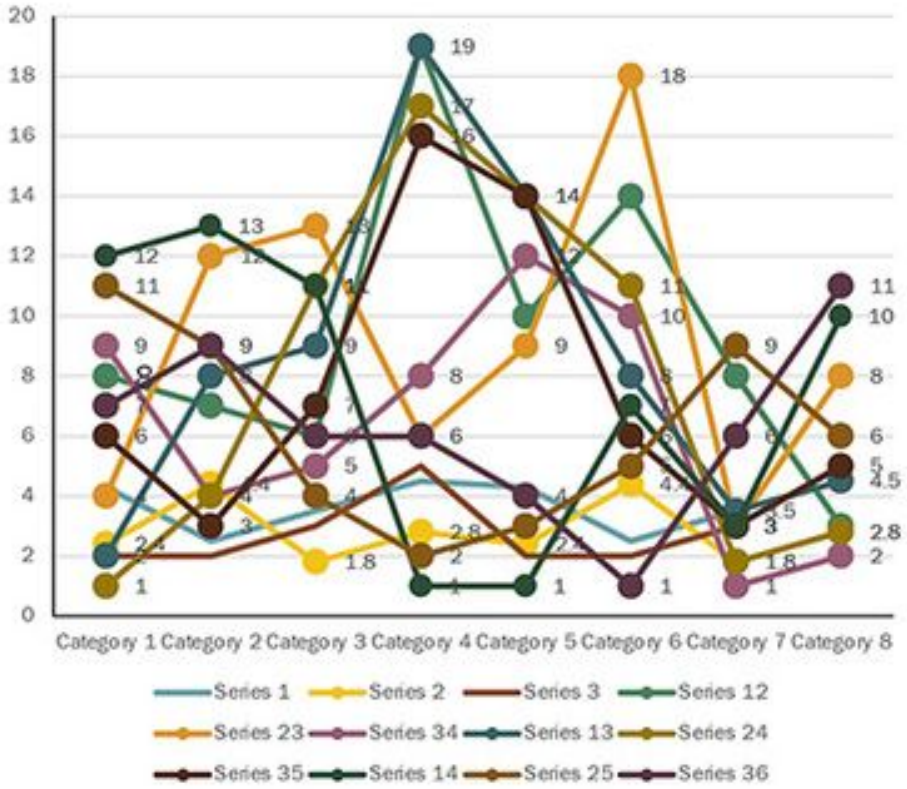
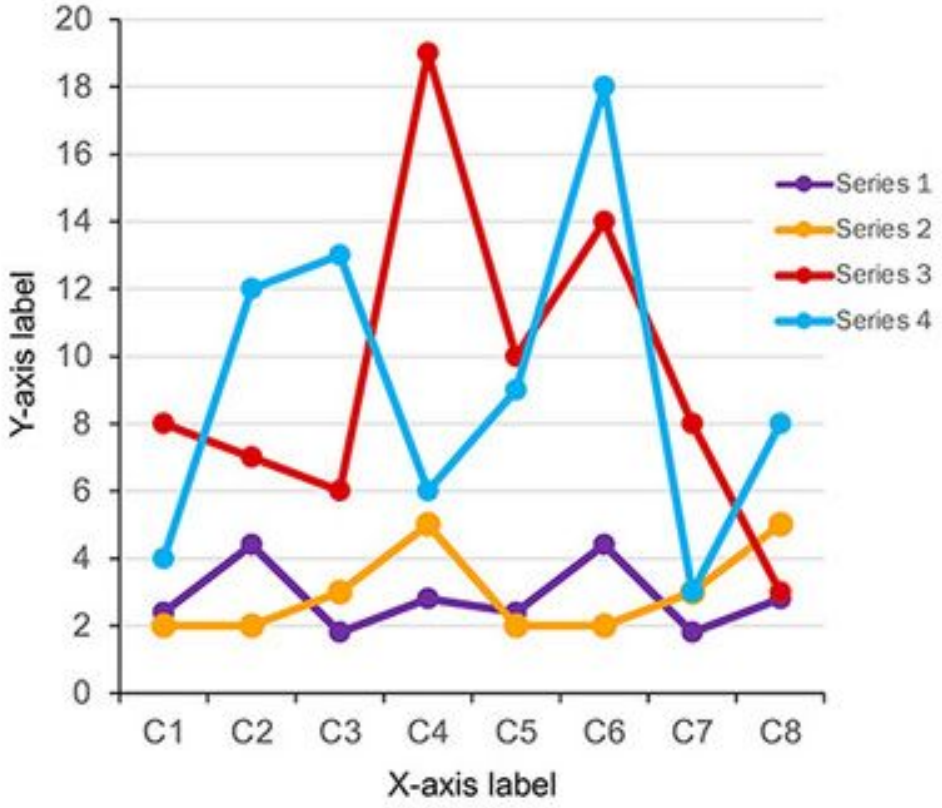
Graphic Design Principles

Part 1: Typography, Labels, and Clarity

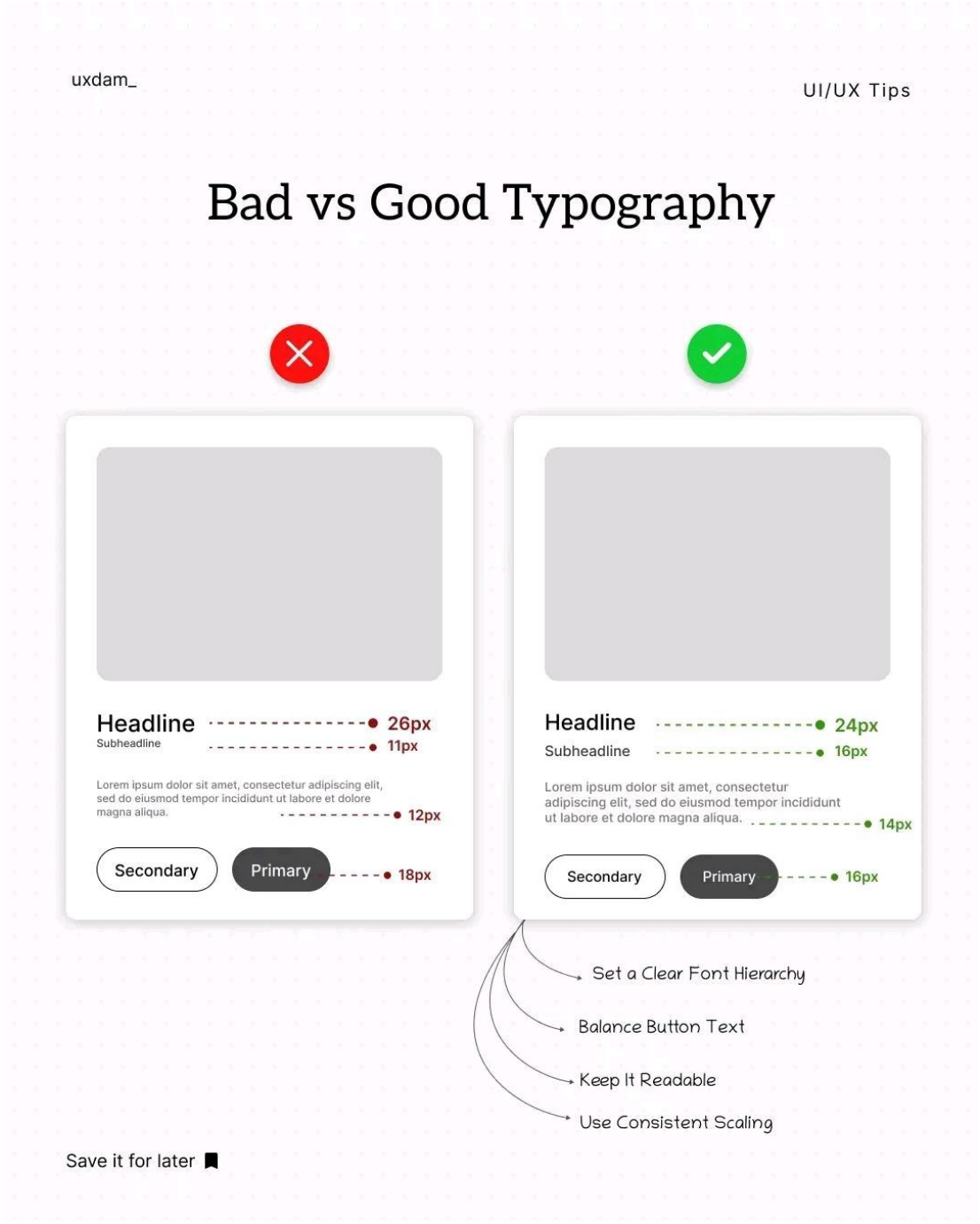
Exploring the visual foundations of effective data storytelling.





https://designcenter.uiowa.edu/creating-effective-posters

https://cl.pinterest.com/pin/1562192995205430 4/



Learning Outcomes (CLO 1)

Apply Principles

Implement basic graphic design rules to enhance data visuals.

Identify Issues

Recognize common typography and labeling errors in figures.

Improve Clarity

Refine existing visuals for better interpretation speed.

Why Typography Matters

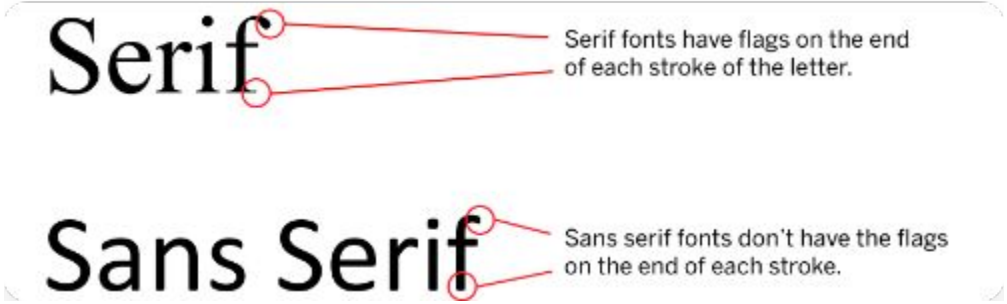
Text is not just a supplement; it is an **integral part** of the visualization.

- Poor typography causes cognitive friction and misunderstanding.
- Readability directly affects how quickly an audience interprets data.
- Consistent styling establishes scientific authority and trust.

