SIXTH ANNUAL EMERGING AND ESTABLISHED AFRICAN RESEARCHERS TRAINING ACADEMY

Making Data Speak – An Introduction to Qualitative and Quantitative Data Visualisation

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Human Sciences Research Council

30 July 2025 | 11:00 to 13:00

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Overview

- Introduction to Data Visualisation
- Visualising Quantitative Data
- Online quiz
- Visualising Qualitative Data
- Hands-On Activity
- Wrap-Up and Q&A

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A PICTURE
IS WORTH A
THOUSAND
WORDS

Learning objectives

At the end of this module, you should:

- Understand the principles of effective data visualisation
- Know when and how to use different types of charts and visuals
- Be able to choose appropriate visualisations for both quantitative and qualitative data
- Gain exposure to common tools and platforms for creating visuals

- **This is not a software tutorial ☺**

Presenting data visually

- Communicating research is key
  - Inform, educate, raise awareness
  - Experts, public and non-experts including policy makers, funders
- Different ways of communicating research
  - Reports, articles, books, policy briefs, opinion pieces
- Visual representations
  - Key points, more appealing

Your identity as a scholar and your academic citizenship is greatly enhanced by sharing your research

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Presenting data visually

Creating visualisations that communicate research effectively:

- **Story:** What story do you want to tell?
- **Data:** What data will you be using?
- **Aim:** What is the aim of sharing your data?
- **Audience:** Who is your target audience?

What is data visualisation?

Data visualisation is storytelling with a purpose

- Graphical representation of information and data
- Uses visual elements like charts, graphs, maps, and infographics
- Helps people understand complex data quickly and clearly
- Transforms raw data into meaningful insights
- Effective data communication - grabs our interest!

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Why is data visualisation important?

Improves understanding

- Makes complex data easier to understand

Reveals patterns and trends

- Identifies insights not immediately obvious in raw data

Supports decision-making

- Facilitates evidence-based actions and strategies

Enhances communication

- Makes data accessible to broader audiences, including non-experts

What to consider in data visualisation

- **Purpose:** What are you trying to show or explain?
- **Context:** What background is needed to understand the visual?
- **Audience:** Who is the data for? What do they need to know?
  - Scholarly vs policy vs public audiences
- **Effective communication:** What visualisations are appropriate?
  - E.g. Graphs, charts, infographics
- **Type of data:** Categorical, numerical, temporal, etc.
  - Qualitative vs quantitative, mixed methods
- **Tool or platform:** What software or medium will be used?

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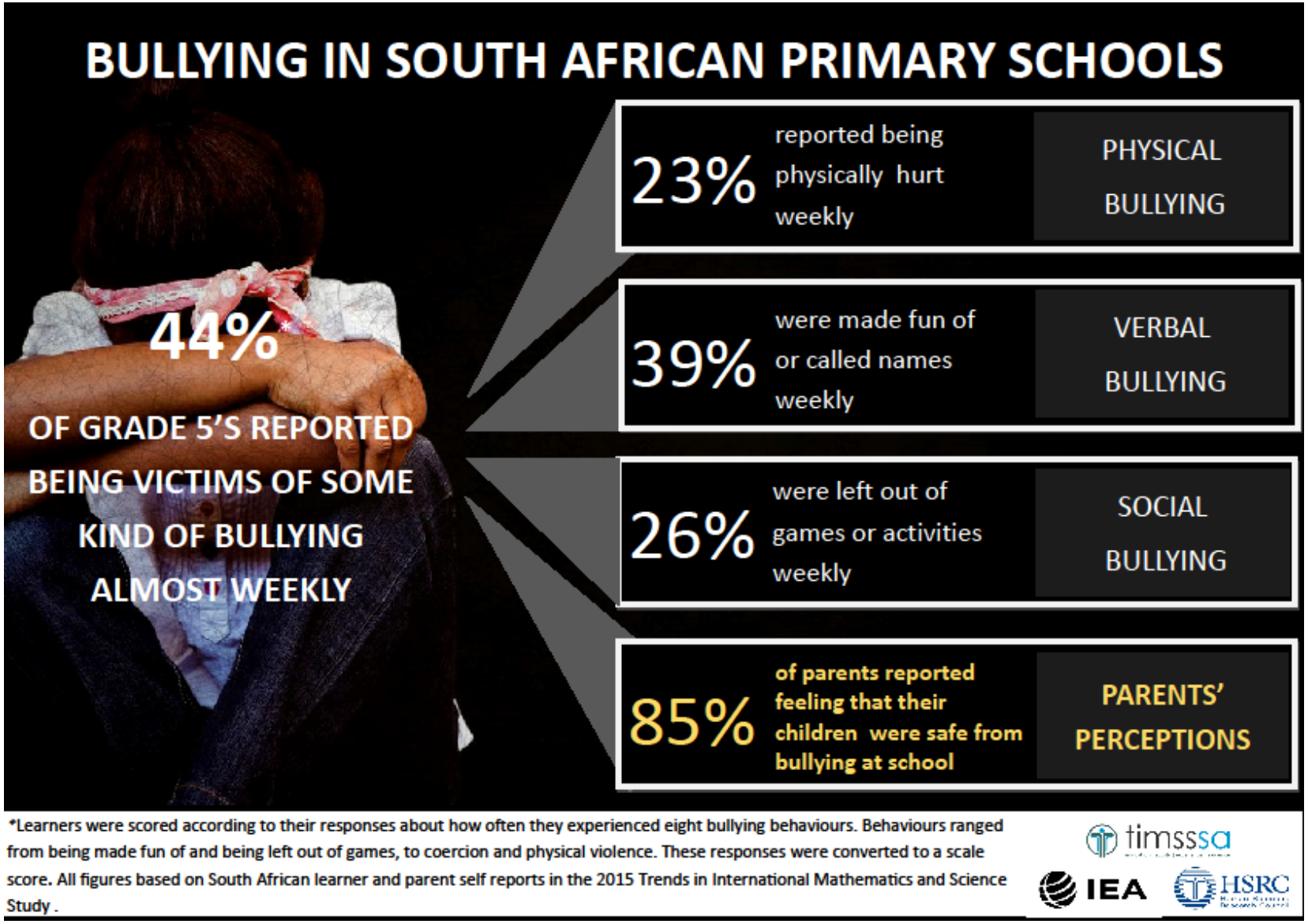
Principles of good data visualisation

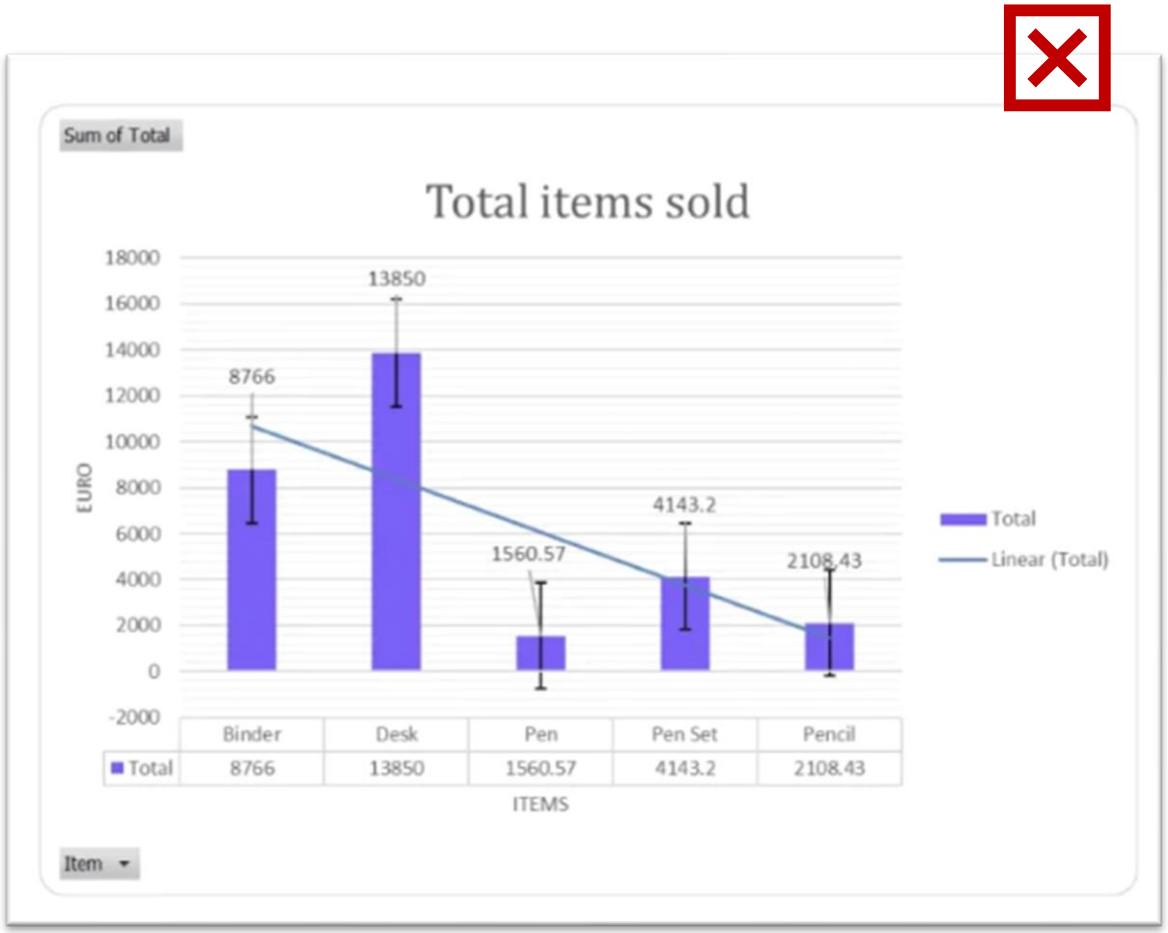
Telling a story

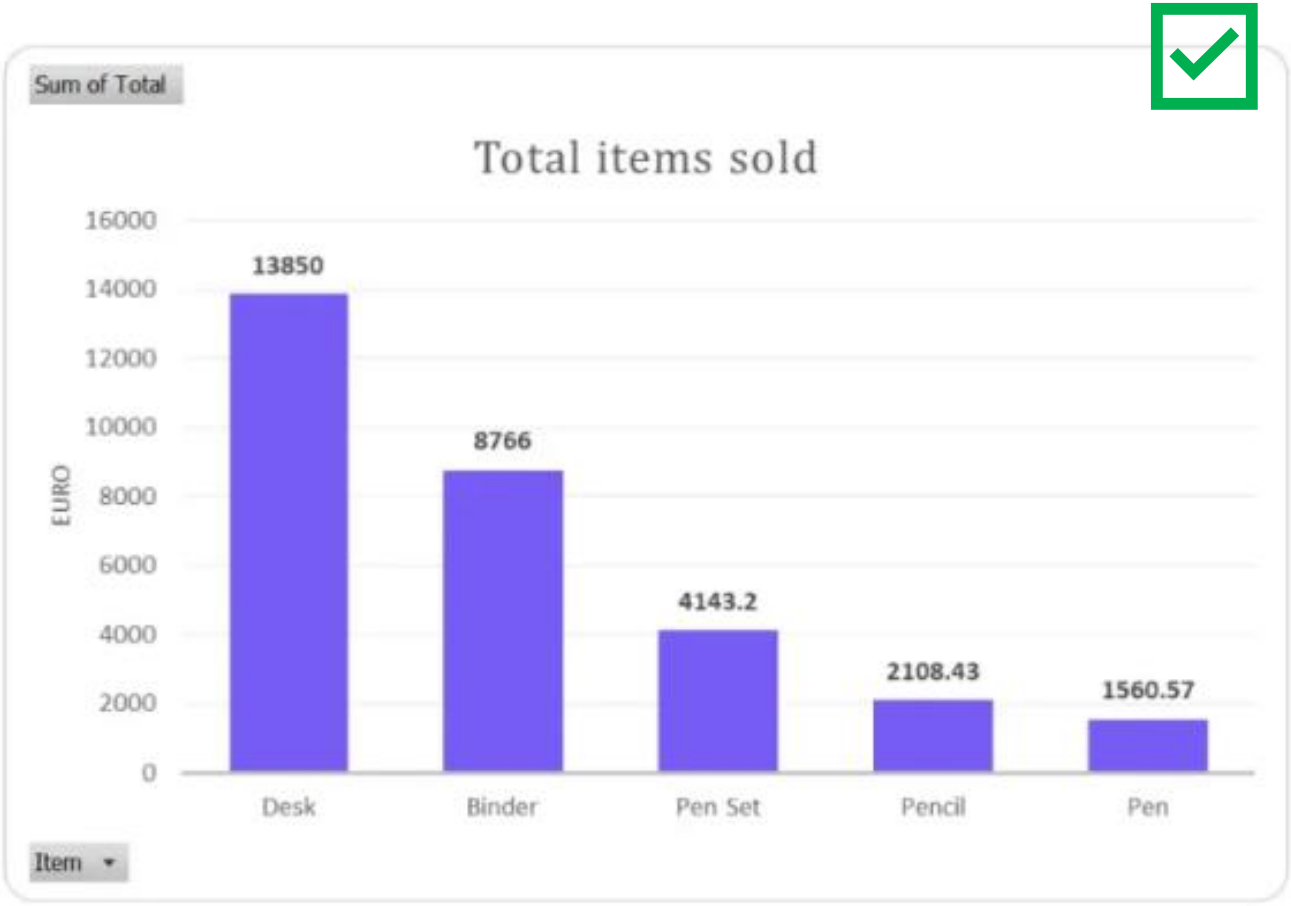
Show only relevant data that supports your message or insight



Principles of good data visualisation

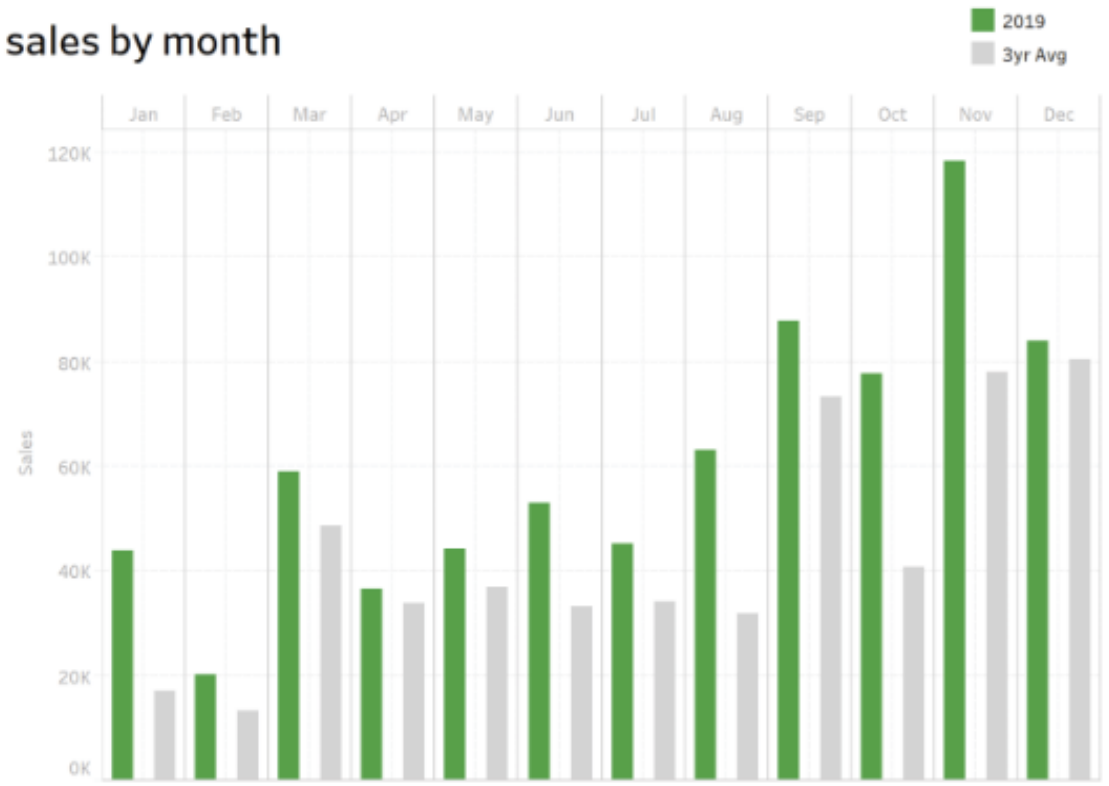
Clarity: Avoid clutter, make visuals easy to read and interpret



