO 3 Add data 75

- CO 3.1 Add data points 75
- CO 3.2 Add dimensions 76

CO 4 Add elements 76

- CO 4.1 Show overlay charts 77

- CO 4.2 Show multi-tier charts 79

- CO 4.3 Show extended charts 81
- CO 4.4 Embed chart elements in tables 82
- CO 4.5 Embed explanations 83

CO 5 Add objects 83

- CO 5.1 Show small multiples 83
- CO 5.2 Show related charts on one page 85
- CO 5.3 Show chart-table combinations 86
- CO 5.4 Show charts and tables in text pages 86

CHECK –

ENSURE VISUAL INTEGRITY 88

CH 1 Avoid manipulated axes 88

- CH 1.1 Avoid truncated axes 88
- CH 1.2 Avoid logarithmic axes 89
- CH 1.3 Avoid different class sizes 89

CH 2 Avoid manipulated visualization elements 89

- CH 2.1 Avoid clipped visualization elements 89
- CH 2.2 Use creative solutions for challenging scaling issues 90

CH 3 Avoid misleading representations 90

- CH 3.1 Use correct area comparisons, prefer linear ones 90
- CH 3.2 Use correct volume comparisons, prefer linear ones 91
- CH 3.3 Avoid misleading colored areas in maps 91

CH 4 Use the same scales 92

- CH 4.1 Use identical scale for the same unit 92
- CH 4.2 Size charts to given data 92
- CH 4.3 Use scaling indicators if necessary 93
- CH 4.4 Use outlier indicators if necessary 93
- CH 4.5 Use magnifying glasses 94

CH 5 Show data adjustments 94

- CH 5.1 Show the impact of inflation 94
- CH 5.2 Show the currency impact 95

ST 3.2 BUILD EXHAUSTIVE STRUCTURES IN CHARTS AND TABLES

The elements of structures presented in charts and tables should also be exhaustive, in other words, adding up to one hundred percent.

In many practical applications of this kind, adding a remainder element ("rest of...") helps to conform to this rule.



Figure ST 3.2: Build exhaustive structures in charts and tables

SI 4.2 AVOID OBVIOUS TERMS

Terms such as "chart analysis", "development", or "comment" are redundant because they name something already shown, see Figure SI 4.2. Other obvious terms in charts and tables are "table", "statistics", "report", "visualization", "structure", or "trend".

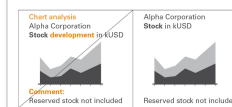


Figure SI 4.2: Avoid obvious terms



Our favorite books and links

- Few, Stephen (2013), Information Dashboard Design, Analytics Press
- Nussbaumer Knaflic, Cole (2015), Storytelling with Data : A Data Visualization Guide for Business Professionals, John Wiley & Sons Inc
- Schwabish, Jonathan (2021), Better Data Visualizations : A guide for Scholars, Researchers, and Wonks, University Presses
- Tufte, Edward R. (2001), The Visual Display of Quantitative Information (2nd edition), Graphics Press LLC
- [Visual Vocabulary](#) on Tableau Public
- [Tableau Visual Guidebook](#)
- [IBCS \(International Business Communication Standards\)](#)



Thank you Preset! 🙏

- Join the Apache Superset community
[Community | Superset](#)
- Ping Srinu Kadamati in the Superset Slack or reach out at srini@preset.io
- Recommendation: their new podcast! [Announcing The Analytics Everywhere Podcast, by Preset](#)
- Your account active will be active for another week!
But Srinu can convert you to the forever free tier! 🎉




Meet our colleagues for another workshop tomorrow

AMLD EPFL 2022

WORKSHOP

The Full Machine Learning Lifecycle - How to Use Machine Learning in Production (MLOps)



Tim Rohner Roman Moser Bernhard Vennemann Spyros Cavadias Steffen Terhaar

14:00-18:00, March 27

D | ONE
WE MAKE SENSE.



Meet us at the main conference

- Meet us at our booth (No 5) in the exhibition hall
- Meet our partner Simon Hefti during the Monday morning keynote session
- Meet Lukas Altenkamp at the AI & Industry track on Tuesday 12.15 pm about “Increasing sales with lightning fast MLOps”



If you are curious about what we are doing at D ONE and would like to stay in touch...



LET'S MAKE SENSE

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