Common Font Types

Serif Fonts

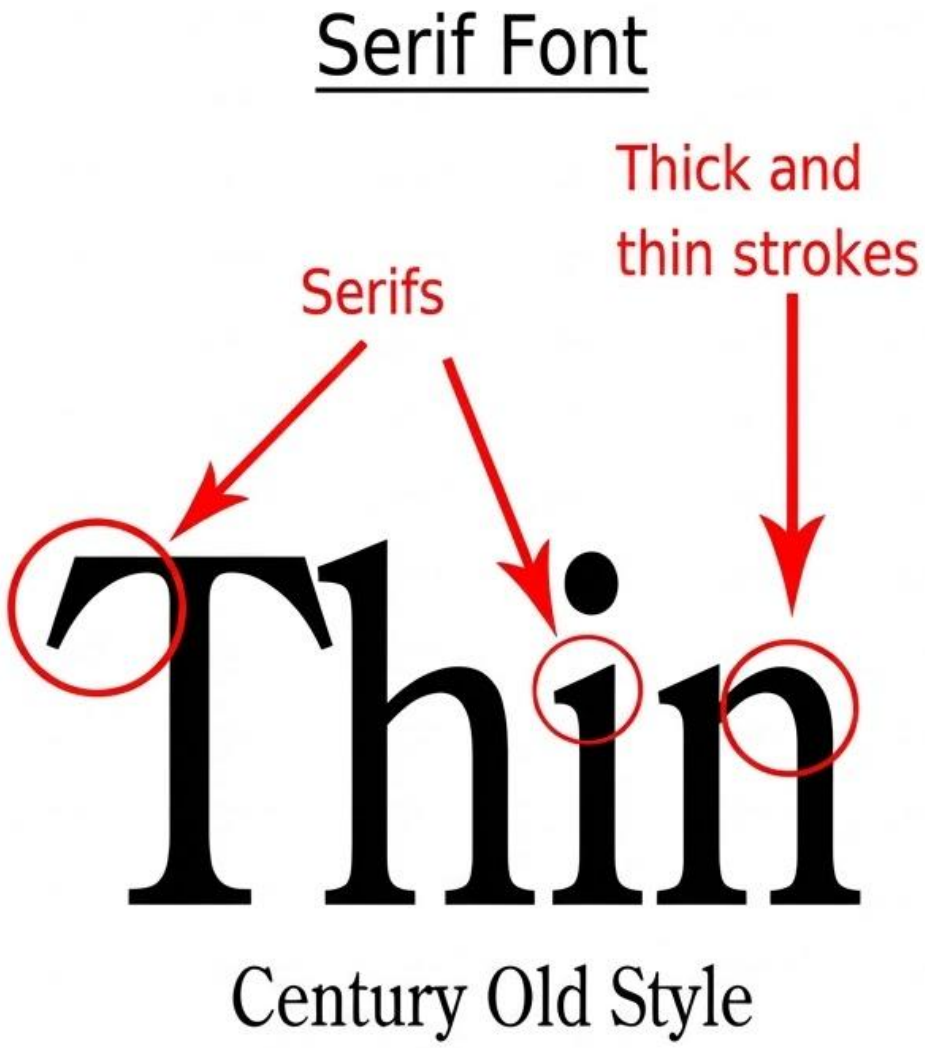
Features small "feet" or strokes at the ends of characters. Best for long-form printed text (e.g., Merriweather).

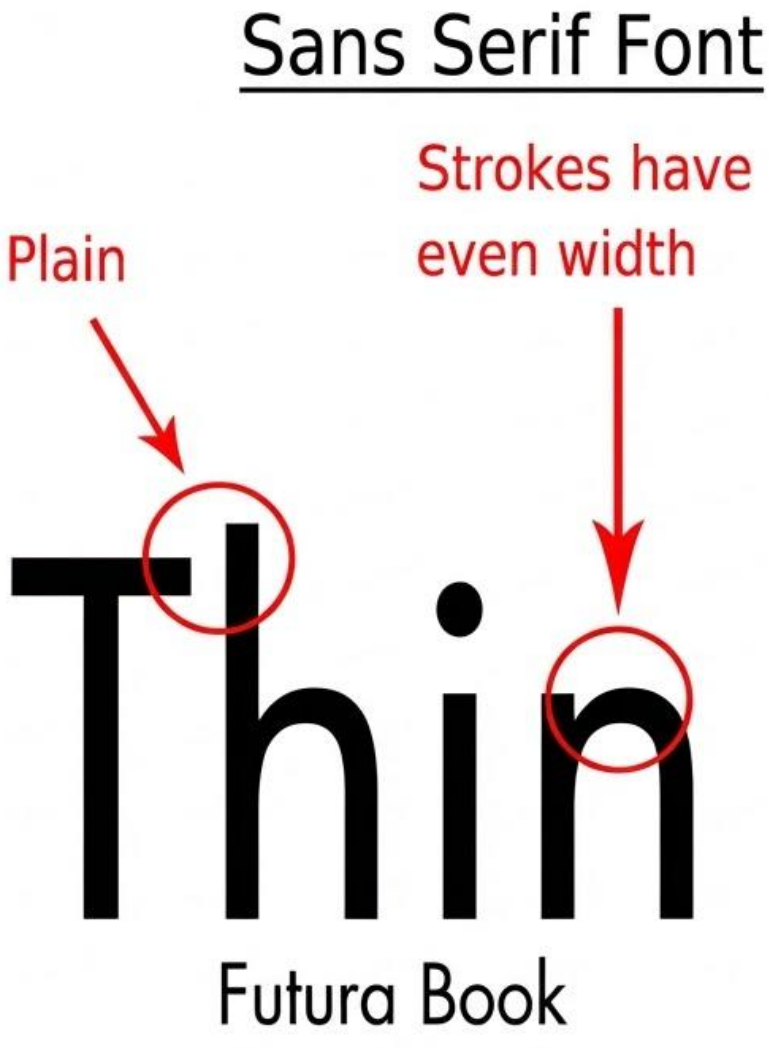


Sans-Serif Fonts

Clean, minimalist appearance without extra strokes. Highly recommended for digital charts and UI (e.g., DM Sans).

https://www.canva.com/learn/serif-vs-sans-serif-fonts/





https://accessibility.goa2jtech.com/accessibility-guide/fonts-typography

Font Choice for Data Viz

- **Prefer Sans-Serif:** Use clean fonts for labels and scales to maintain legibility at small sizes.
- **Avoid Decorative:** Script or stylized fonts distract from the data and reduce clarity.
- **Maintain Consistency:** Stick to 1-2 font families throughout the entire figure.
- **Legibility First:** Ensure text remains readable even when charts are scaled down for reports.