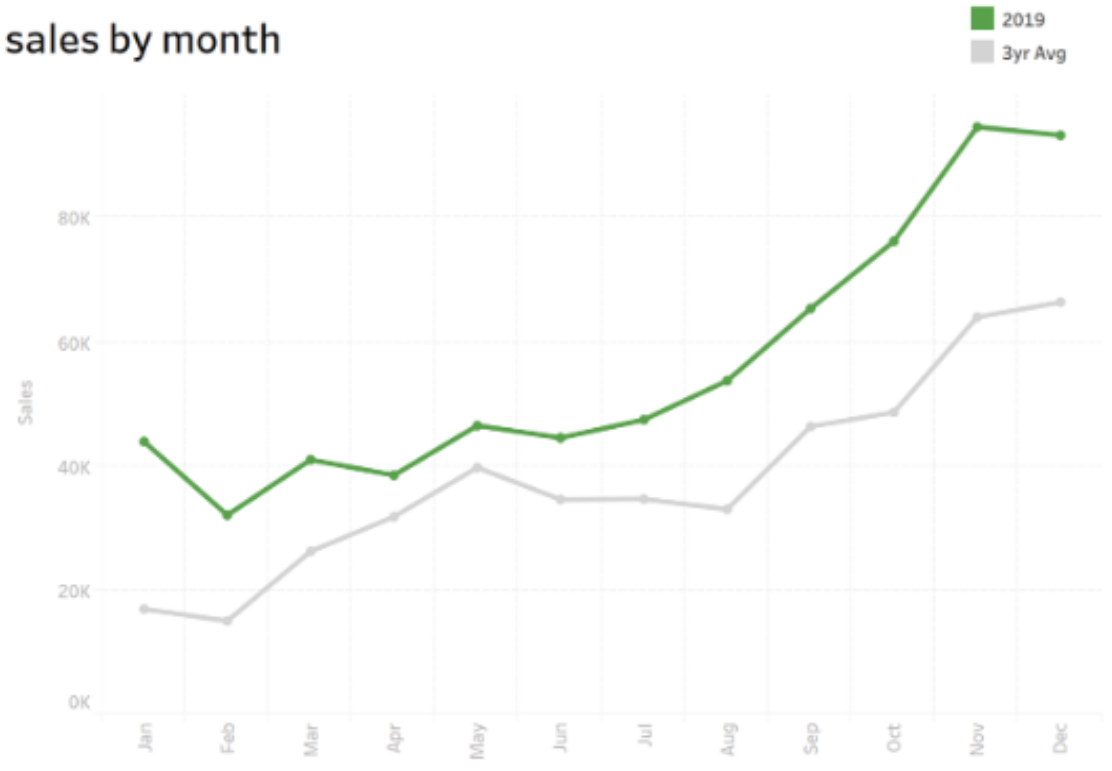


Principles of good data visualisation

Simplicity: Aim for minimalist design - less is often more



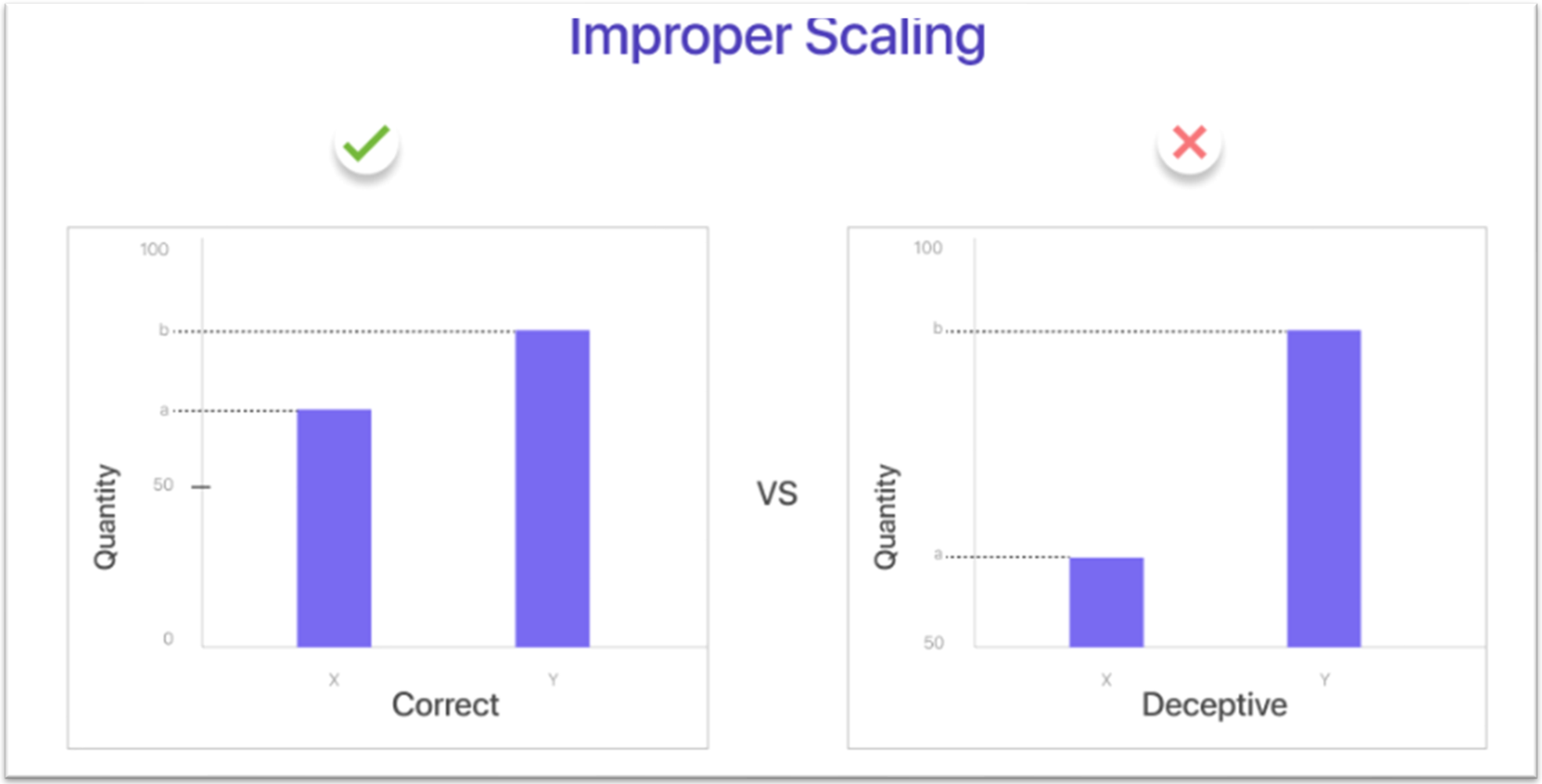
ineffective



effective

Principles of good data visualisation

Accuracy: Represent data truthfully without distortion

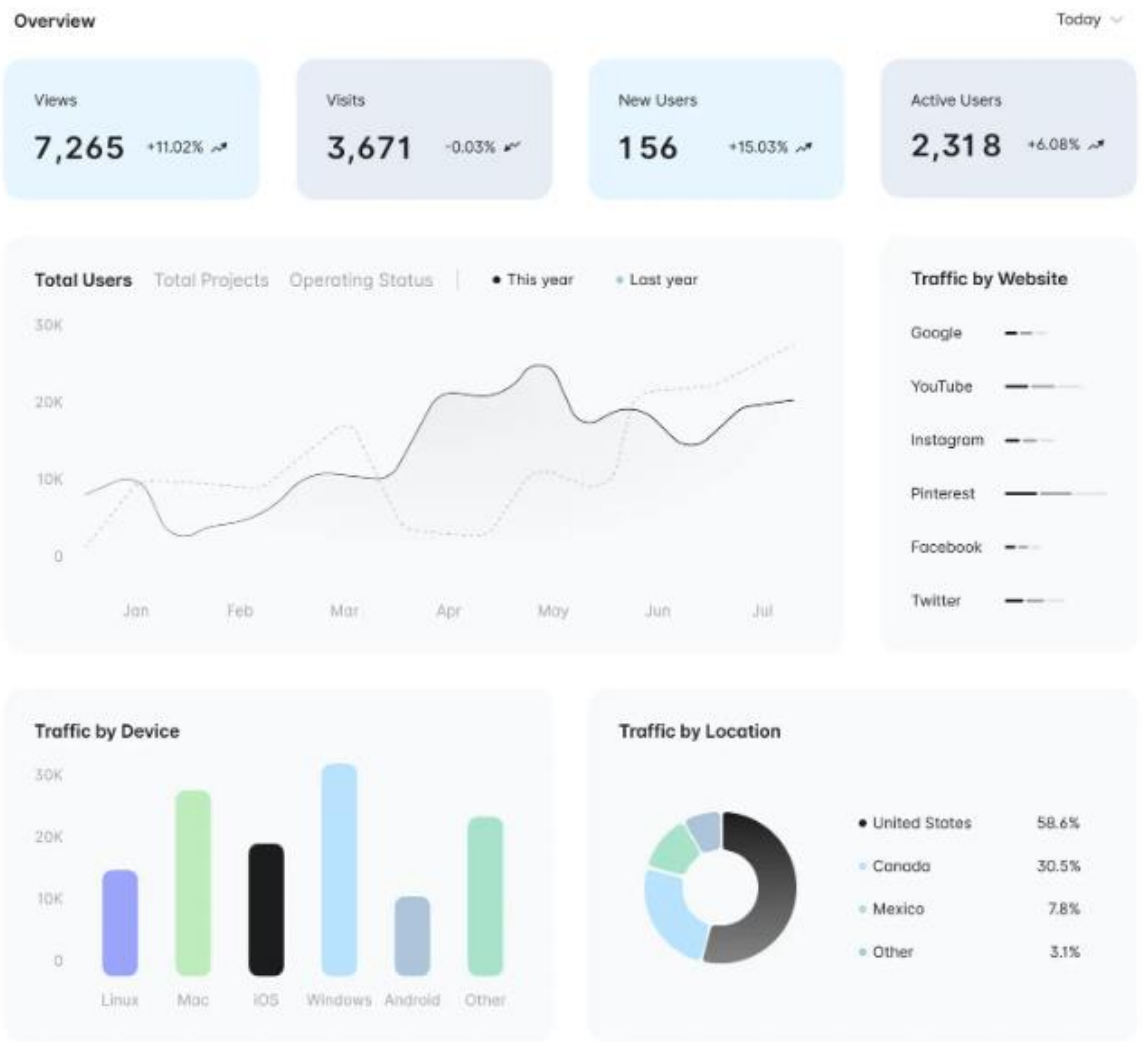


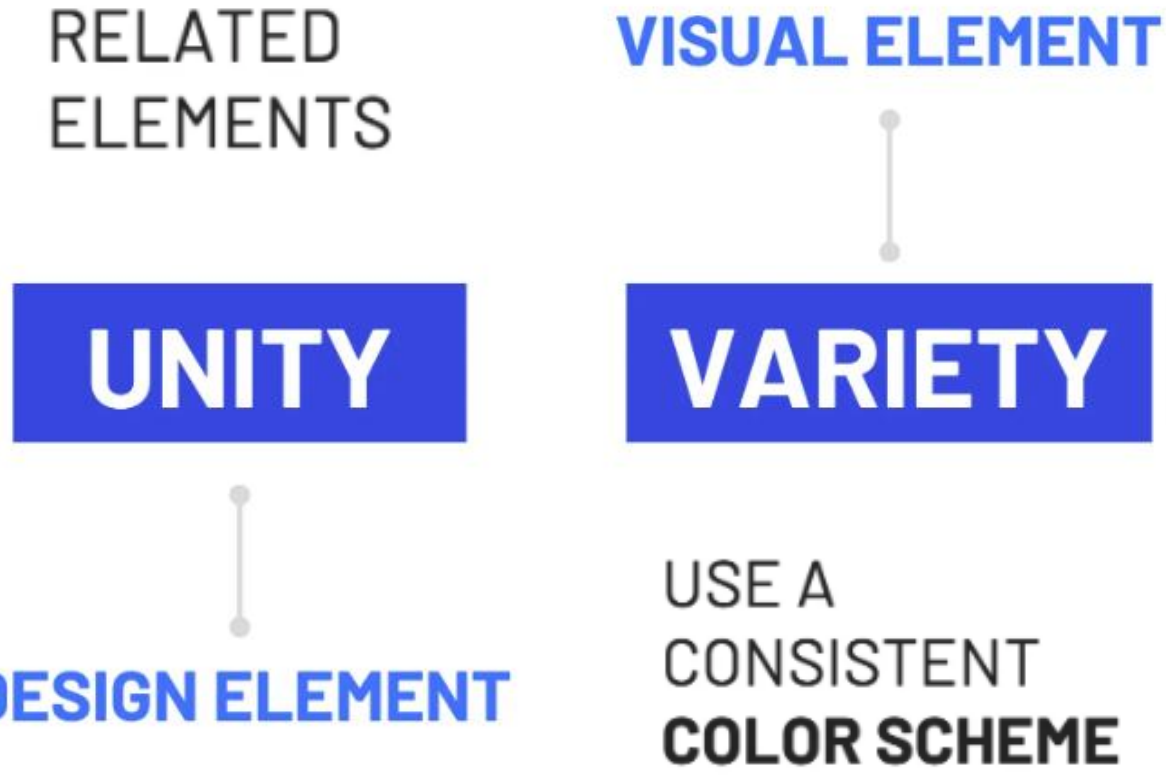
Principles of good data visualisation

Accuracy: Represent data truthfully without distortion

Principles of good data visualisation

Consistency: Use consistent scales, colours, and formats across visuals

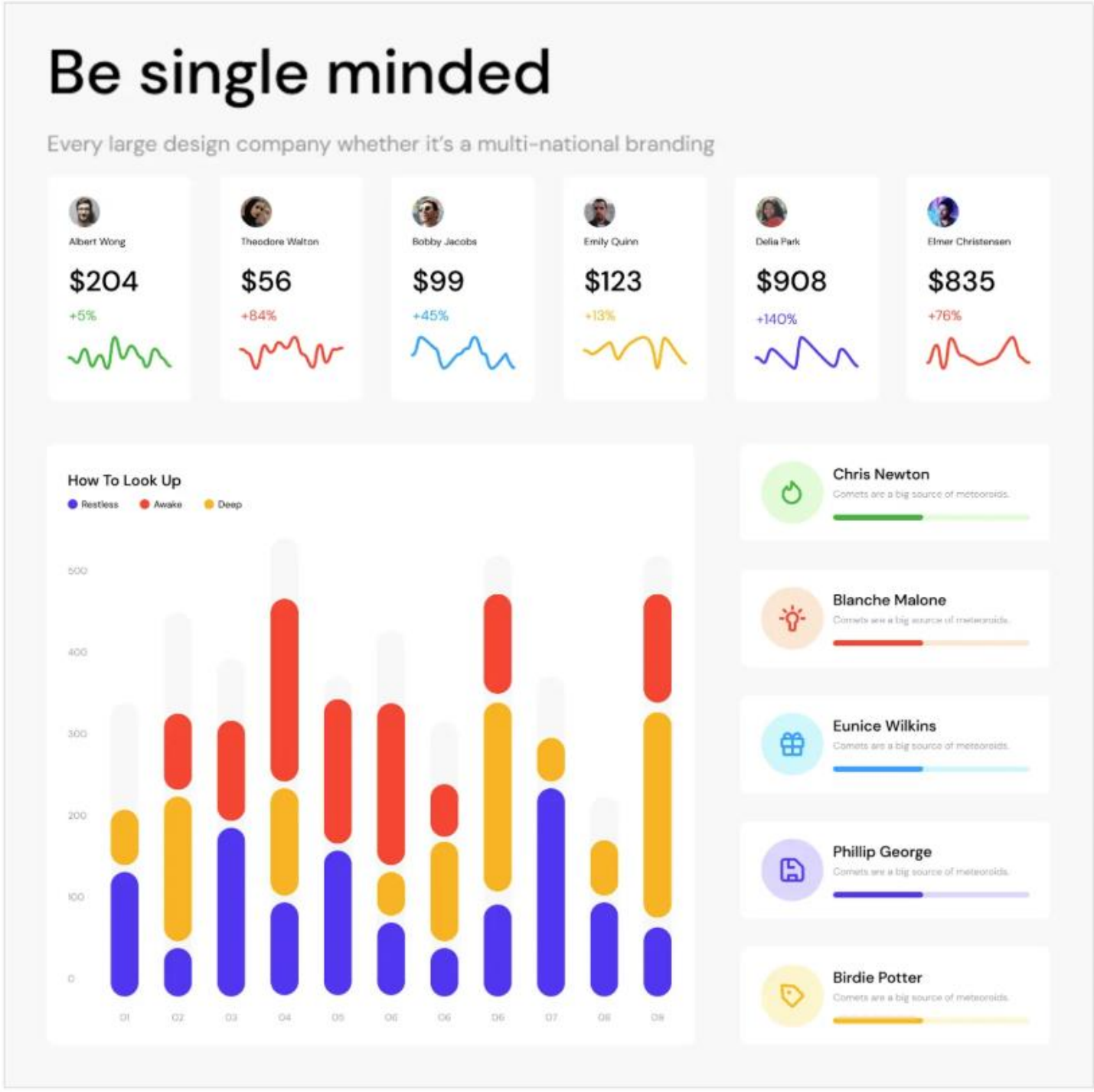




Principles of good data visualisation

Key points

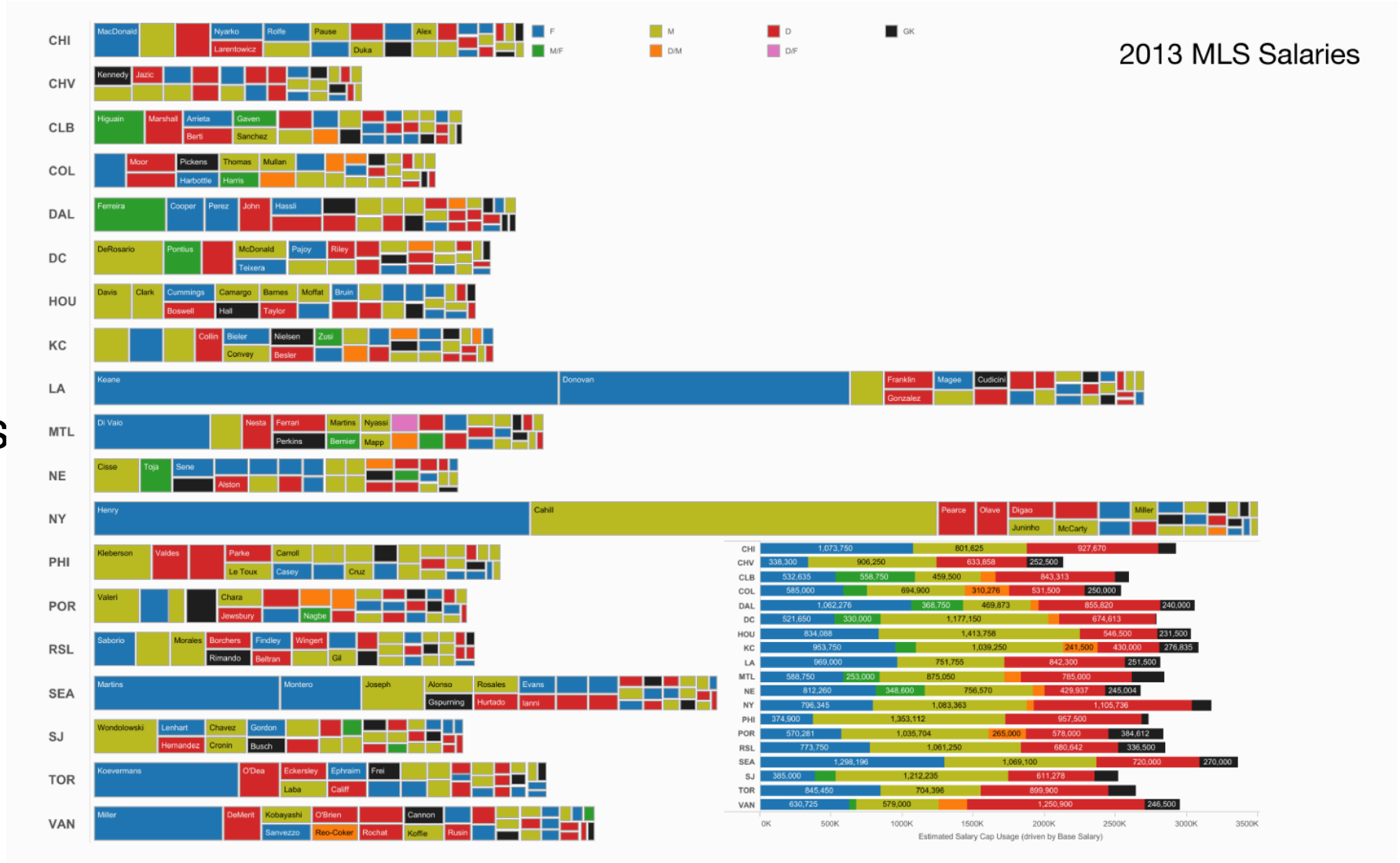
Use colour, contrast, and layout to draw attention to key points



Common pitfalls to avoid

Too much data

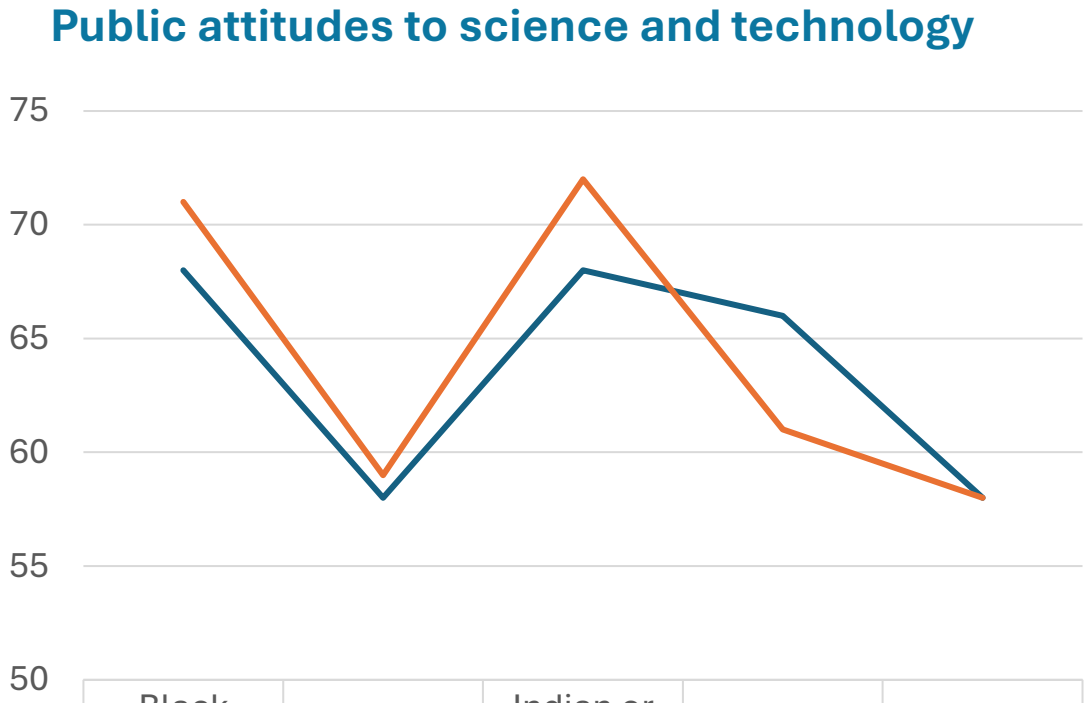
Overloading visuals with too many details



Common pitfalls to avoid

Inappropriate chart types

E.g. Using pie charts for trends, line graphs for discrete variables

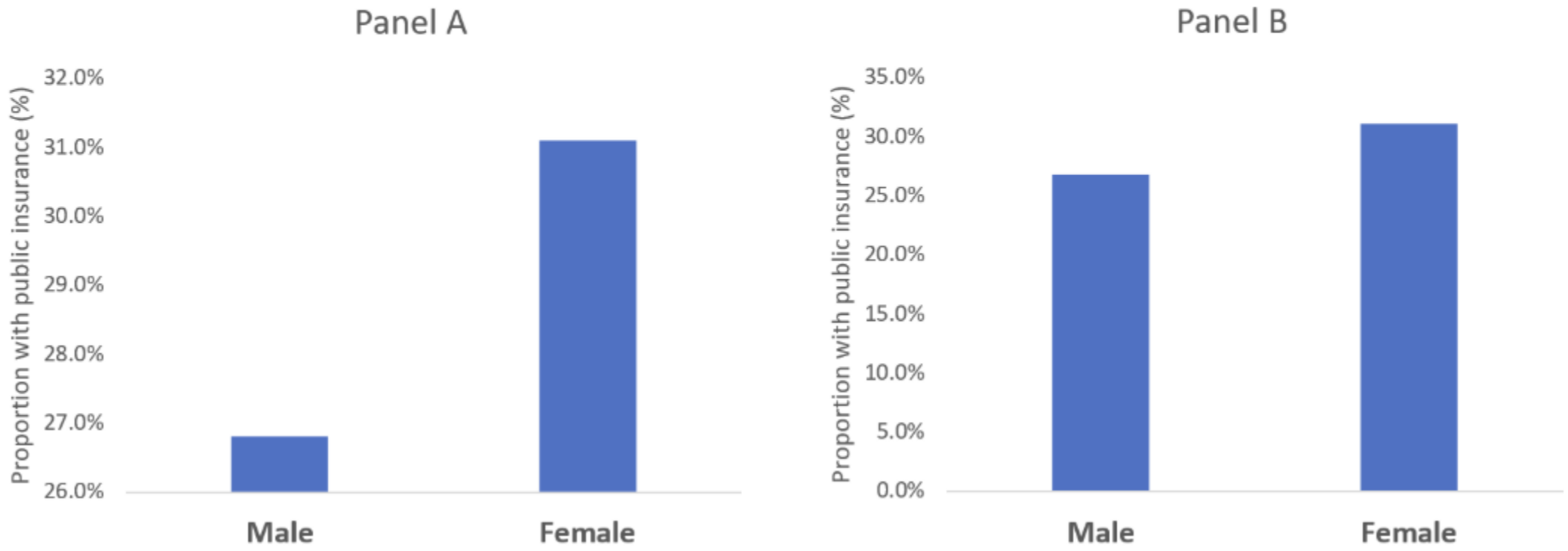


	Black African	Coloured	Indian or Asian	White	Other
AVERAGE PROMISE	68	58	68	66	58
AVERAGE RESERVATION	71	59	72	61	58

Common pitfalls to avoid

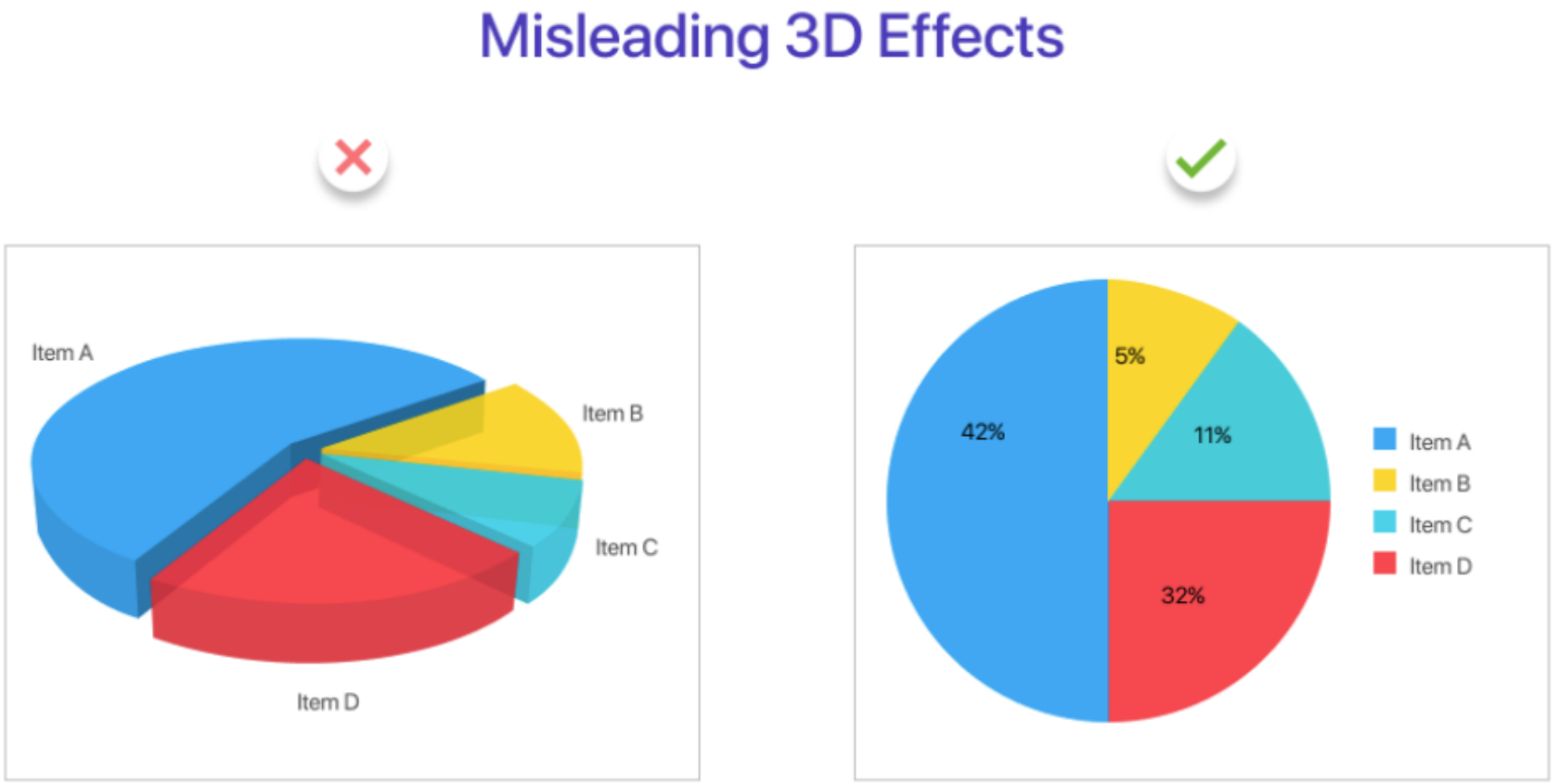
Distorted scales: Misleading axes or inconsistent intervals

Figure 1. Comparisons of bar charts using a truncated y-axis (A) and a full y-axis (B).