Sparrows

Serifs

ROBOTO SERIF

India: 14.20m

GEORGIA

India: 14.20m

GARAMOND

Sparrows

ROBOTO

India: 14.20m

HELVETICA

India: 14.20m

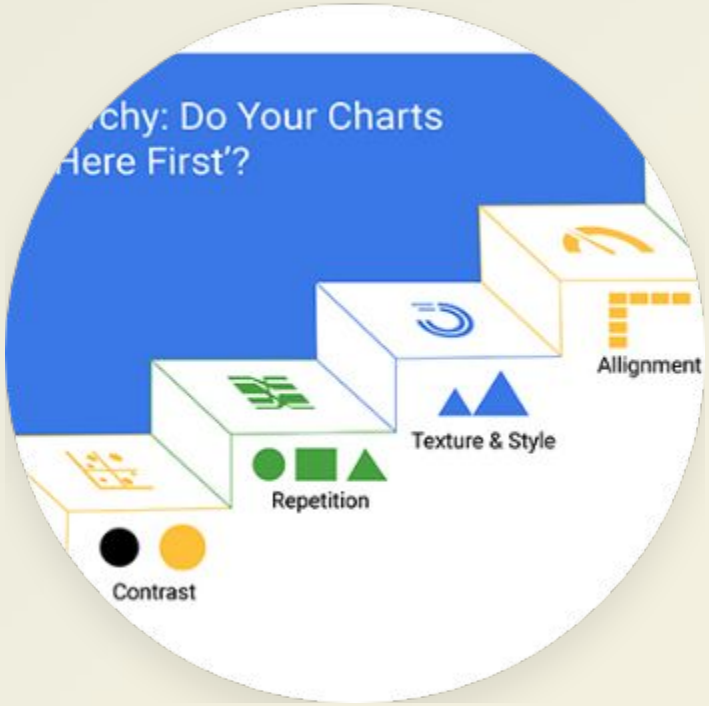
FUTURA

SERIF FONTS

SANS-SERIF FONTS

https://www.datawrapper.de/blog/fonts-for-data-visualization

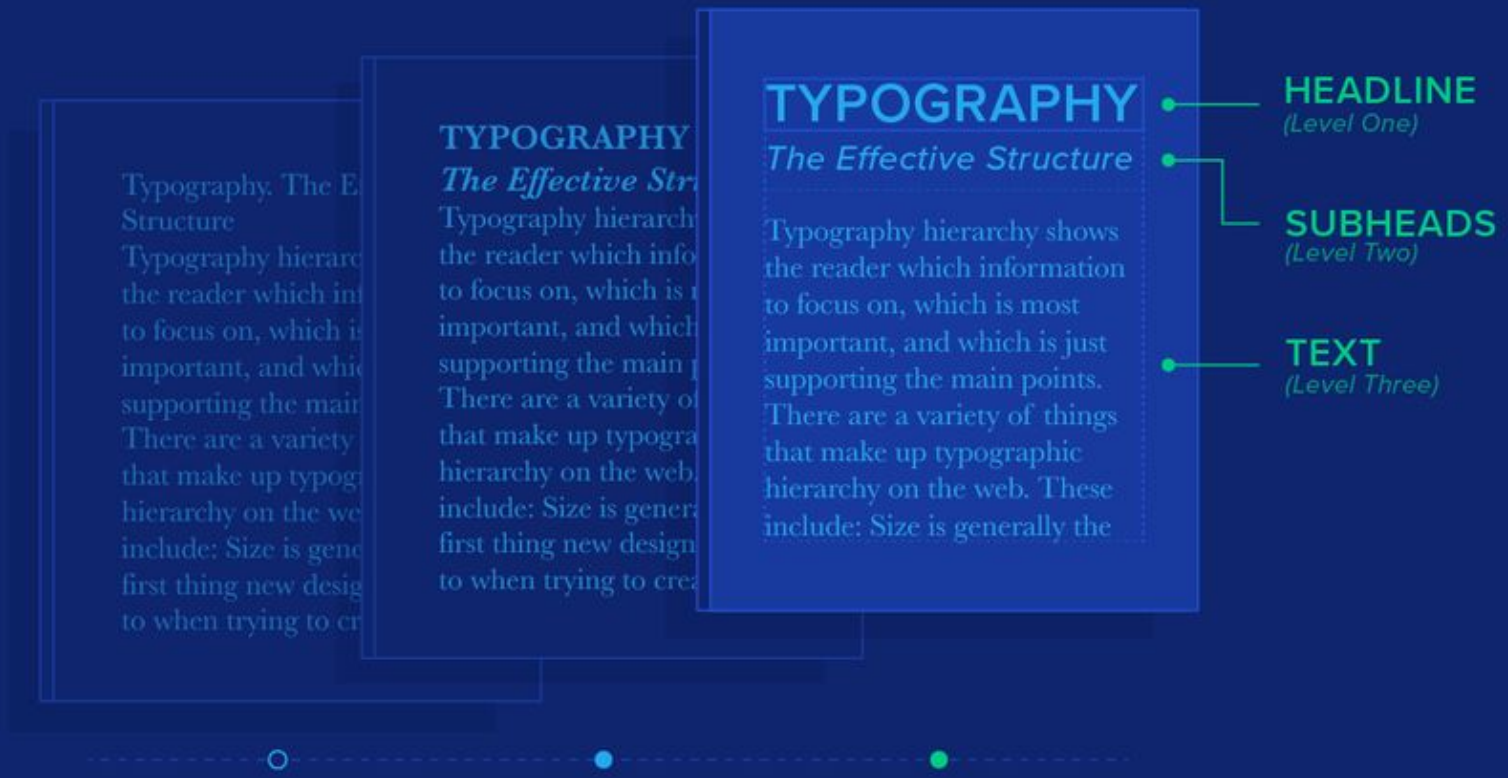
Font Size and Hierarchy



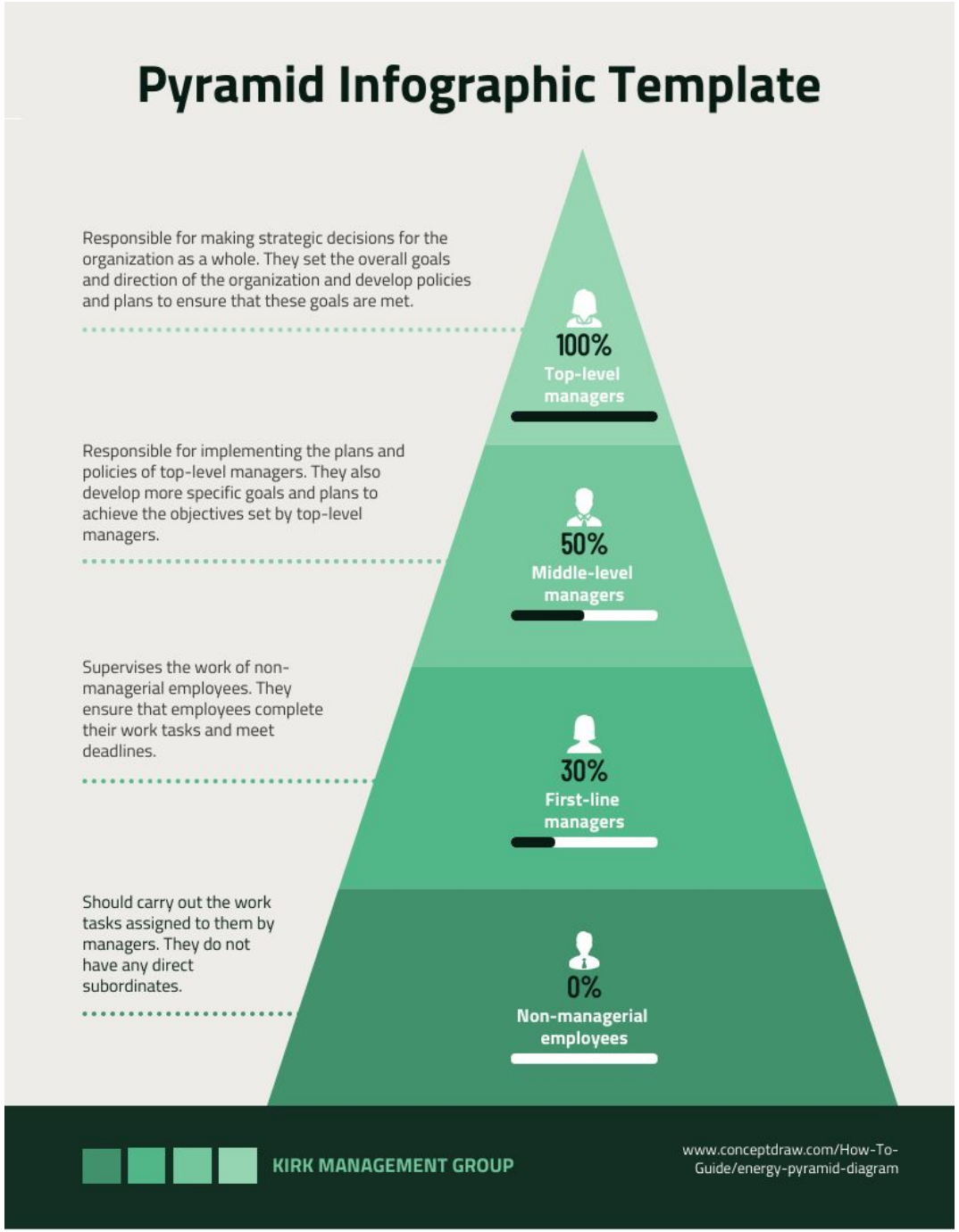
Establishing Order

Visual hierarchy guides the viewer's eye to the most important information first.

- **Title:** Most prominent (largest/boldest).
- **Axis Labels:** Secondary priority.
- **Tick Labels:** Smallest but must remain readable.



https://www.toptal.com/designers/typography/typographic-hierarchy



https://venngage.com/blog/hierarchy-infographic/

Font Weight and Emphasis

Guidance

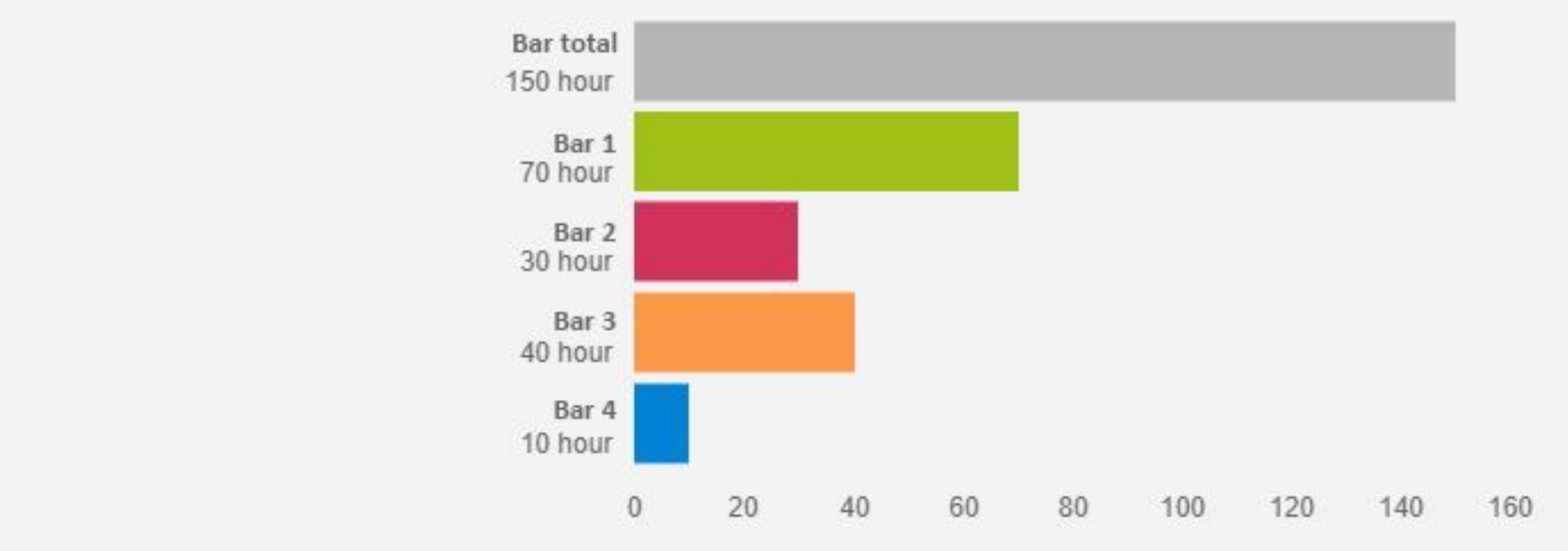
Use **Bold** or *Italics* sparingly to guide the viewer's attention to specific data points or outliers.

Avoid Noise

Excessive emphasis (e.g., underlining everything) creates visual noise and makes the figure harder to parse.

Word Cloud

https://www.ilustromania.com/art-principles/emphasis---techniques-to-highlight-key-elements-in-your-art



https://stackoverflow.com/questions/46221425/chart-js-make-part-of-labels-bold

Labels in Data Visualization

Axis Labels

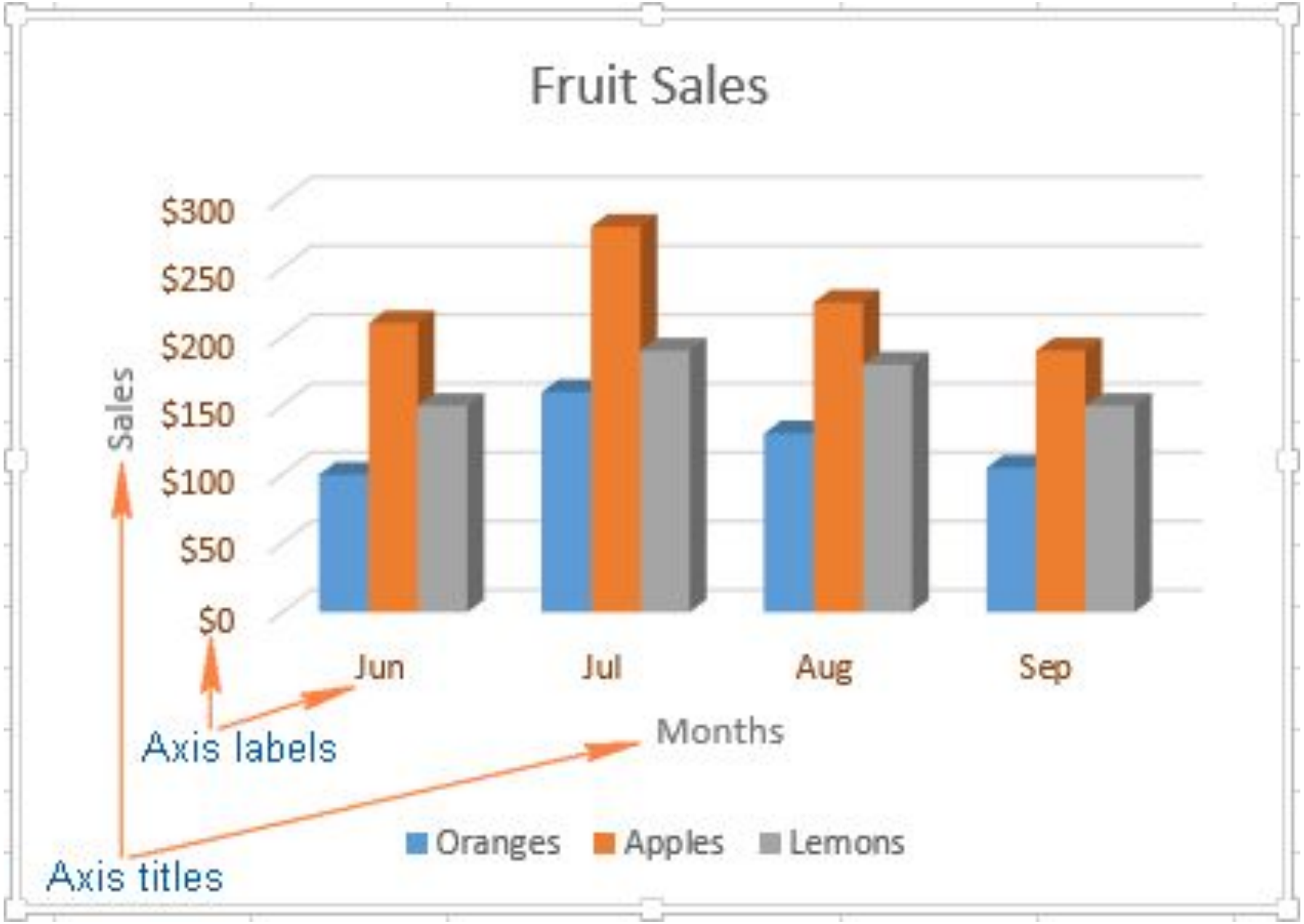
Clearly define what each axis represents.

Legends

Map colors or shapes to data categories.

Direct Labeling

Place text next to data to reduce eye movement.



https://www.ablebits.com/office-addins-blog/excel-charts-title-axis-legend/

Axis Labels and Units

- **Clear Names:** Don't use internal database variable names (e.g., use "Population" not "pop_2024").
- **Always Include Units:** Specify if data is in kilograms, dollars, or percentages.
- **Avoid Abbreviations:** Use full words unless space is extremely constrained.