Common pitfalls to avoid

Distorted scales: Misleading axes or inconsistent intervals



Misleading Pie Chart

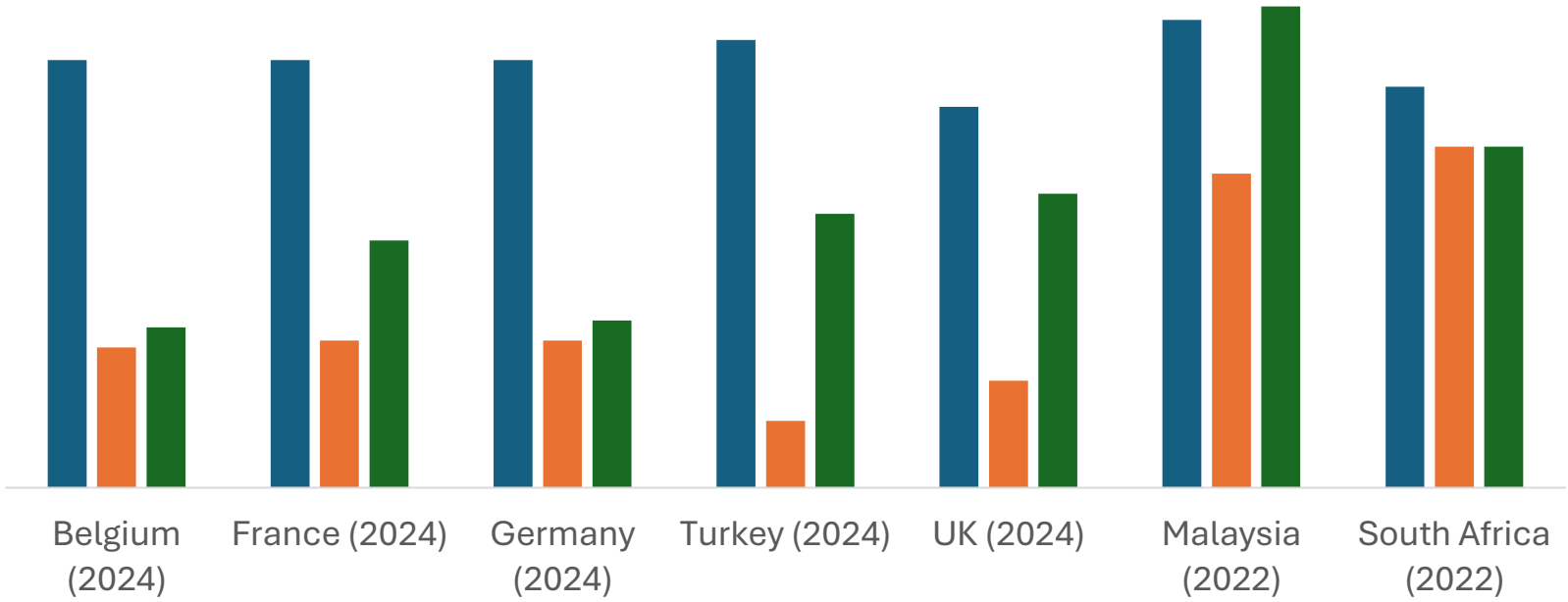
Regular Pie Chart

Don’t use a pie chart is there are more than 5 parts

Common pitfalls to avoid

Lack of context

Missing titles, labels, or source information



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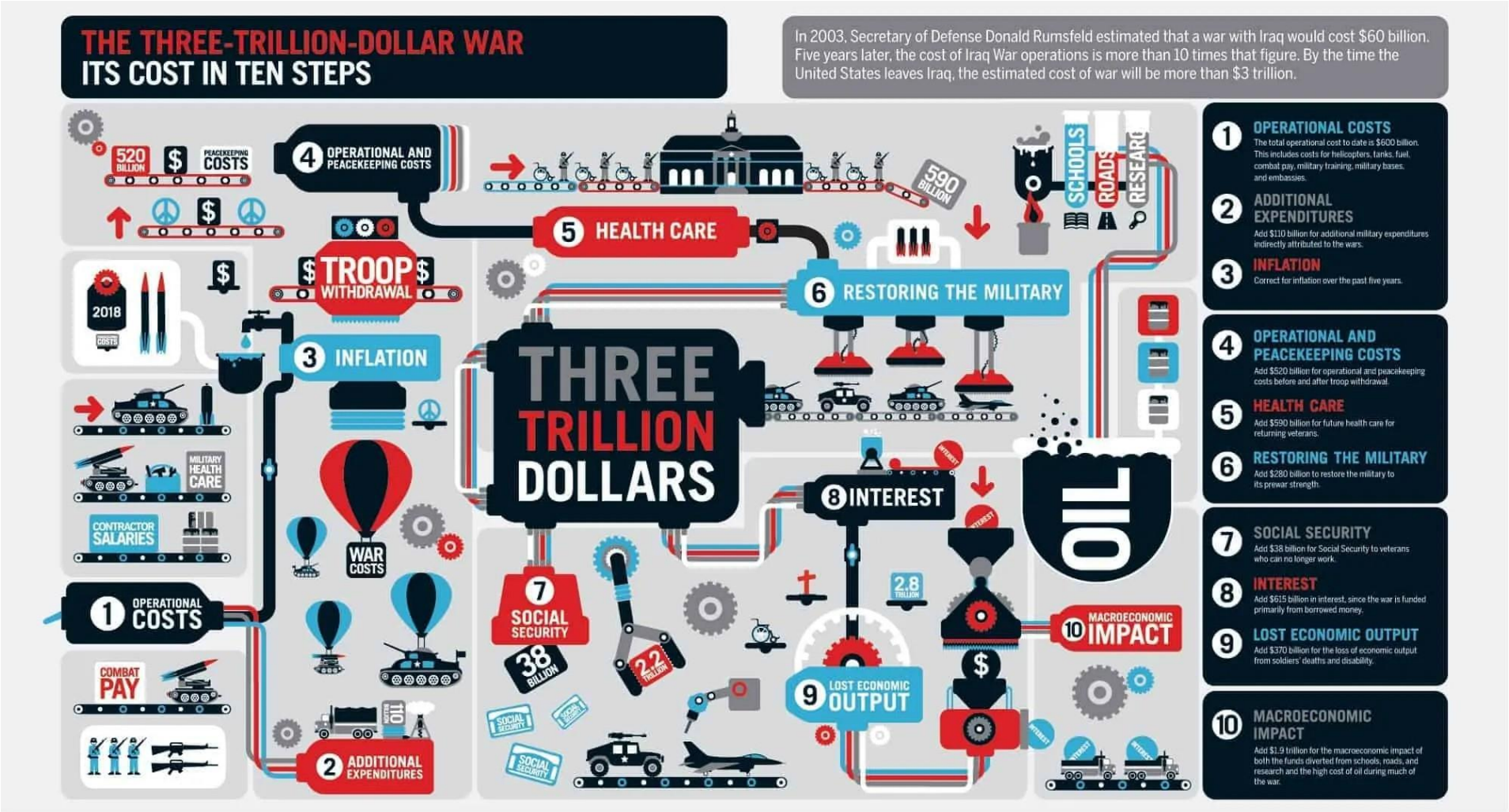
Common pitfalls to avoid

Overdesign

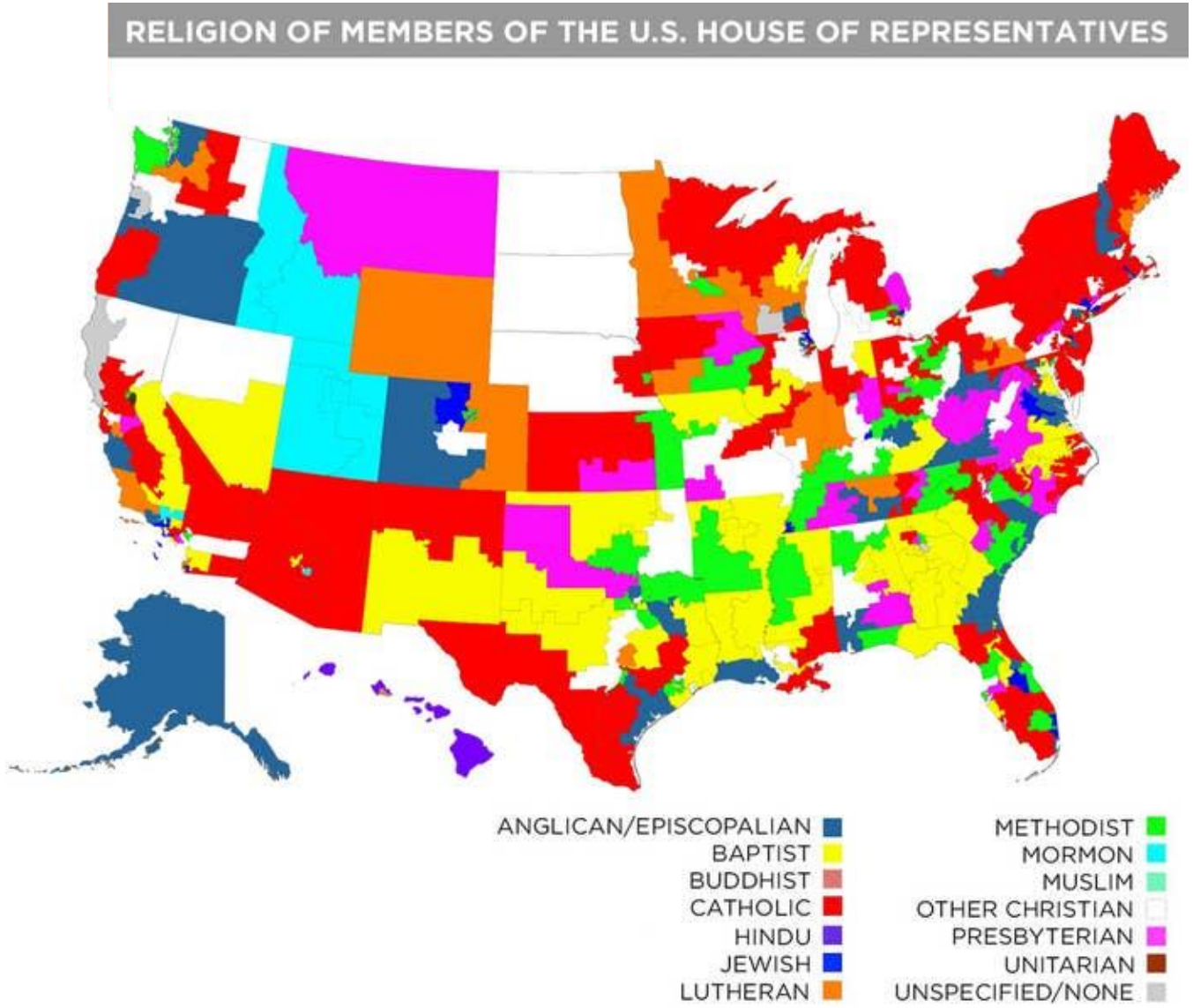
Can confuse rather than clarify



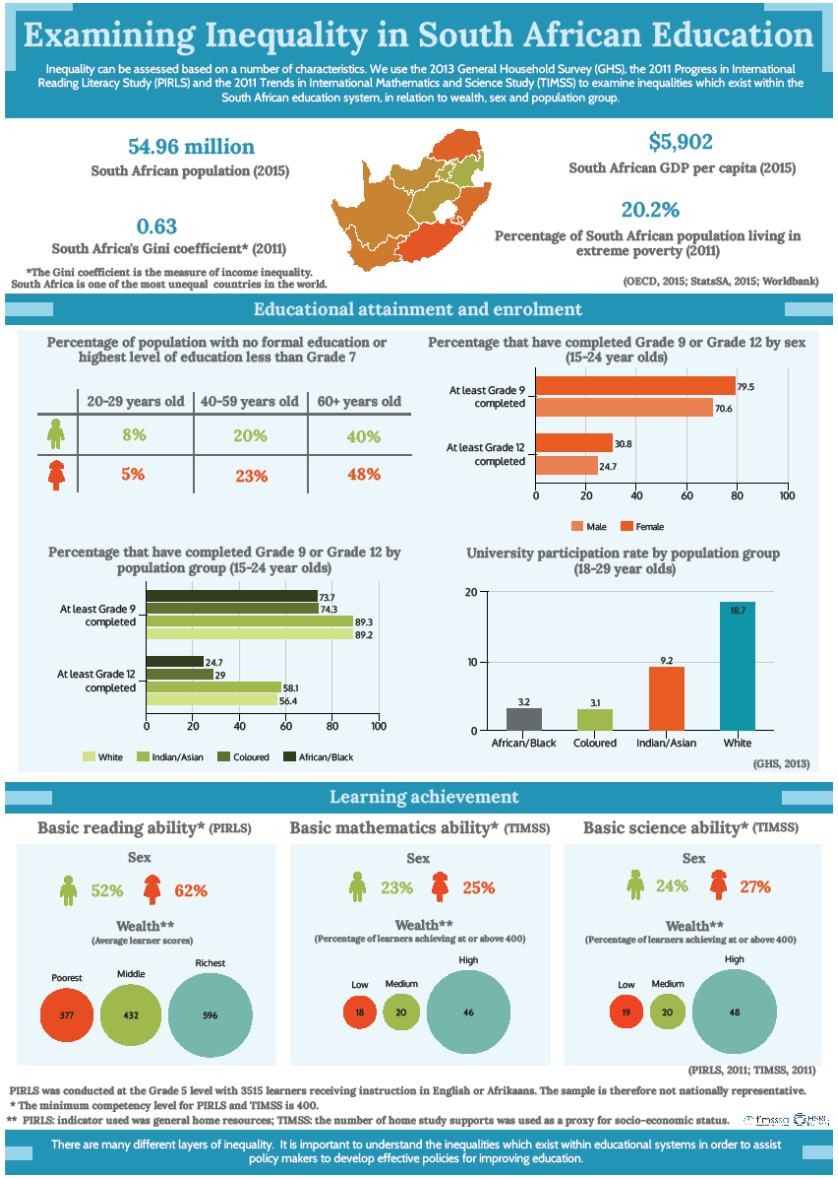
Common pitfalls to avoid

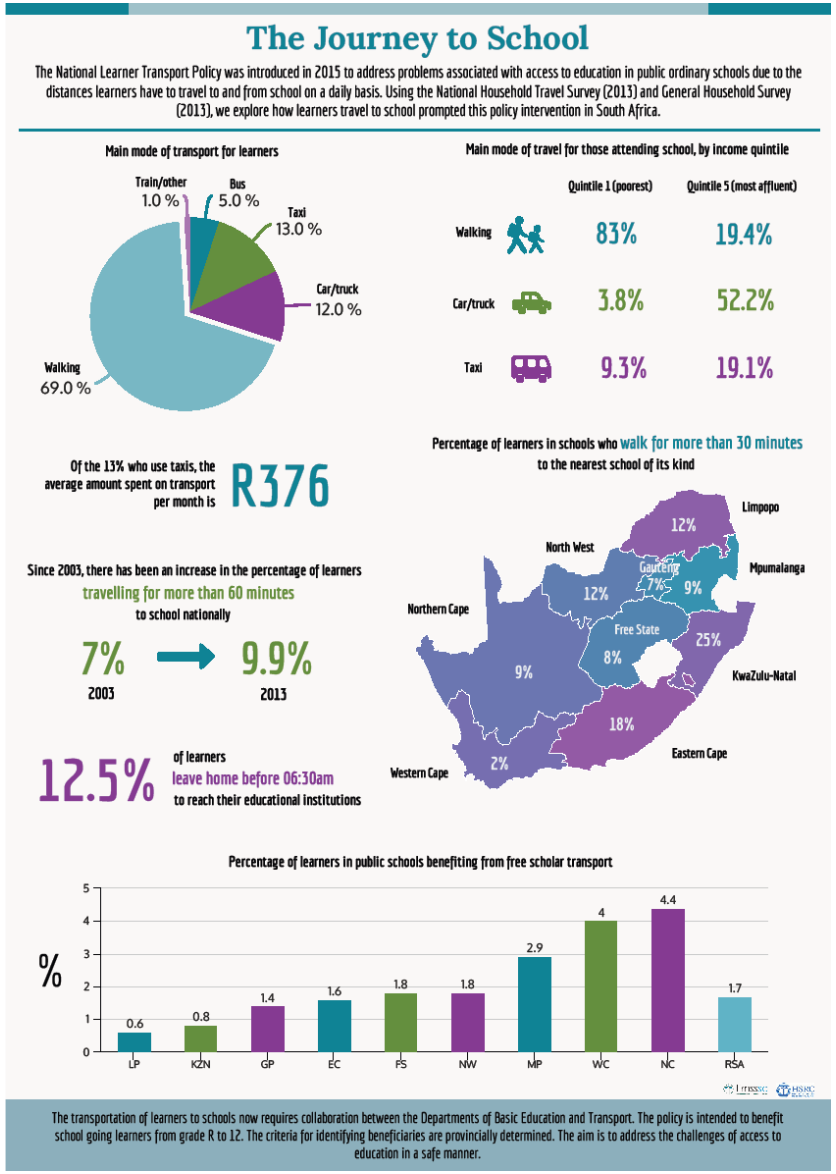
Ignoring accessibility

Hard-to-read fonts, poor contrast, or mismatched colours



Telling a story through infographics

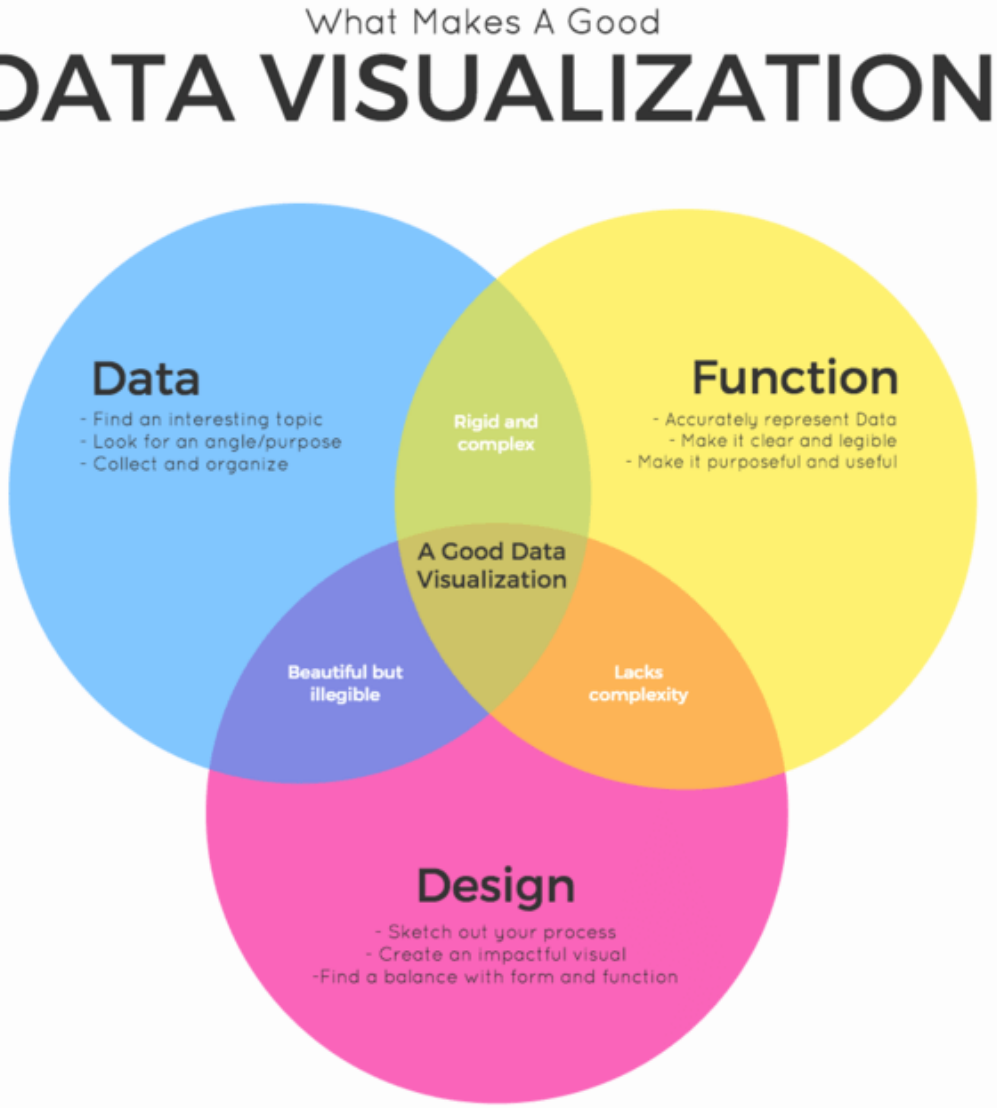




Ask yourself

"Does this help the audience see what I want them to see?"

Good data visualisation bridges the gap between data and understanding



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Quantitative Data Visualisation

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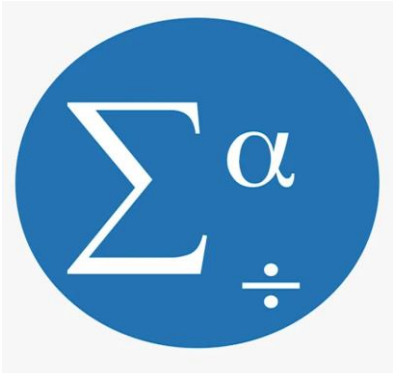
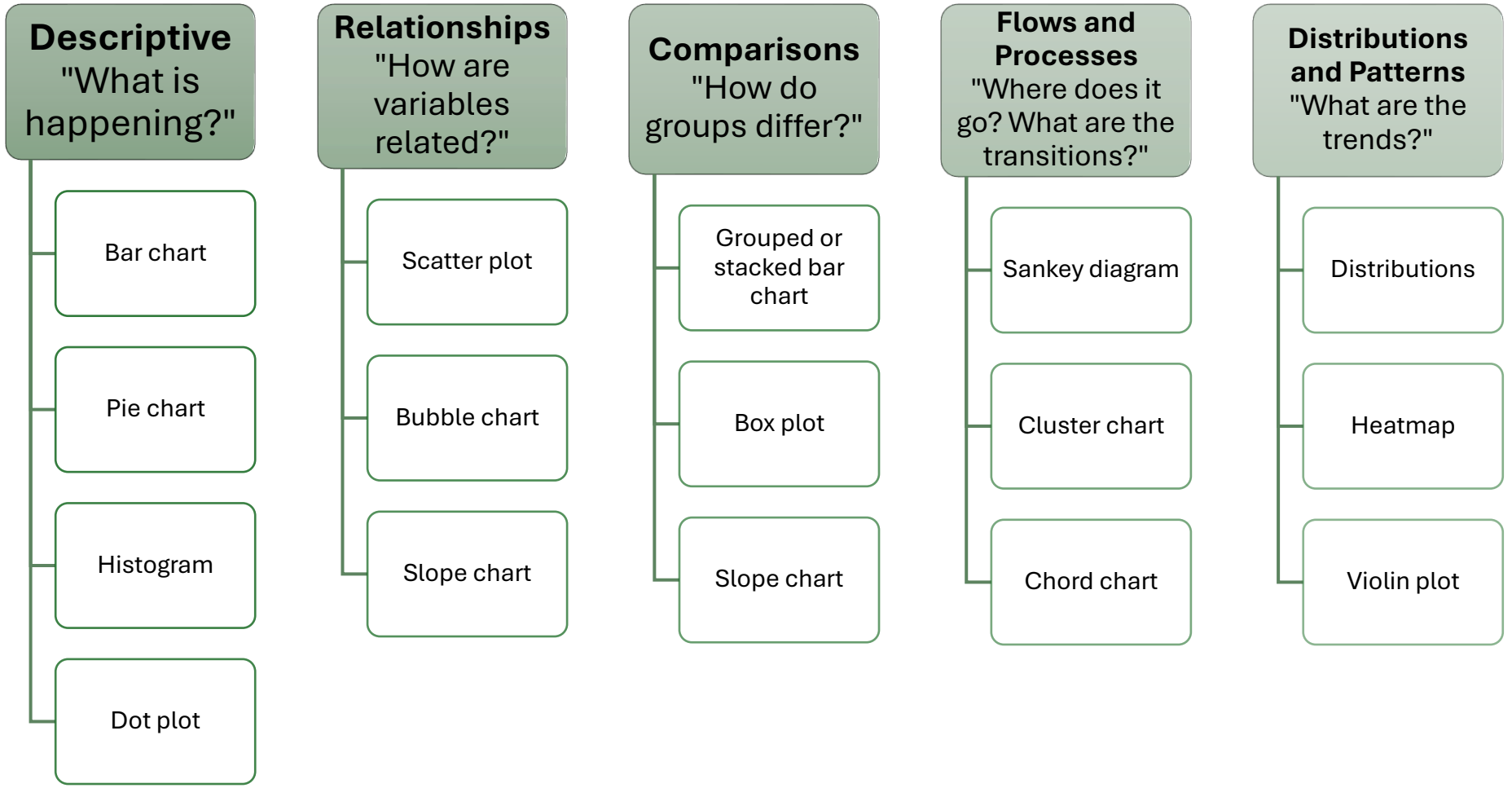
Most have AI functions!



Using templates

- Speeds up visual creation with ready-made formats
- Ensures consistency and professional appearance
- Minimizes errors in layout and formatting
- **Most data visualization software has downloadable templates that you can edit**
- Modify data ranges and labels directly in your spreadsheet
- Customise titles, colours, labels for clarity and audience relevance

Types of Quantitative Visualisations by Purpose



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Descriptive: What is happening?

- Summarises key dataset features.
- Clarifies data and reveals patterns
- Common descriptive visualisations include: bar charts, pie charts, histograms, and dot plots.
- **Easily done in Excel, Canva, Venngage**

Table 1: University completion rate by country

	Male university completion rate	Female university completion rate	University completion rate
South Africa	10%	3%	8%
Ghana	3%	1%	2%
Kenya	6%	5%	5%
Benin	3%	2%	3%

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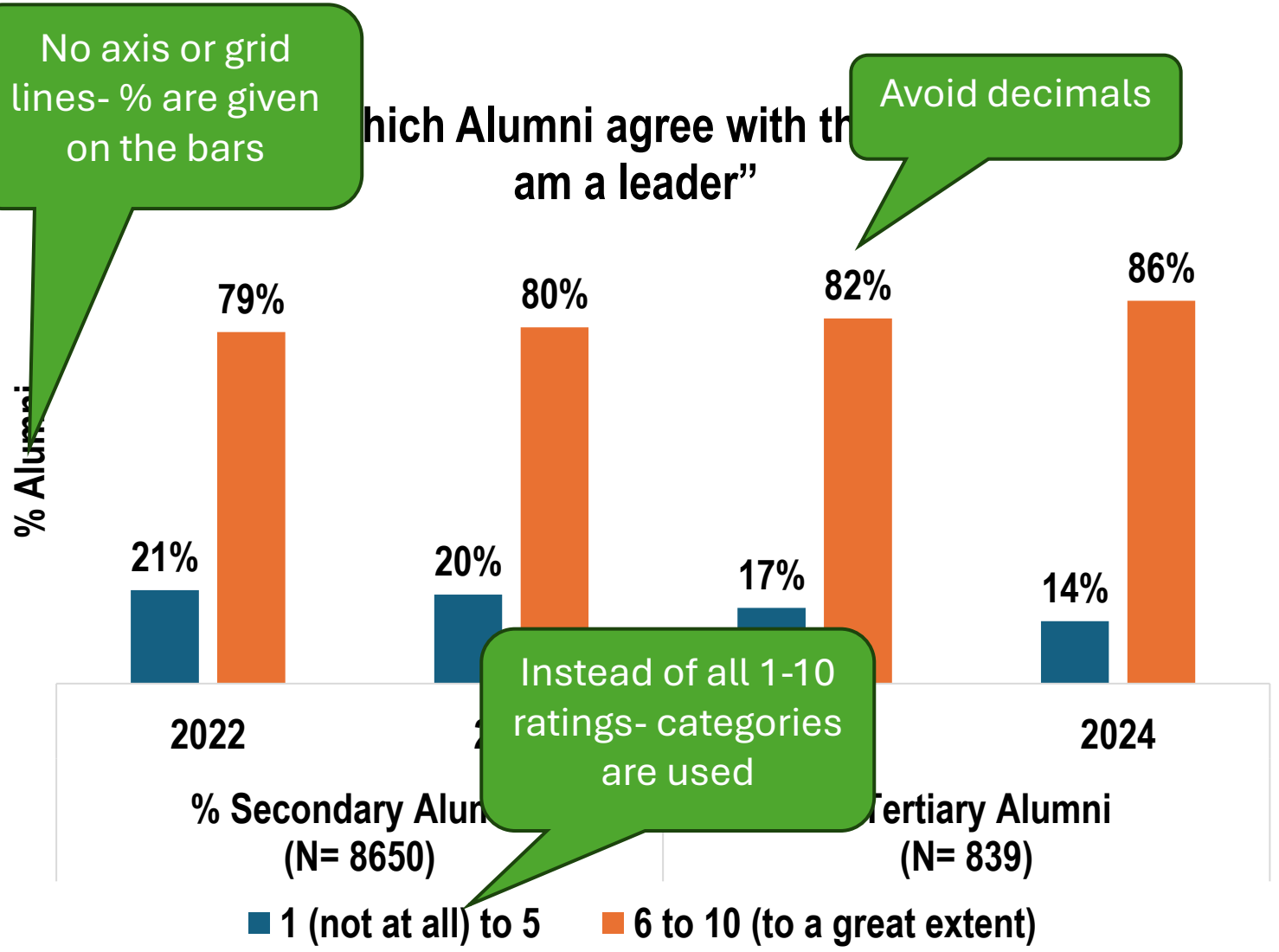
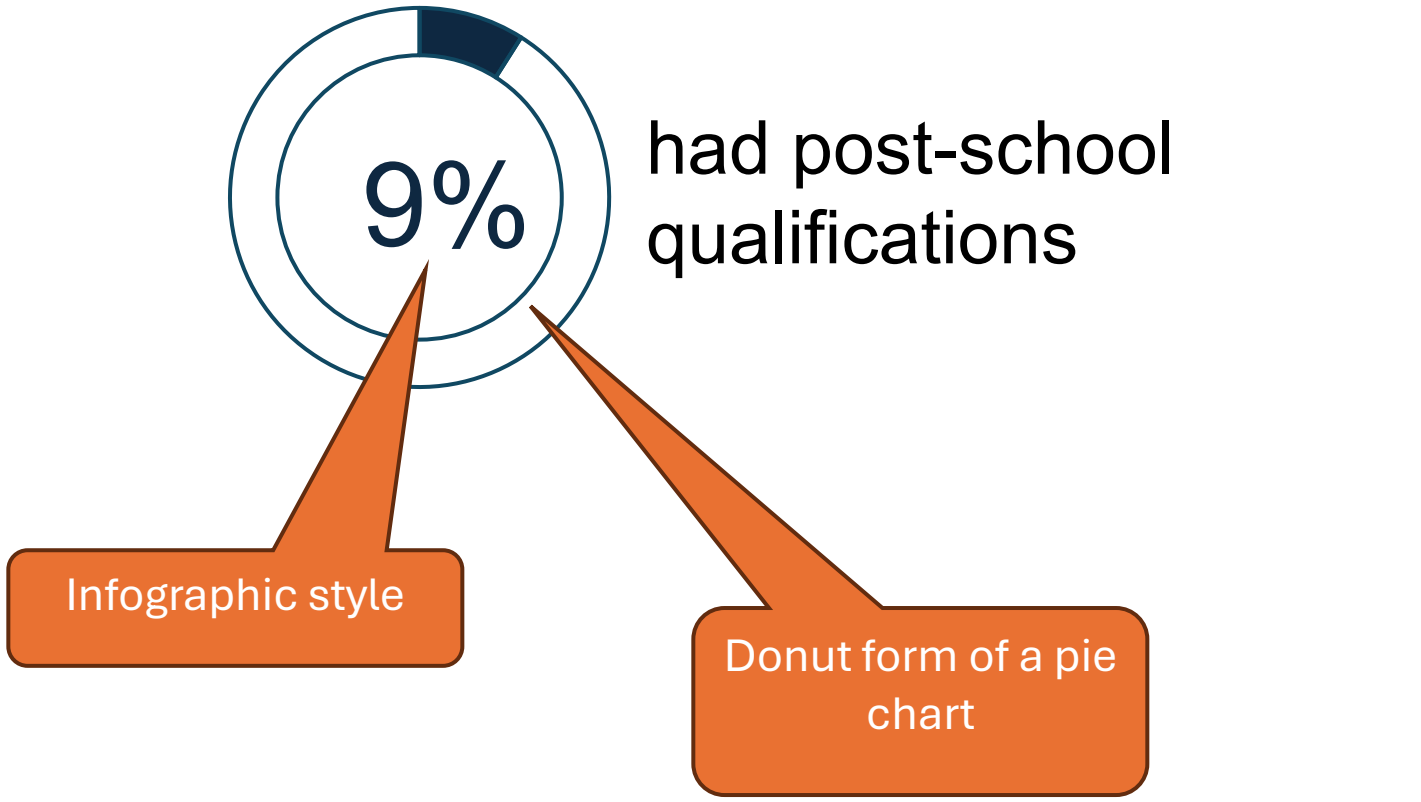
Bar Chart: Comparing Frequencies/Categories