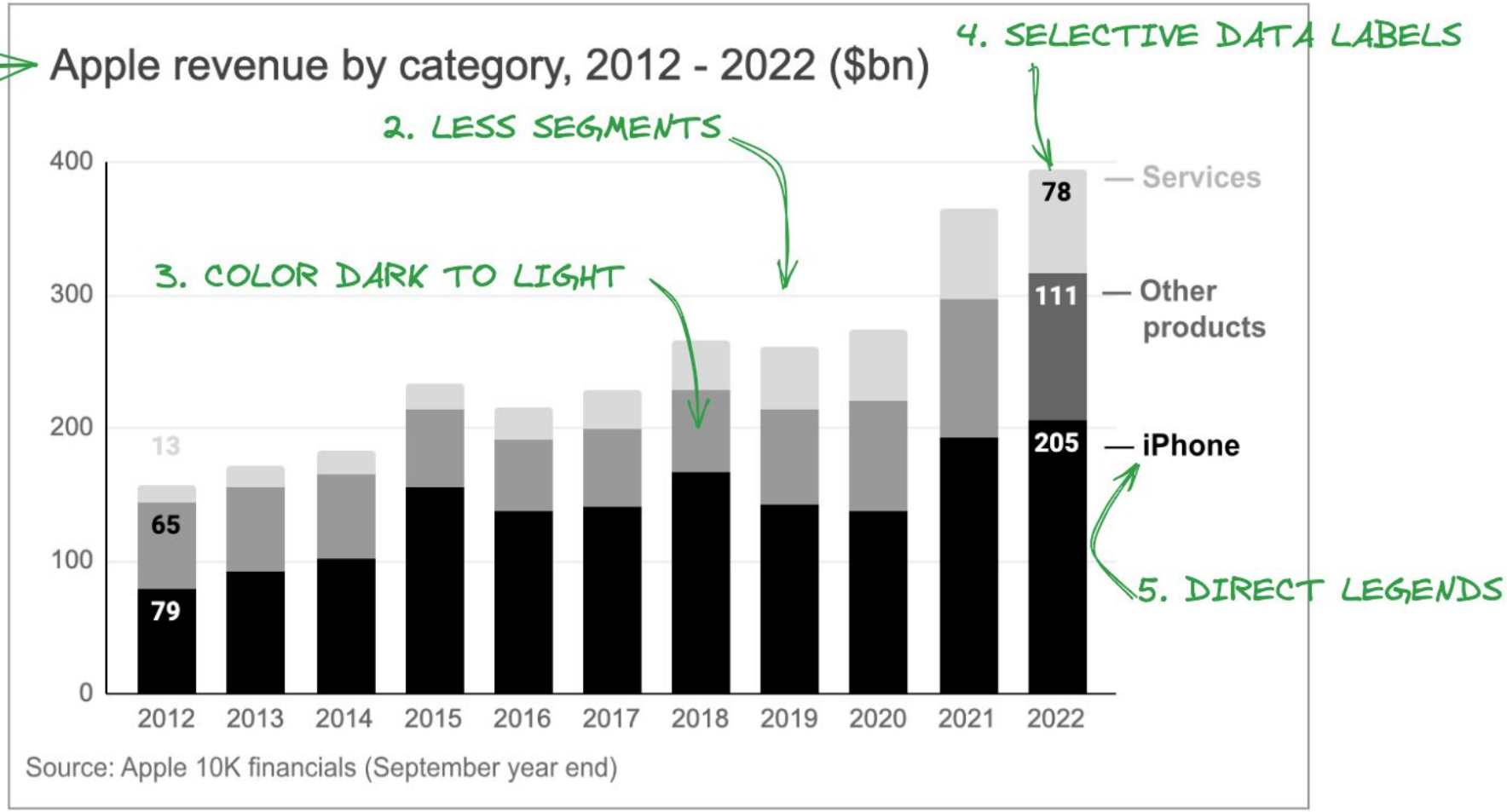
Titles That Communicate Meaning

Beyond "Chart 1": Using titles to state the main message.

GOOD CHART FORMATTING

https://mannhowie.com/chart-formatting

1. DESCRIPTIVE TITLES



5. DIRECT LEGENDS

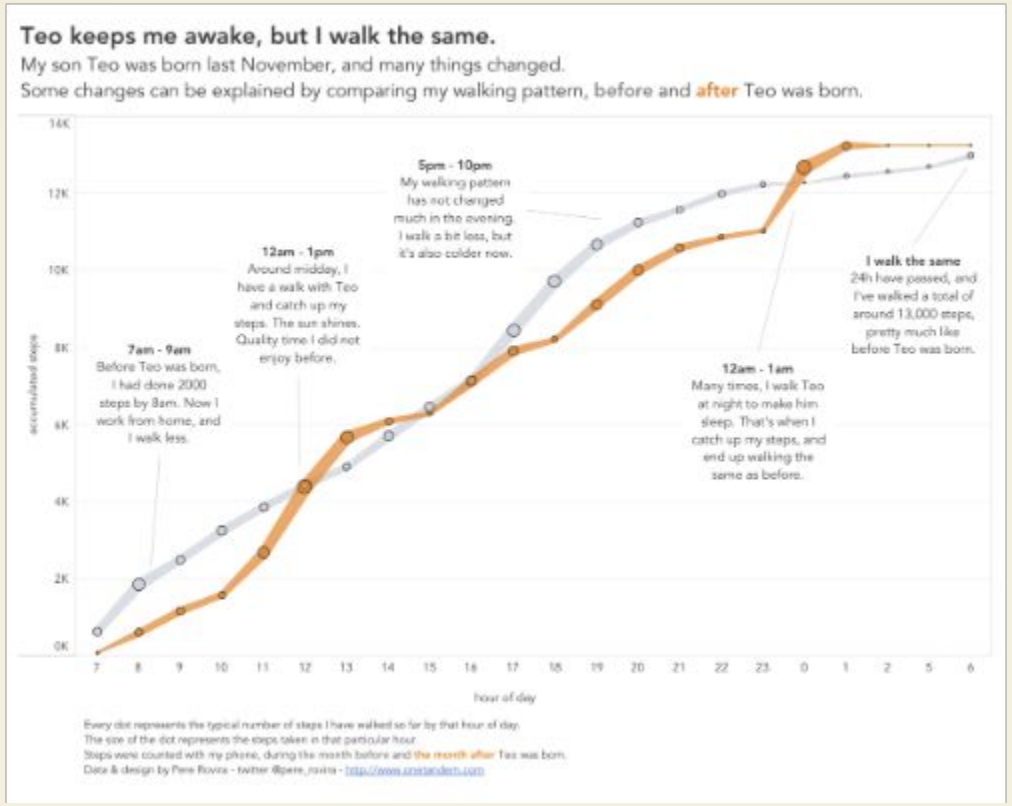
mannhowie.com

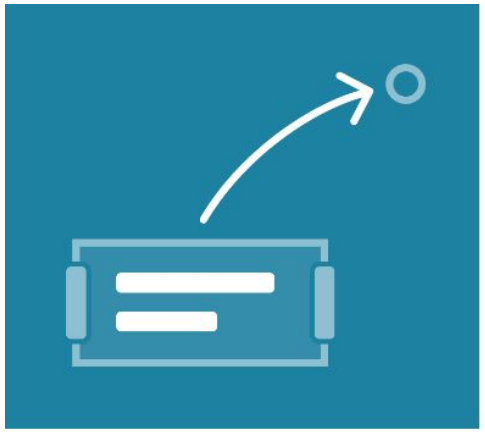
Annotations and Explanations

Guiding the Interpretation

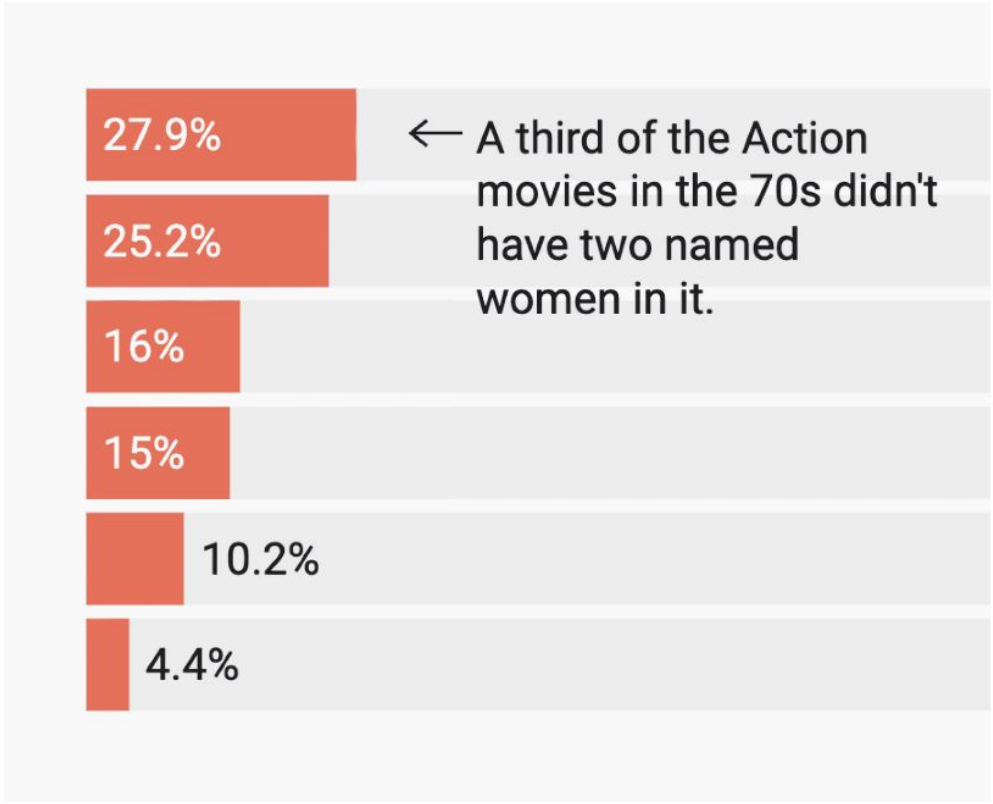
Annotations act as "micro-stories" within your visualization.

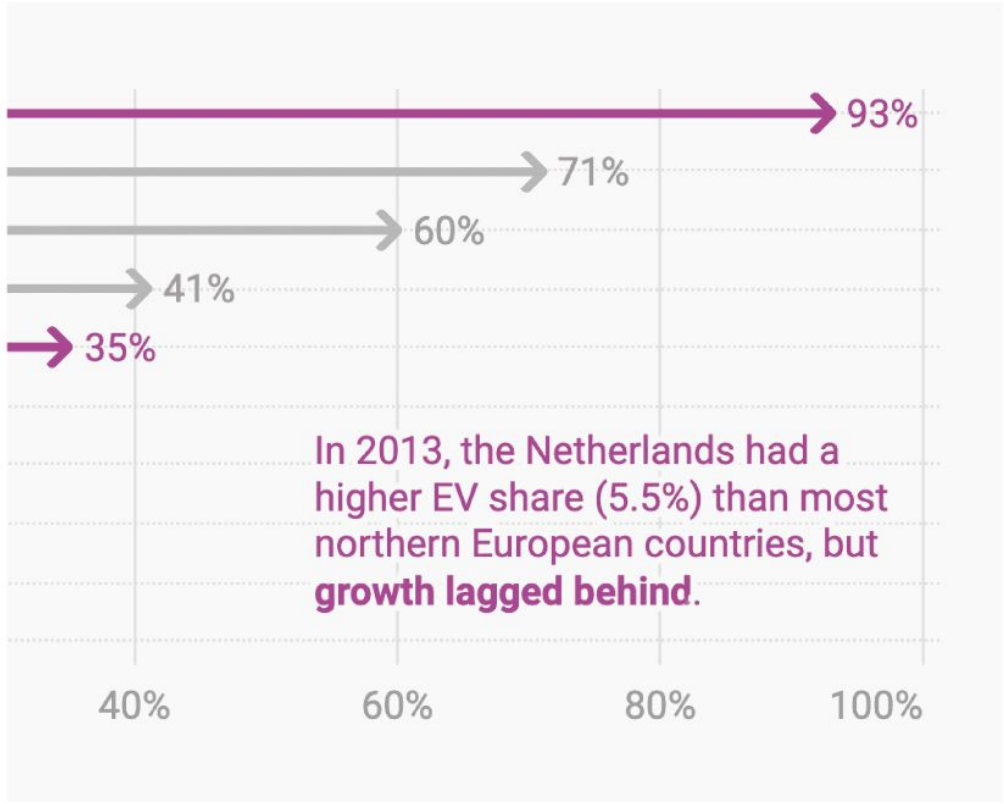
- Highlight key peaks or valleys.
- Explain unusual patterns or sudden shifts.
- **Goal:** Reduce the time it takes for a user to understand the "why".