- Compares quantities across different categories
- Each bar shows category value
- Effective for showing differences between groups



Pie Chart: Showing Proportions

- Display proportions of a whole
- Each slice represents a category
- Proportional to category's overall percentage
- Useful for showing the composition of a dataset



Histogram: Distribution of a Single Variable

- Illustrate the distribution of a single variable
- Divides data into frequency bins
- Help identify the shape, center, and spread of the data.

Demo of template

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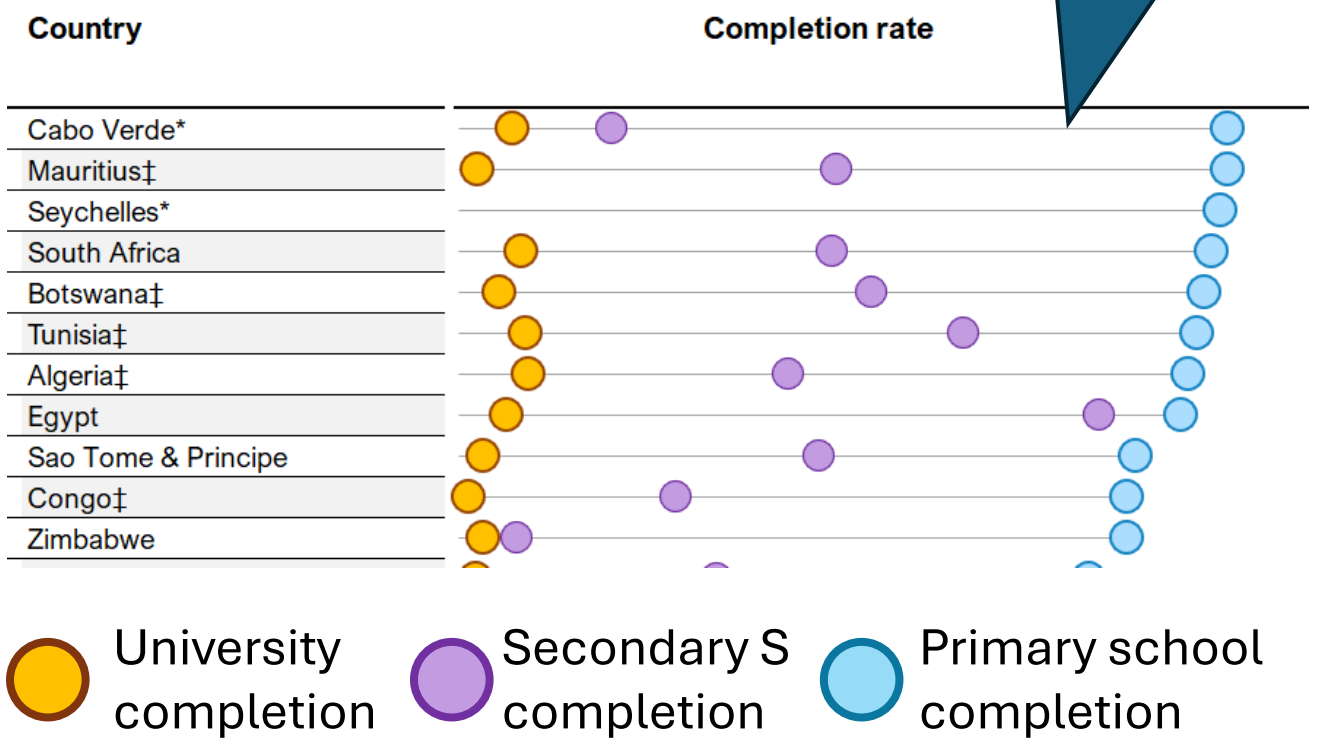
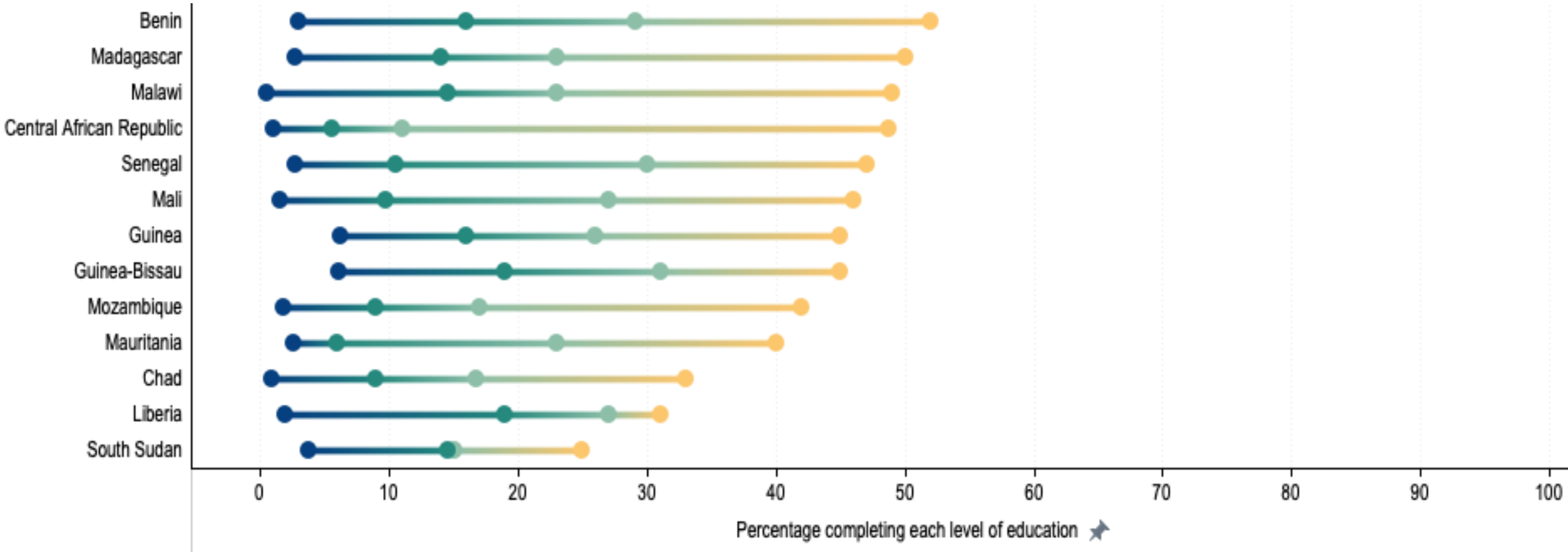
Dot Plot: An Alternative to Bar Charts

- Offer a simple yet effective alternative to bar charts
- Dots represent individual data points
- Useful for many data categories

Figure 1: Educational attainment as a proportion of the age-appropriate population (%)



Connected dot plot in excel

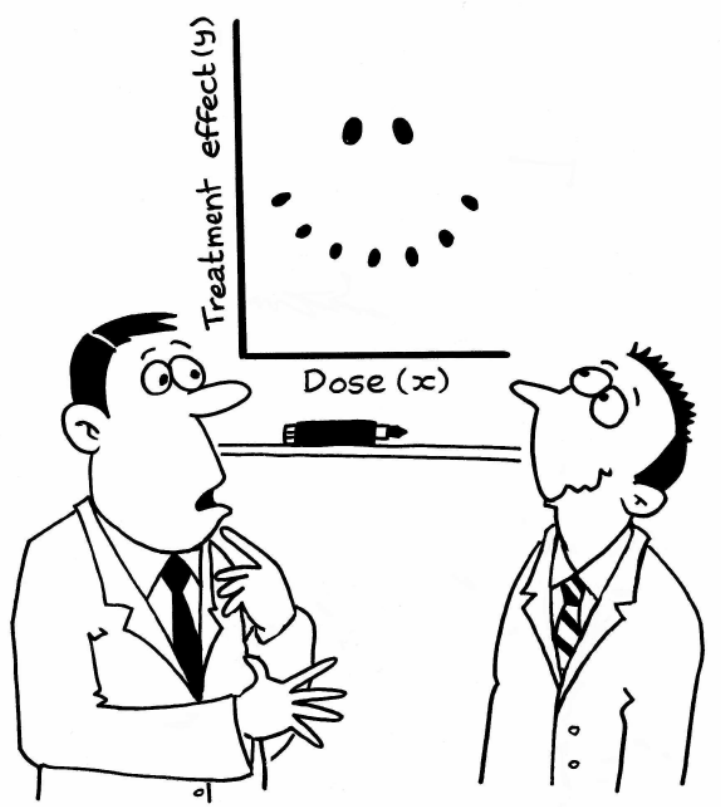


University
Upper secondary
Lower secondary
Primary

+ a b | e a u

Relationships:
How are Variables Related?

- Key to analyzing variable relationships
- Scatter plots, bubble charts, line charts, and bump charts are used to explore these relationships
- Identify patterns and correlations easily



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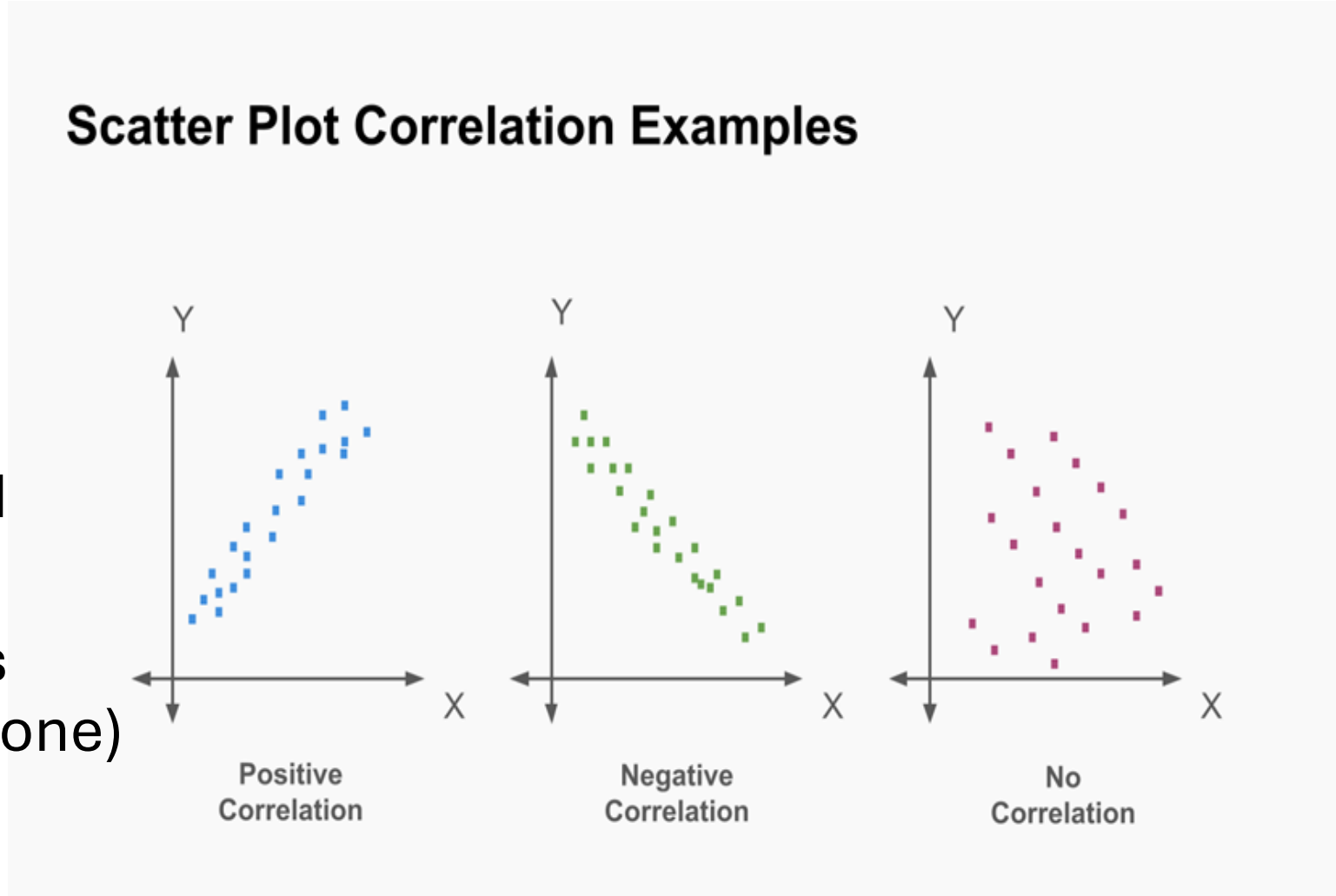
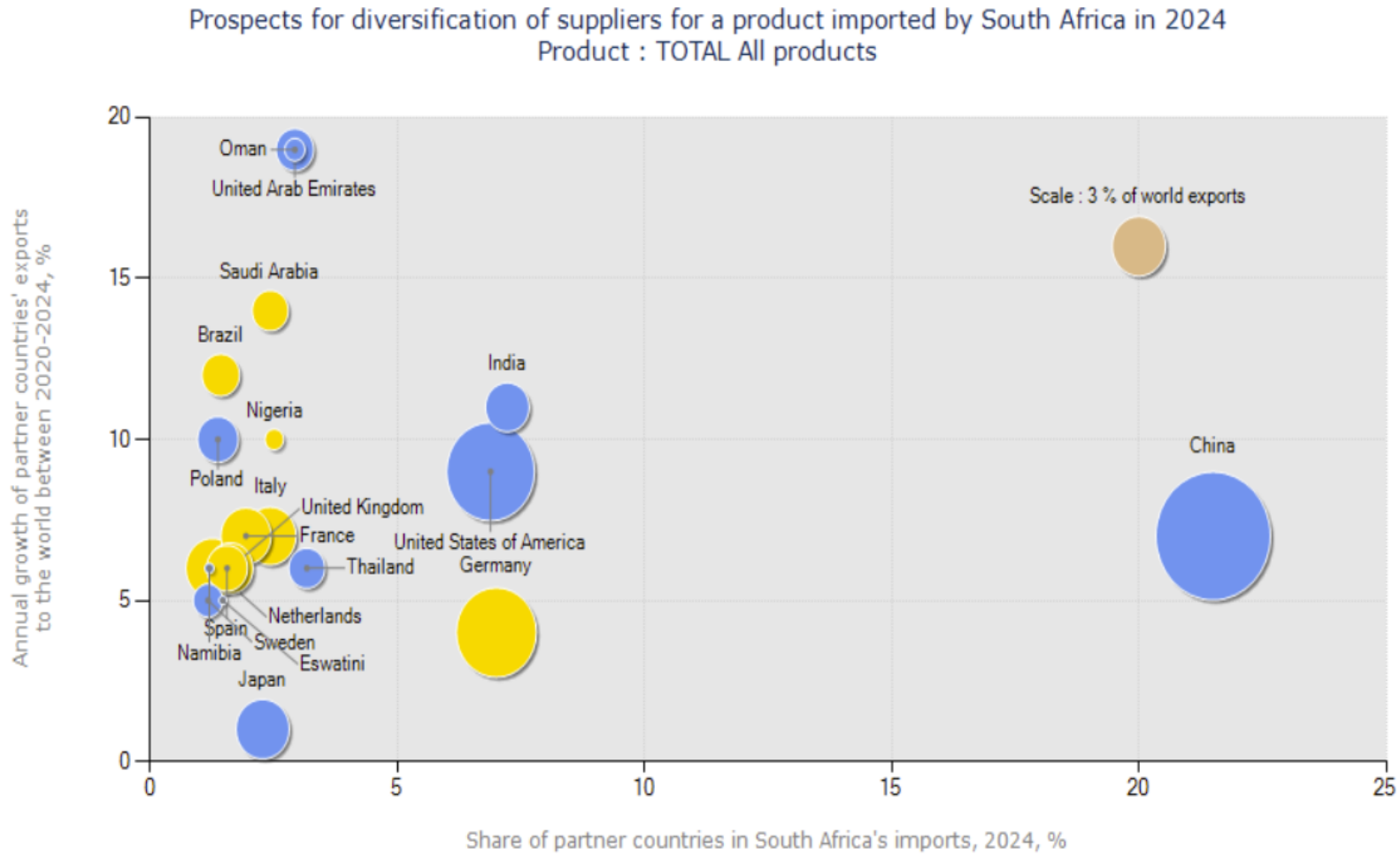
Scatter Plot: Correlations and Associations

- Show the relationship between two variables
- Points represent paired data values
- Can reveal correlations (positive, negative, or none)



Bubble Chart: Adding an Extra Dimension

- Extend scatter plots by adding a third dimension
- Bubble size reflects added variable
- Useful for multi-point relationships



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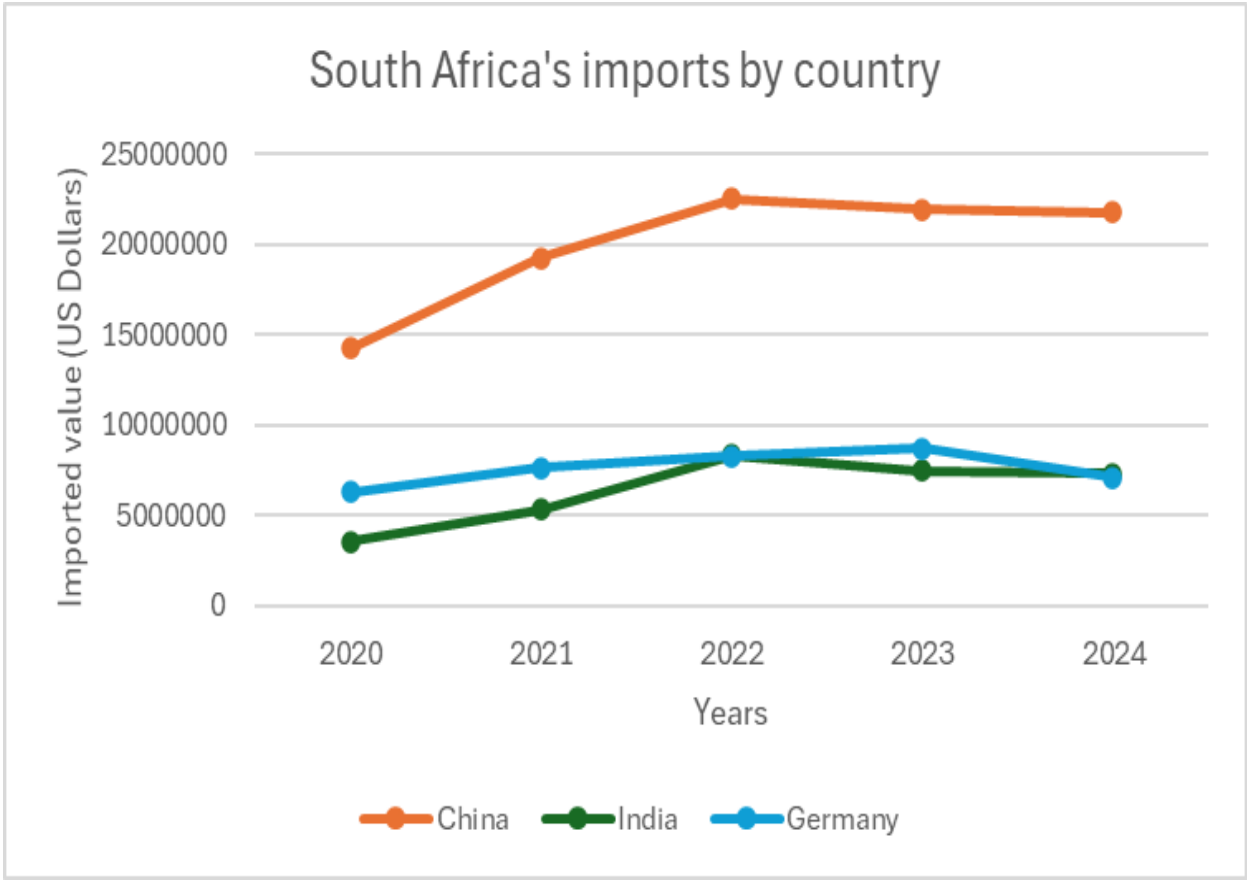
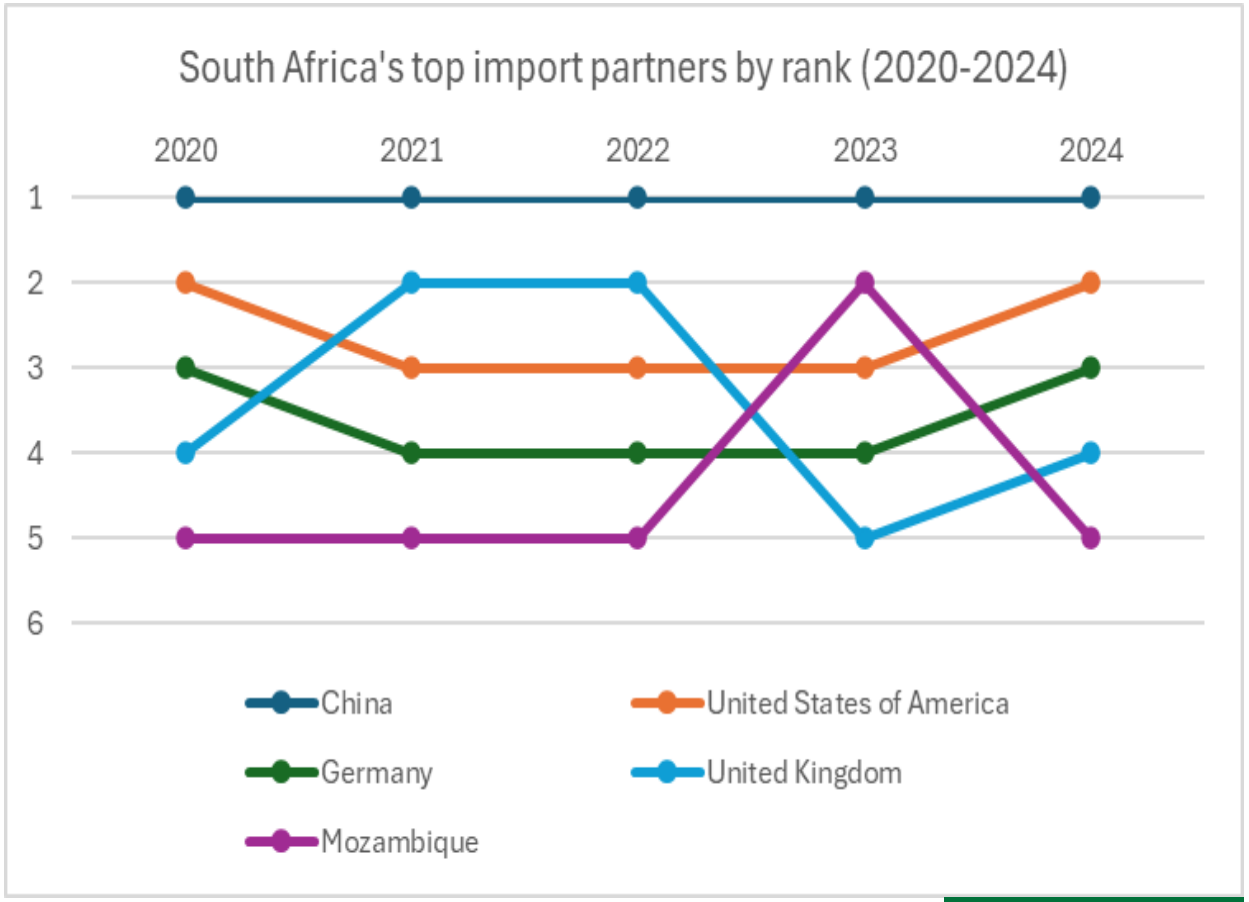
Line Chart: Trends Over Time

- Used to display trends over time
- Visualizes trends with connected lines
- Supports pattern recognition and forecasting



Bump Chart: Change in Rank Over Time

- Illustrate changes in rank over time
- Visualising ranking changes over time
- Highlight shifts in relative performance.
- Modified line graphs



Excel

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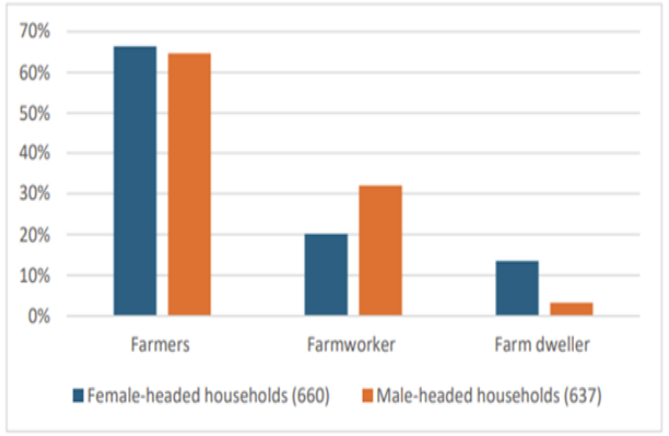
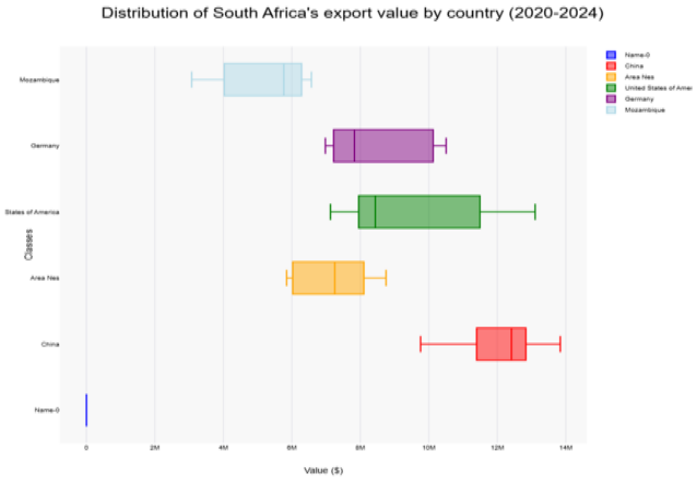
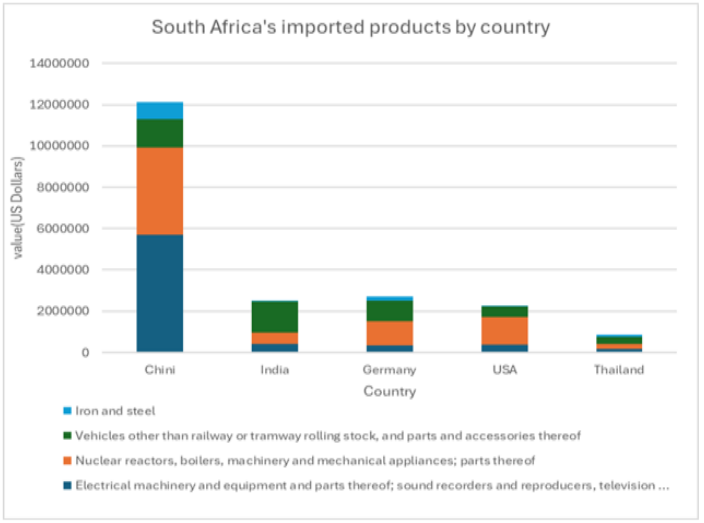
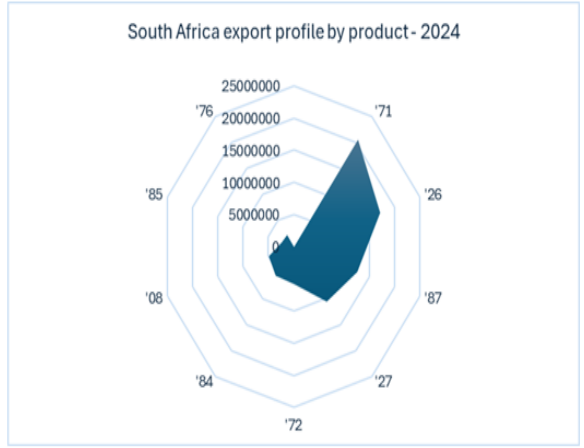
Comparisons: How Do Groups Differ?