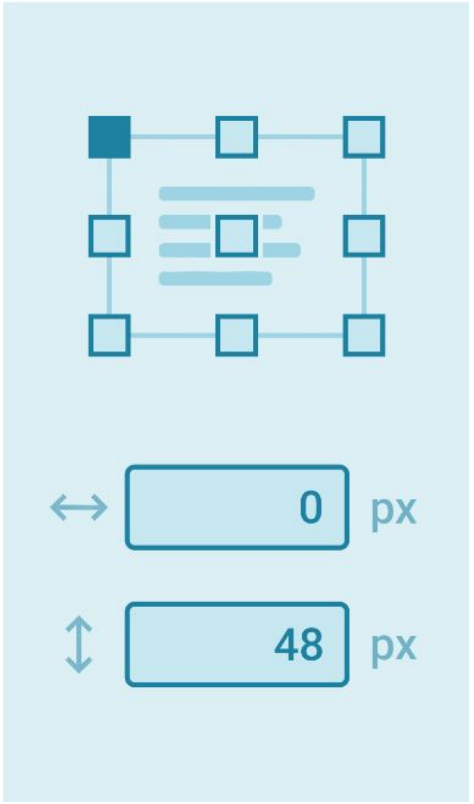




Annotations in bar, range & dot charts

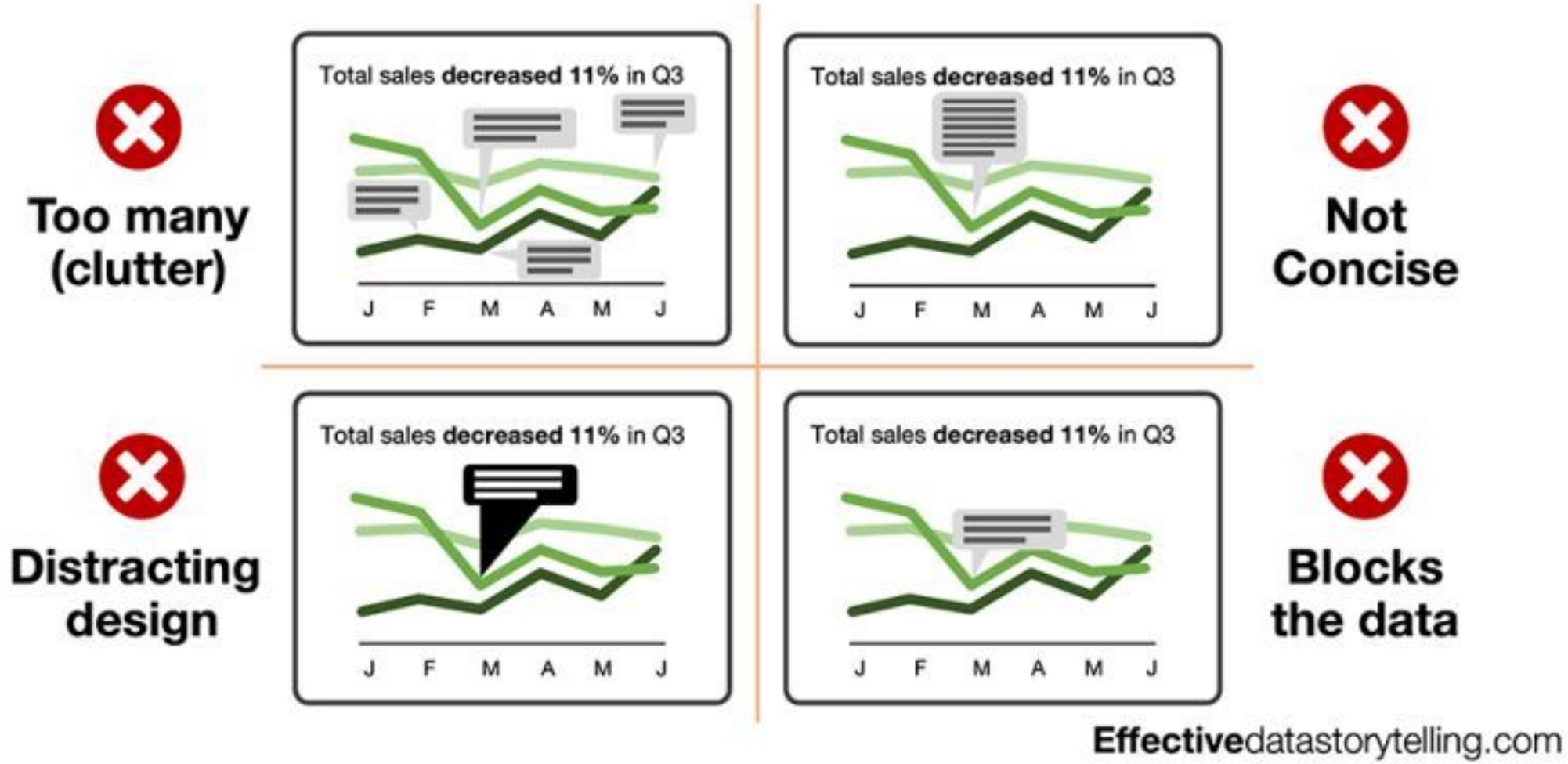






https://www.datawrapper.de/blog/annotations-in-bar-charts

Annotations: Four common mistakes



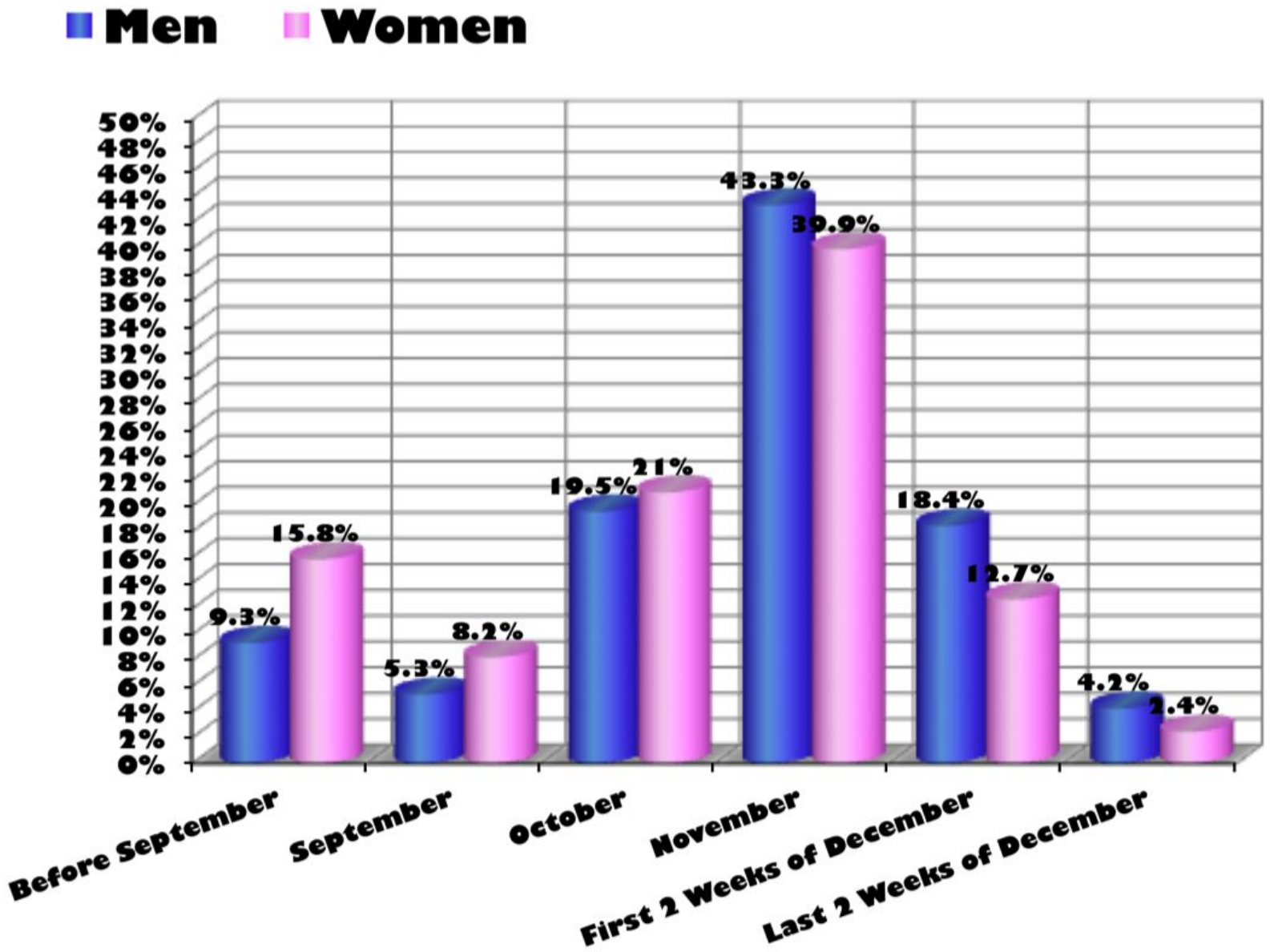
https://www.linkedin.com/posts/brentdykes_datastorytelling-activity-7303130790362501121-9en2

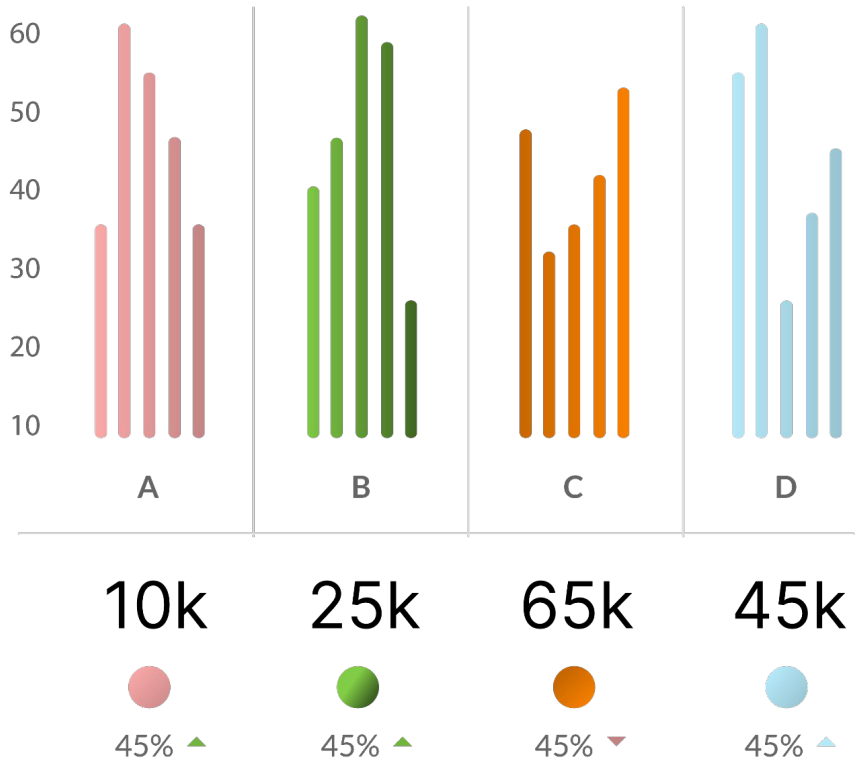
Clarity and Simplicity

> "Maximize the data-ink ratio... Remove unnecessary text and reduce visual noise to focus strictly on the message."
>
> — Claus O. Wilke

Shoppers Begins Shopping for Holidays

https://www.storytellingwithdata.com/blog/2017/3/29/declutter-this-graph





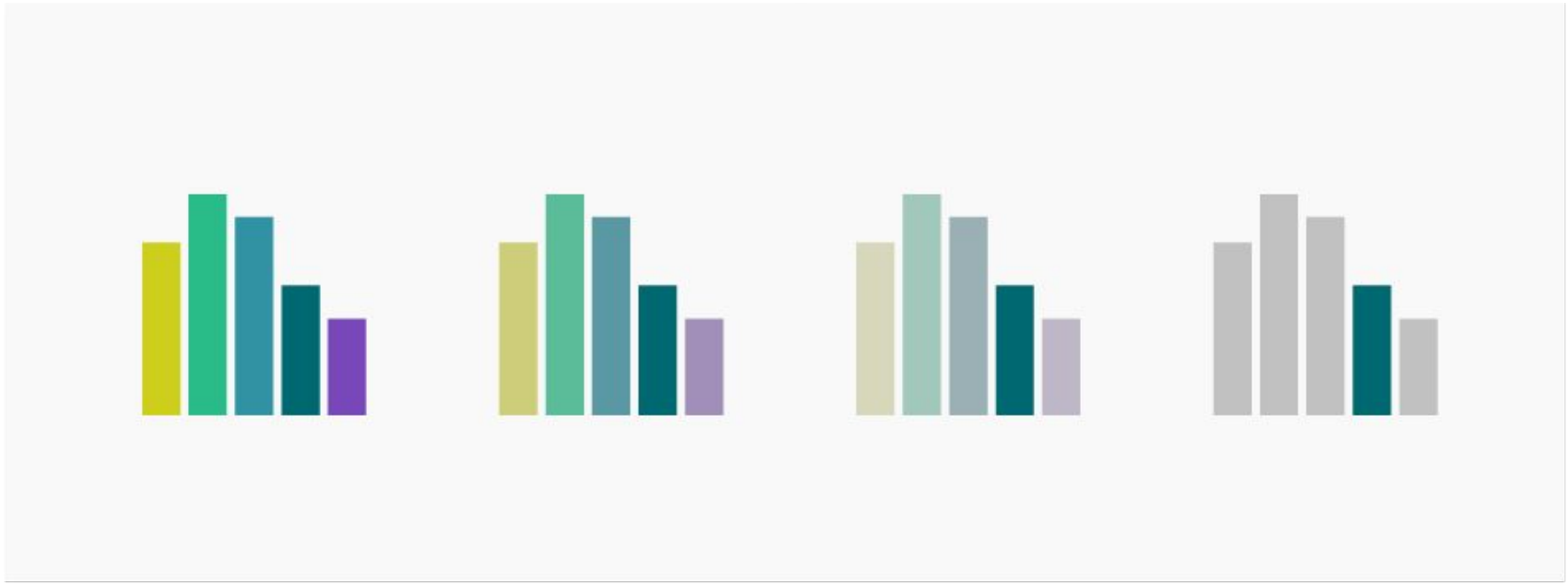
https://magipik.com/vector/minimalist-data-visualization-dashboard-with-charts-graphs-and-analytics-for-modern-analytics-platforms-113339

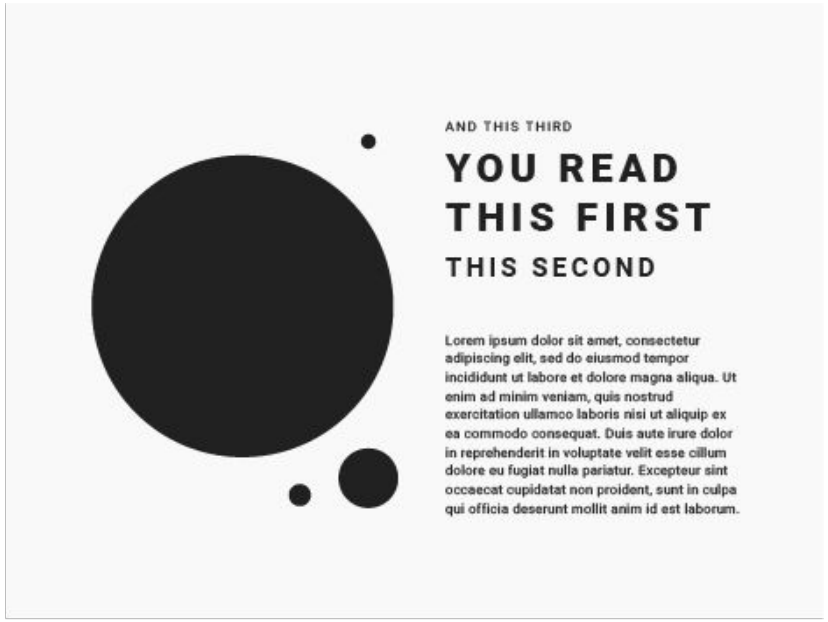
Introduction to Color

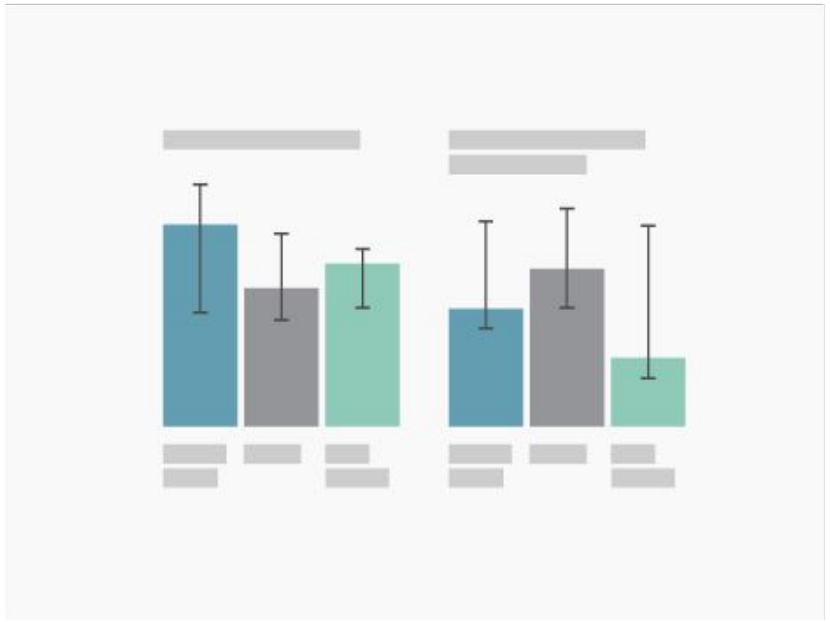
Color as Information

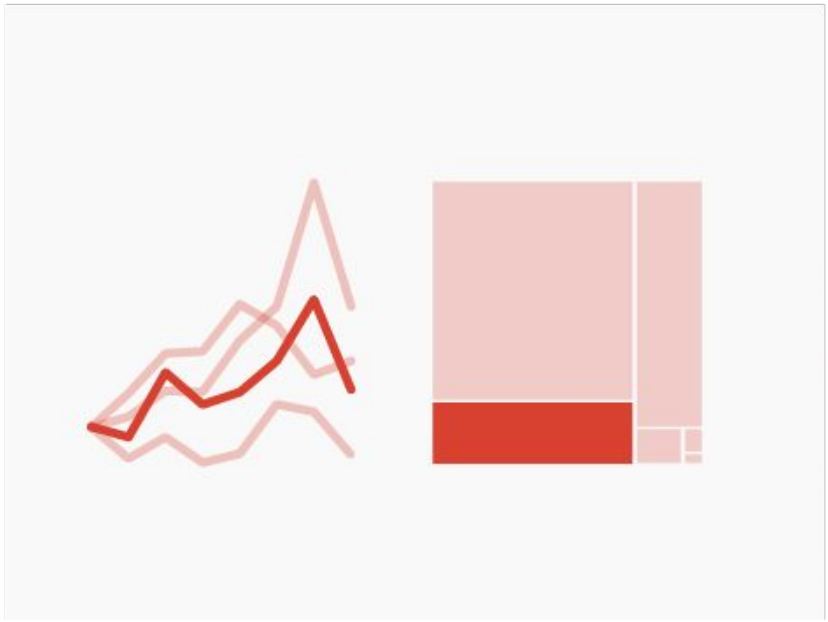
Color is not decoration; it is a tool for distinction and emphasis.

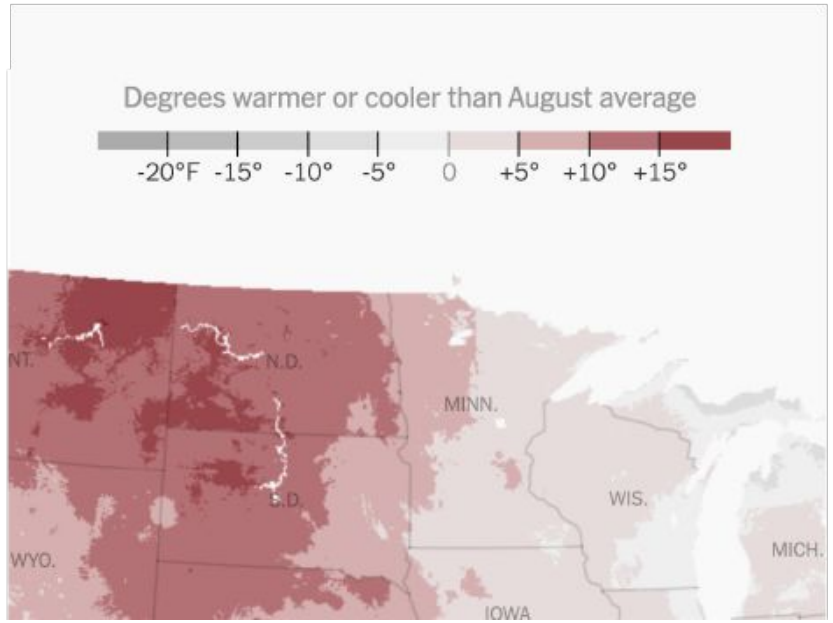
- **Contrast:** Critical for readability.
- **Accessibility:** Consider color-blind viewers.
- **Purpose:** Use color to support the data story.



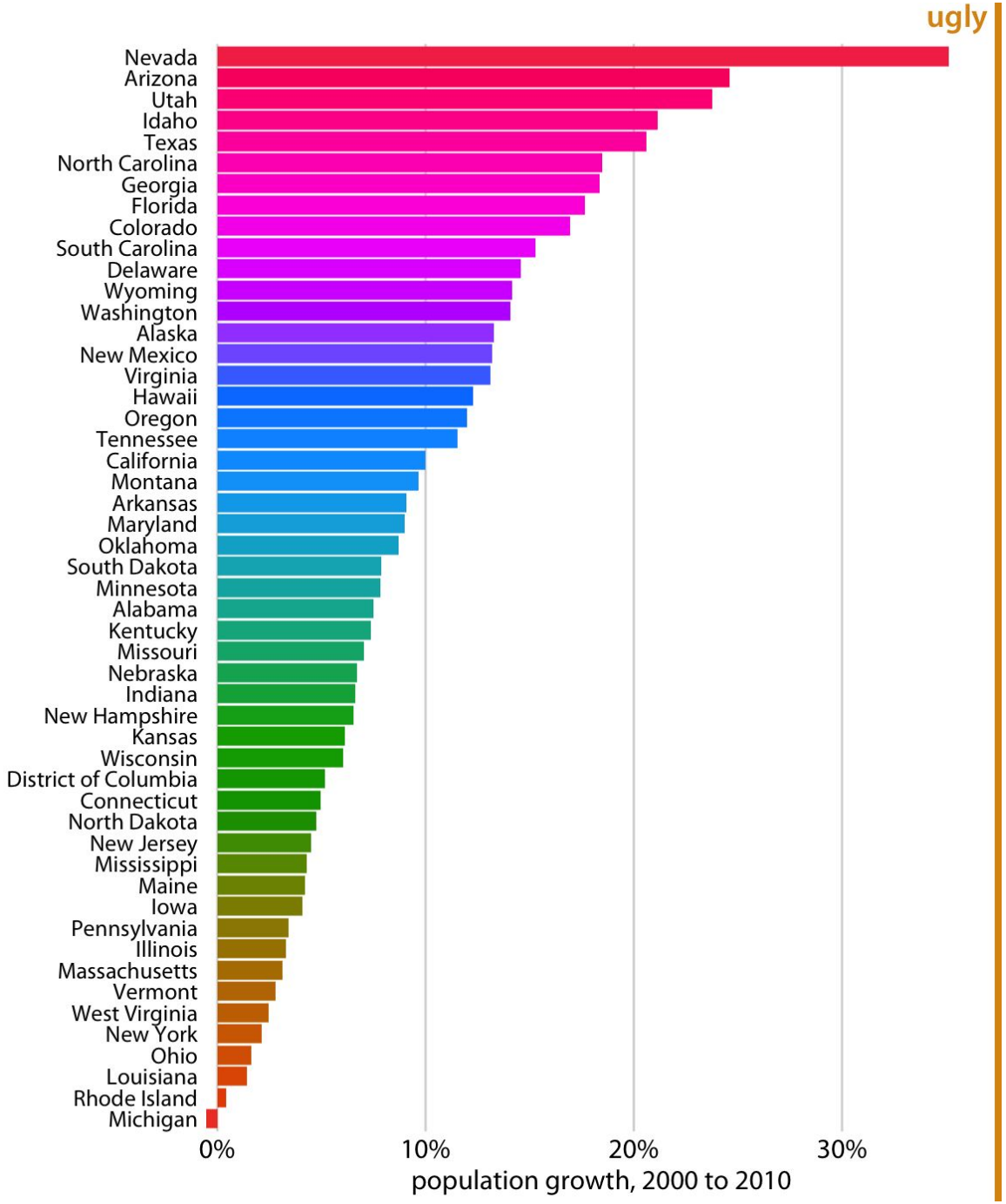








https://www.datawrapper.de/blog/emphasize-with-color-in-data-visualizations



A second common problem is coloring for the sake of coloring, without having a clear purpose for the colors. Instead of coloring the bars by geographic regions, I have given each bar its own color, so that in aggregate the bars create a rainbow effect. This may look like an interesting visual effect, but it is not creating any new insight into the data or making the figure easier to read.

https://clauswilke.com/dataviz/color-pitfalls.html

Text and Background Contrast

Contrast Ratio

High contrast (dark text on light background) improves accessibility and reading speed.

Avoidance

Never use low-contrast combinations like light gray text on a white background.

Figures in Technical Contexts

- **Self-Contained:** A figure should be understandable without reading the entire surrounding text.
- **Visual Continuity:** Figures should match the style and font of the technical report.
- **Insight Driven:** Prioritize communicating insights over raw data points.

Figure Captions

Show

State exactly what the figure shows (the variable and axes).

Why

Explain why the data matters or the key takeaway.

No Repeat

Avoid simply repeating the main title of the chart.

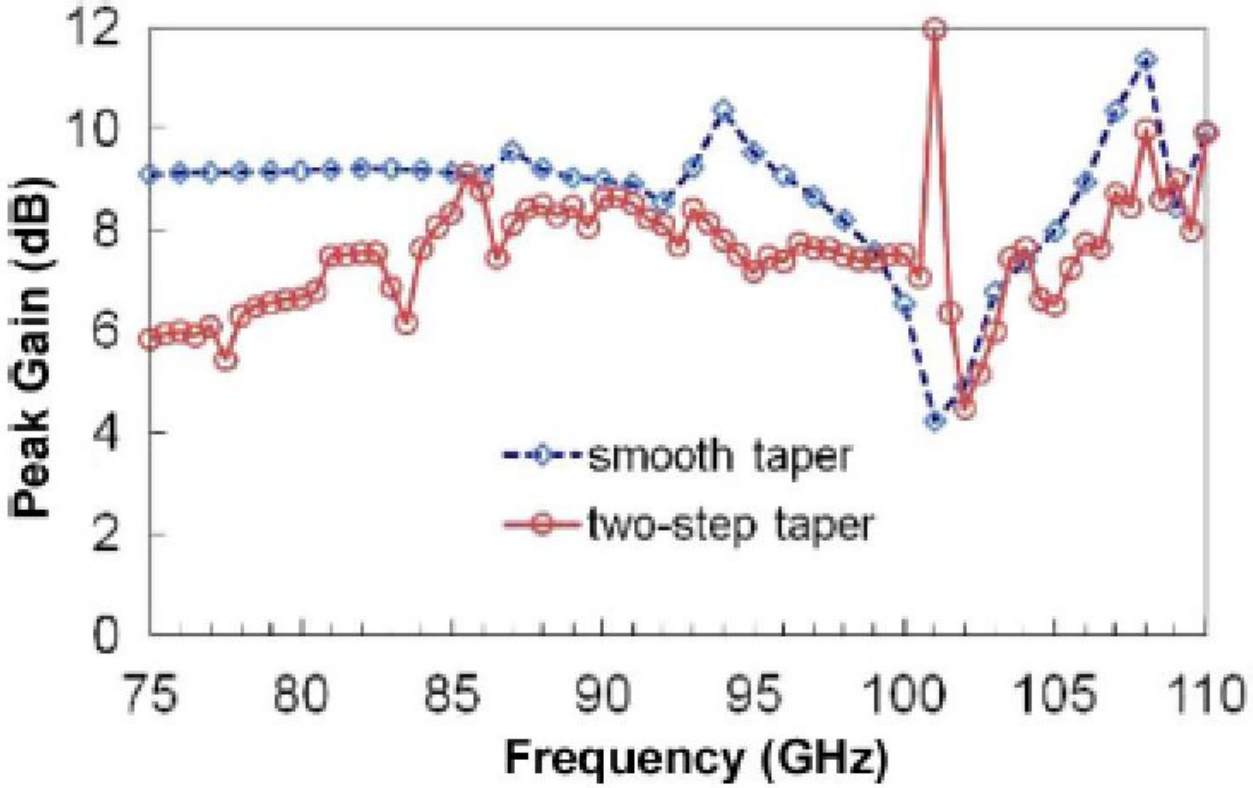


Fig. 11. Comparison of peak antenna gain for a two-step tapered and pyramidal-prismatic tapered Si antenna. The two-step taper antenna used the same dimensions as the two-step tapered example of Table II. The pyramidal-prismatic tapered antenna's peak gain was nearly identical to the two-step taper when both tapers were of equal length. Doubling the length of the smooth taper (results shown in this figure) only increased the peak gain by approximately 1–2 dB. From this, it can be concluded that the cost of using a step taper over a smooth taper is small. The step taper is more convenient for Si micromaching fabrication.

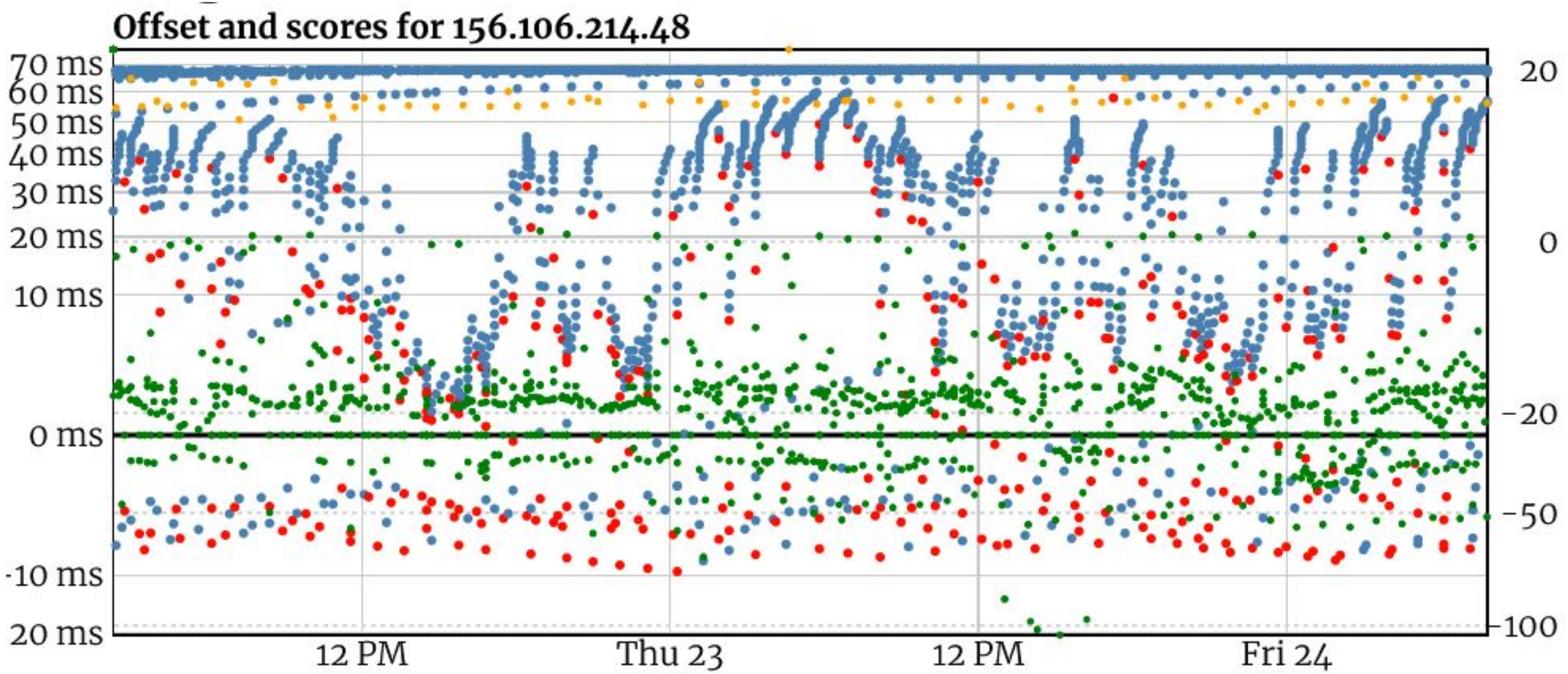
https://chec.engineering.cornell.edu/visuals/captions-for-figures-in-documents/

Example: Poor Typography

Identifying Failures

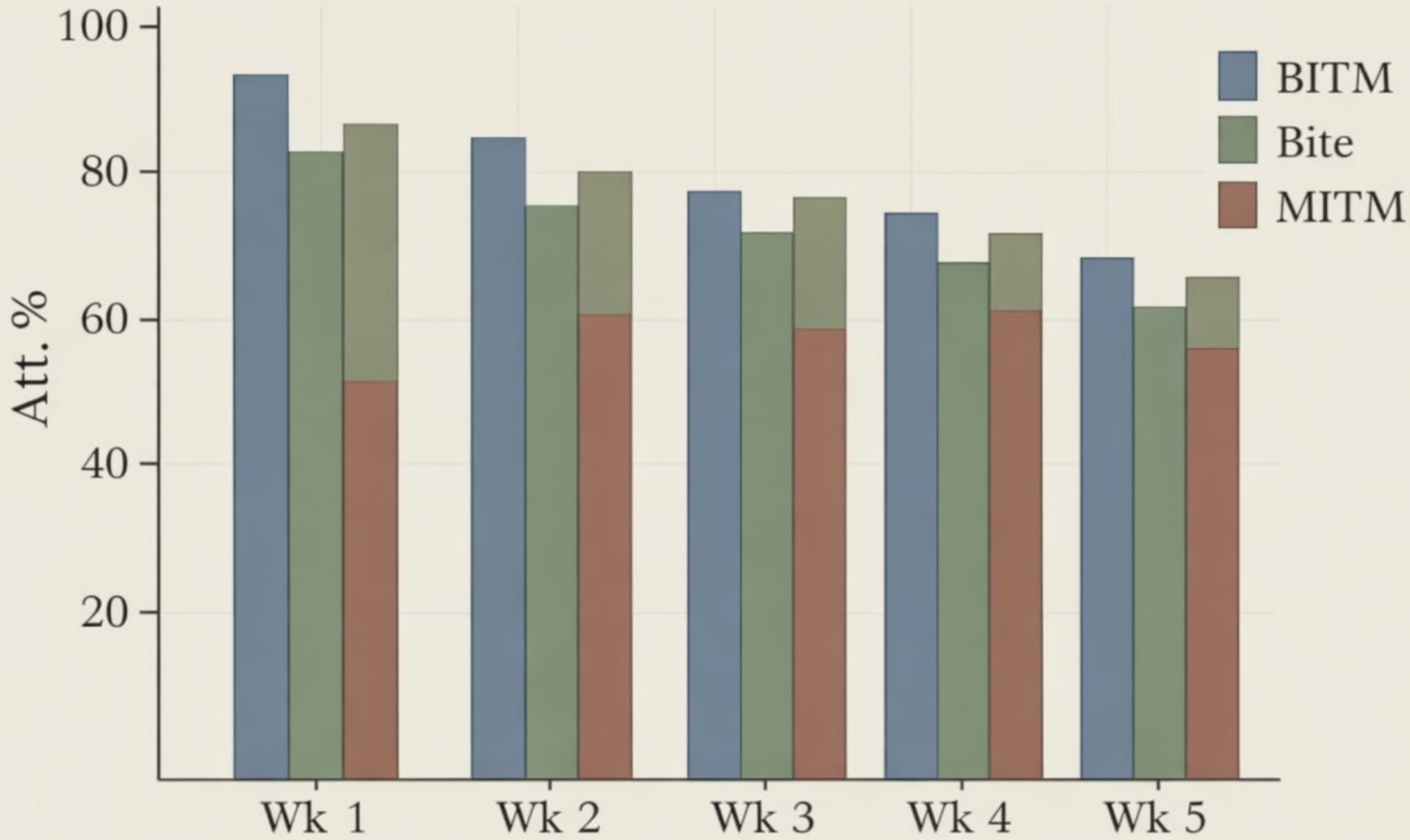
Common issues:

- Font size is too small for projection.
- Axis labels are cryptically abbreviated.
- Mixing Serif and Sans-Serif fonts haphazardly.



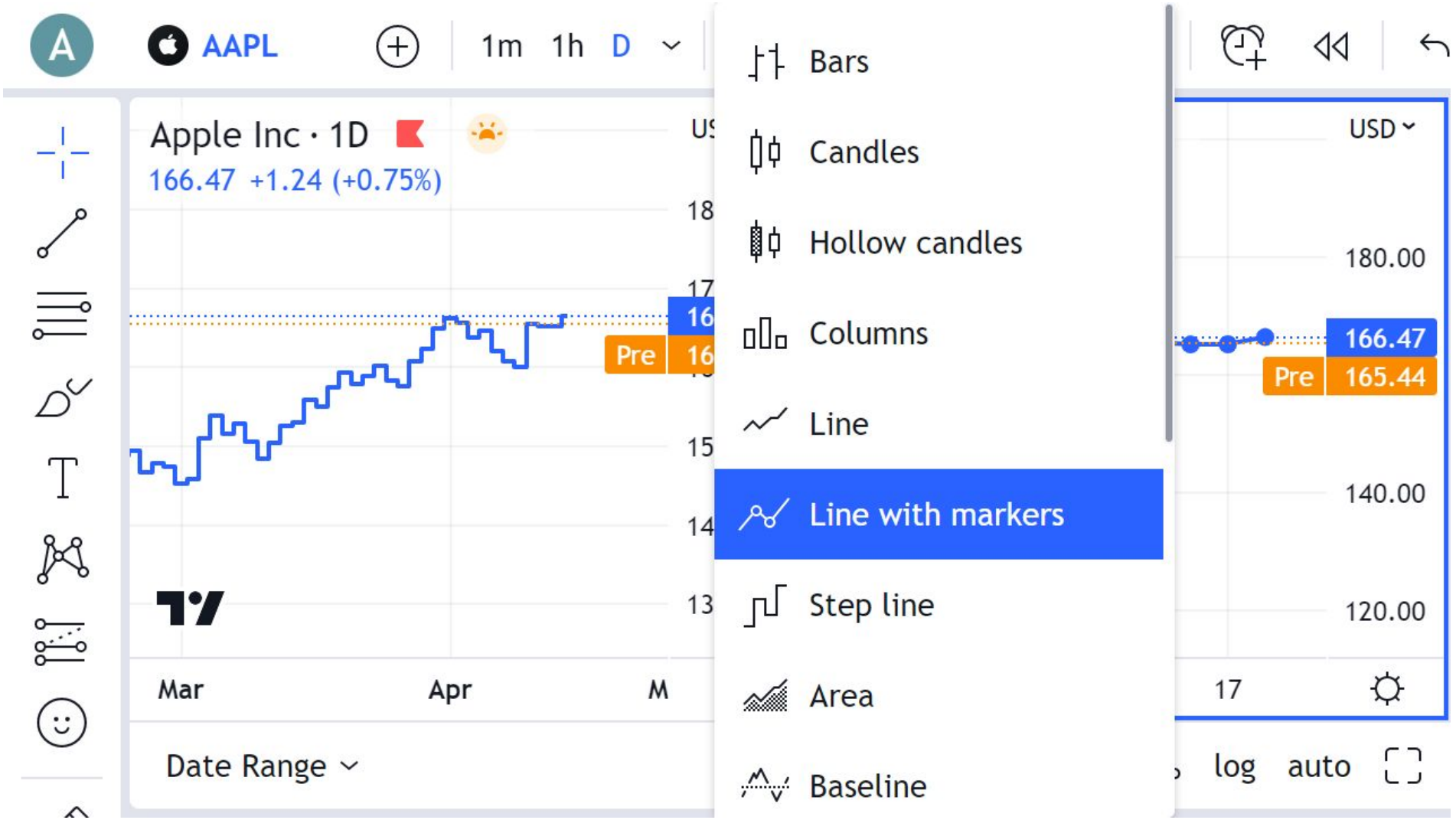
https://community.ntppool.org/t/unreadable-scale-on-the-left-y-axis-of-the-monitoring-graph-offset-values/2804

Graph 1



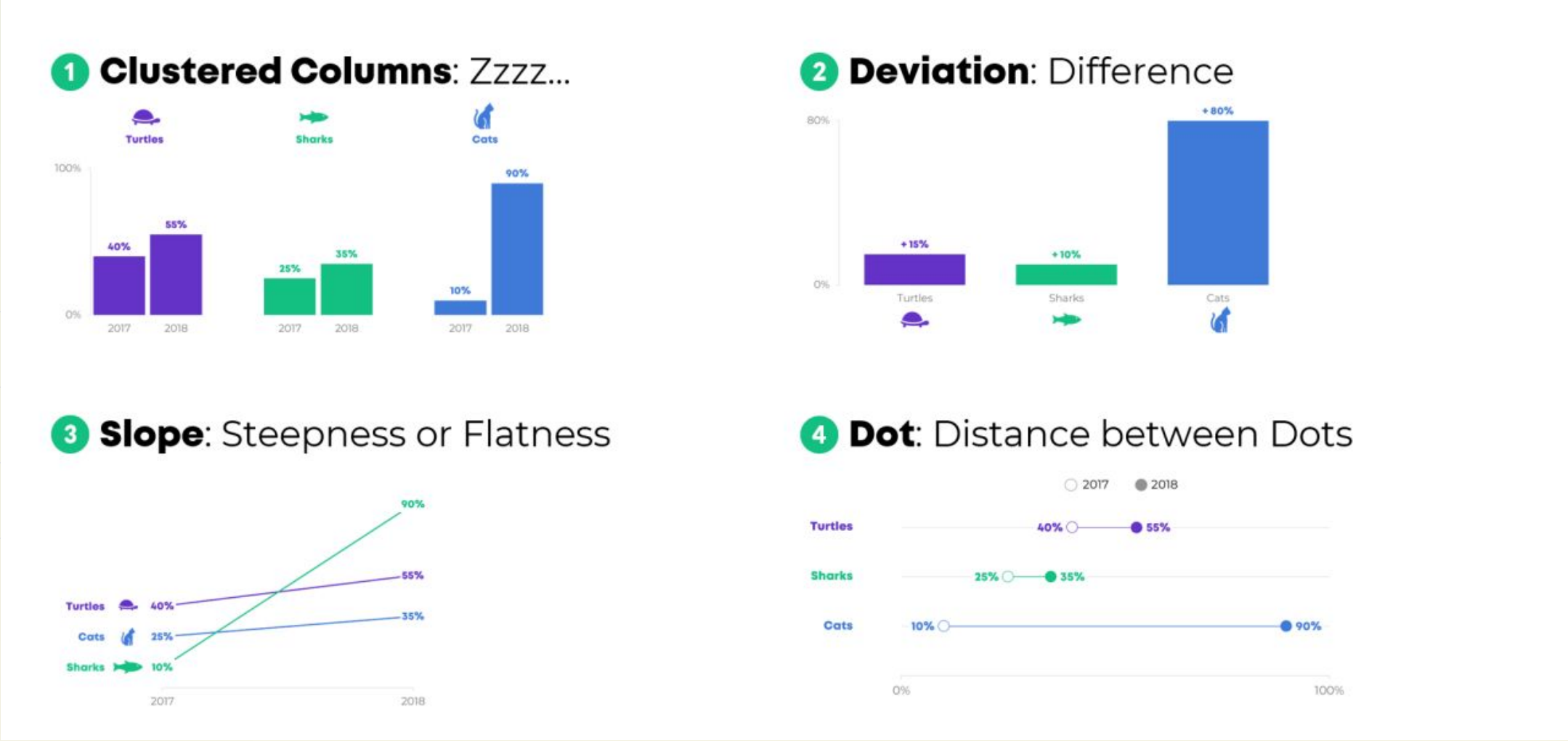
Improved Typography Example

Applying hierarchy and clarity to the previous "Poor" figure.



https://www.tradingview.com/blog/en/new-chart-types-37791/

Before and After Comparison



Chapter Summary

- **Typography:** Affects interpretation speed and reading comfort.
- **Labels:** Guide the viewer's interpretation of abstract data points.
- **Clarity:** A fundamental design goal to reduce visual noise.
- **Simplicity:** Always remove non-essential elements.

Questions?

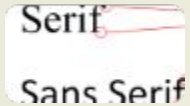
Thank you for participating.

Reference: Wilke, C. O. (2019). *Fundamentals of Data Visualization*. O'Reilly Media.

Image Sources

https://kirby.datawrapper.de/media/pages/blog/fonts-for-data-visualization/1b4b4316ca-1740123168/Artboard-835-1.png

Source: www.datawrapper.de



https://ittrainingcontent.iu.edu/training/pgdlb/files/pc/img/detail_1_serif-sans-serif.png

Source: ittrainingcontent.iu.edu

https://ppcexpo.com/blog/wp-content/uploads/2024/12/visual-hierarchy.jpg

Source: ppcexpo.com

https://images.squarespace-cdn.com/content/v1/55b6a6dce4b089e11621d3ed/1516165255299-VI219Z90E8POMUDETDE5/Pere.png

Source: www.storytellingwithdata.com

https://miro.medium.com/v2/resize:fit:1400/1*qgHKU9Gwv_gmOMxFYVwoFw.png

Source: uxdesign.cc

https://s3.fr-par.scw.cloud/plecto-prod-plecto-website-2025/images/3d_bar_graph.max-800x600.format-jpeg.jpg

Source: www.plecto.com