- Essential for identifying differences and similarities
- Includes bar, box, slope charts, snowflake plots
- Shows variation across data groups









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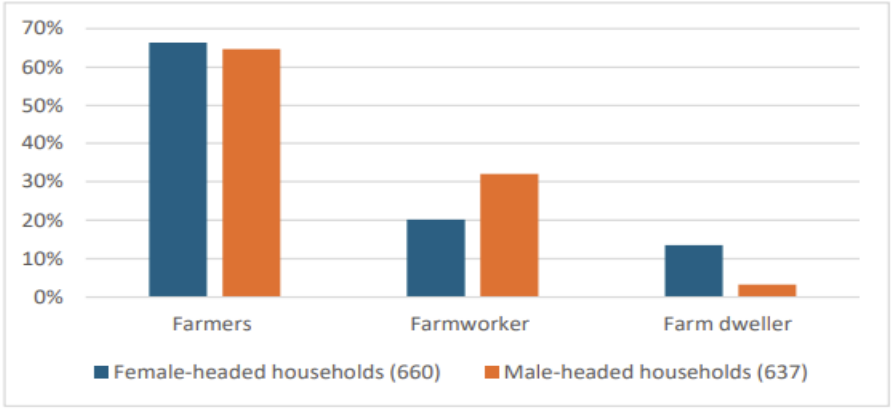
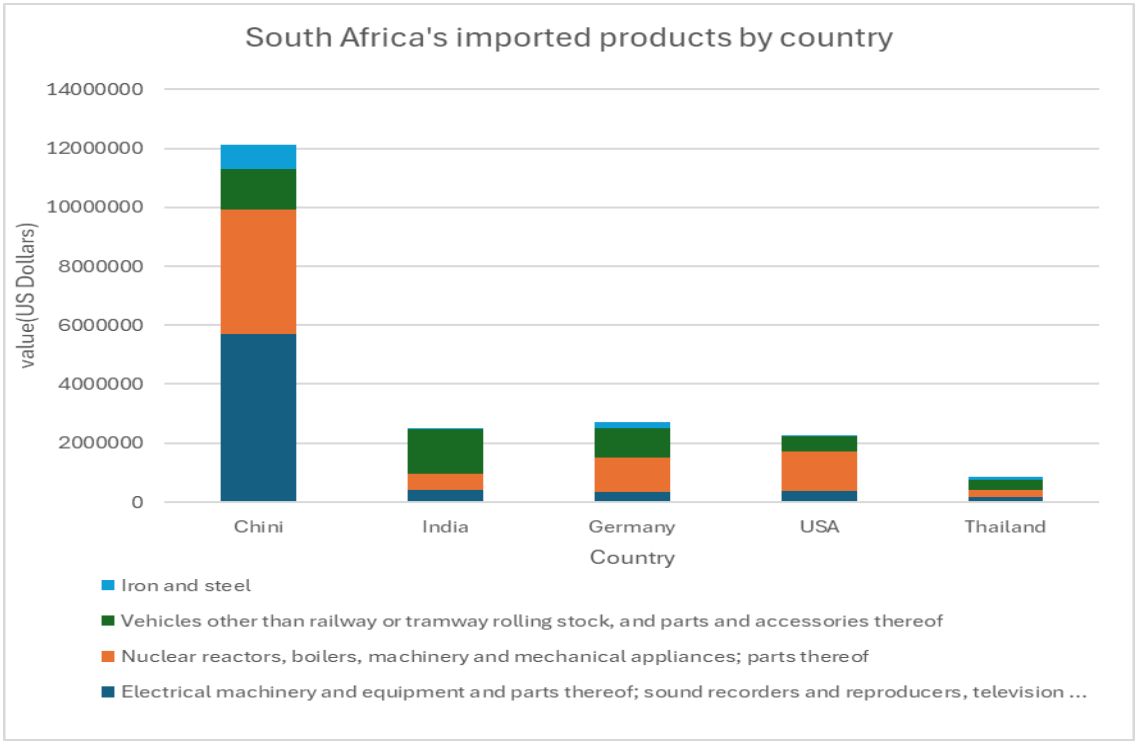
Grouped or Stacked Bar Chart

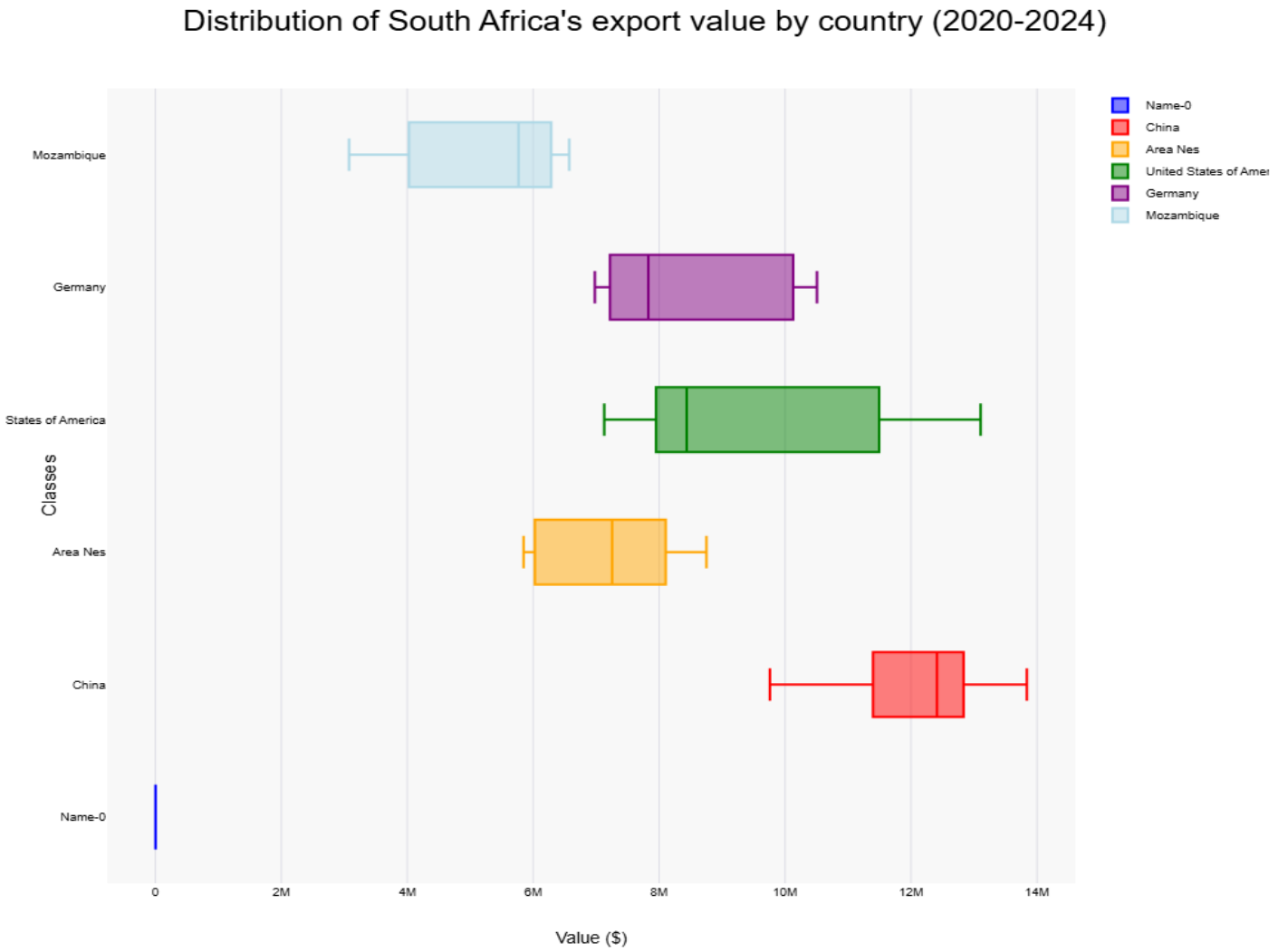
- Group bars - Compares groups side-by-side
- Stacked bars - Shows group composition by segment





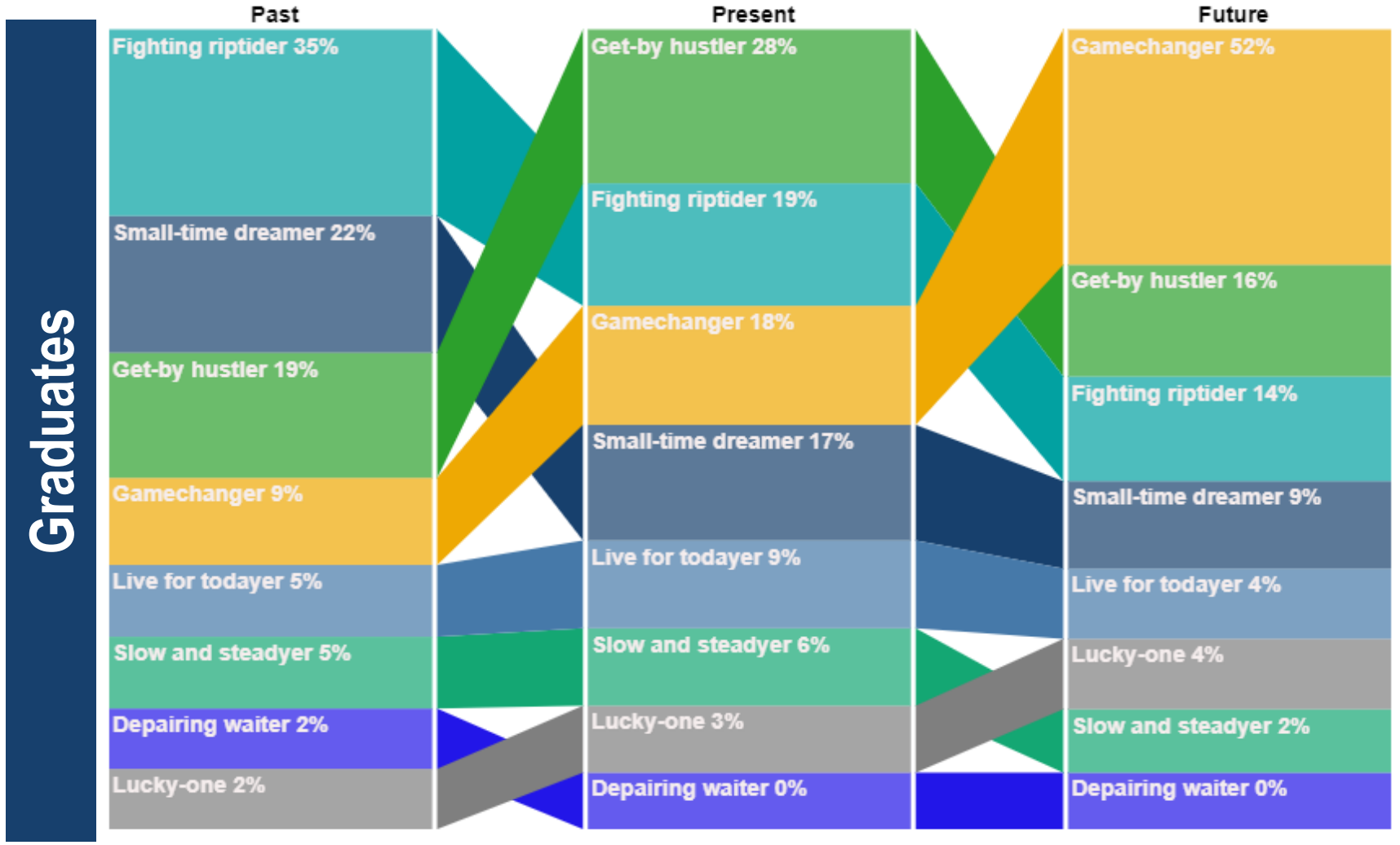
Box Plot: Distribution Comparisons Across Groups

- Shows data distribution by group
- Shows median, quartiles, and outliers
- Useful for comparing group outcomes



Comparison chart

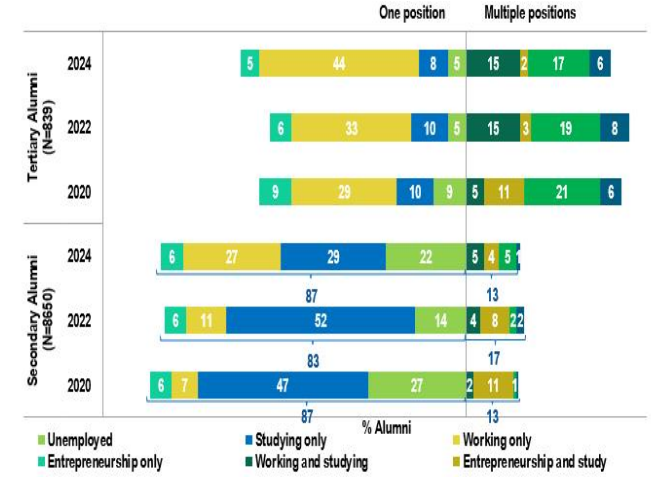
- Cross between a bump chart and stacked bar graph
- Changes in proportion and ranking

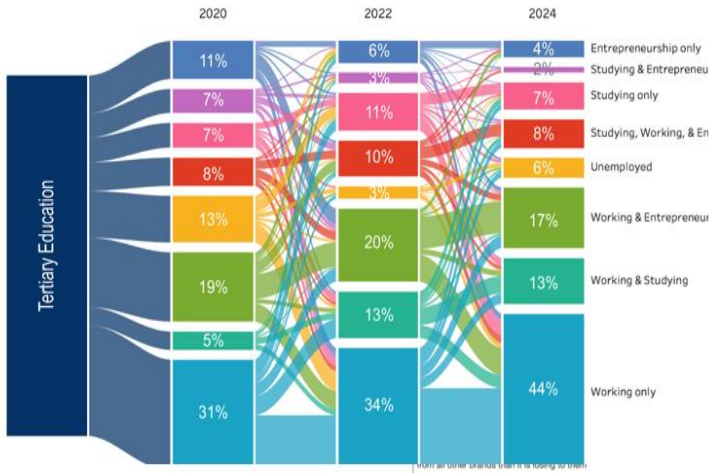


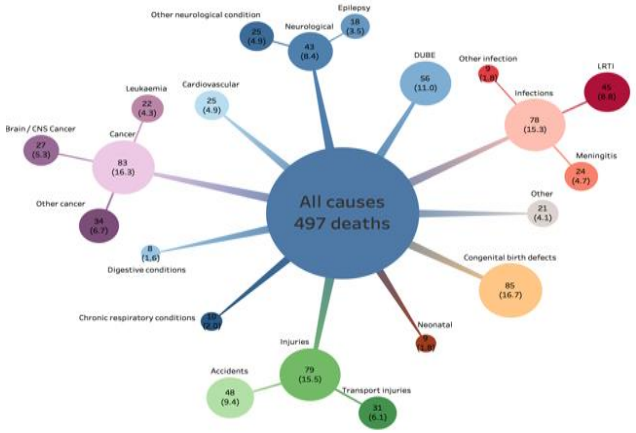
ChartExpo

Flows and Processes
Where does it go?
What are the transitions?

- Highlights movement and transitions
- Includes Sankey, alluvial, snowflake charts
- Visualises flows across categories or stages
- Ideal for showing pathways or hierarchies







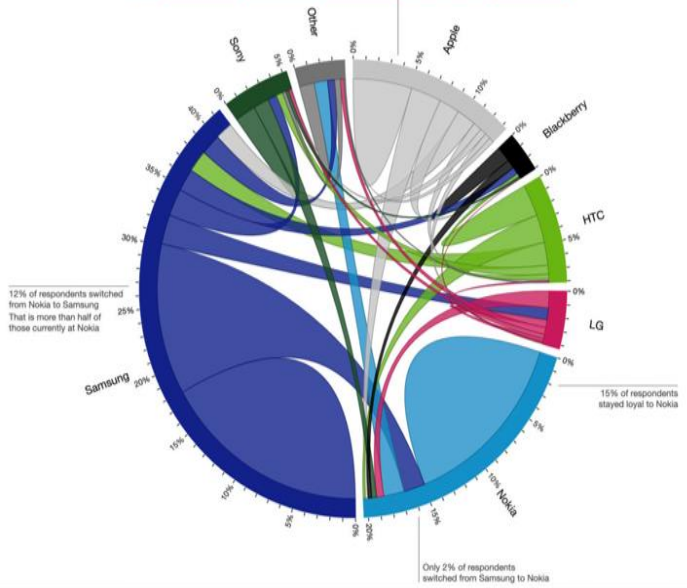


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Figure 1: Five most common mobility journey of graduates

Place of study 2020	2022	2024	% Graduates	n	Mobility journey
			29%	152	(1)Remaining home
			25%	133	(2)Remaining: Returning home from Africa
			12%	62	(3)Exiting Africa
			10%	59	(4)Returning home to Africa
			8%	38	(5)Circulating on/off-Continent

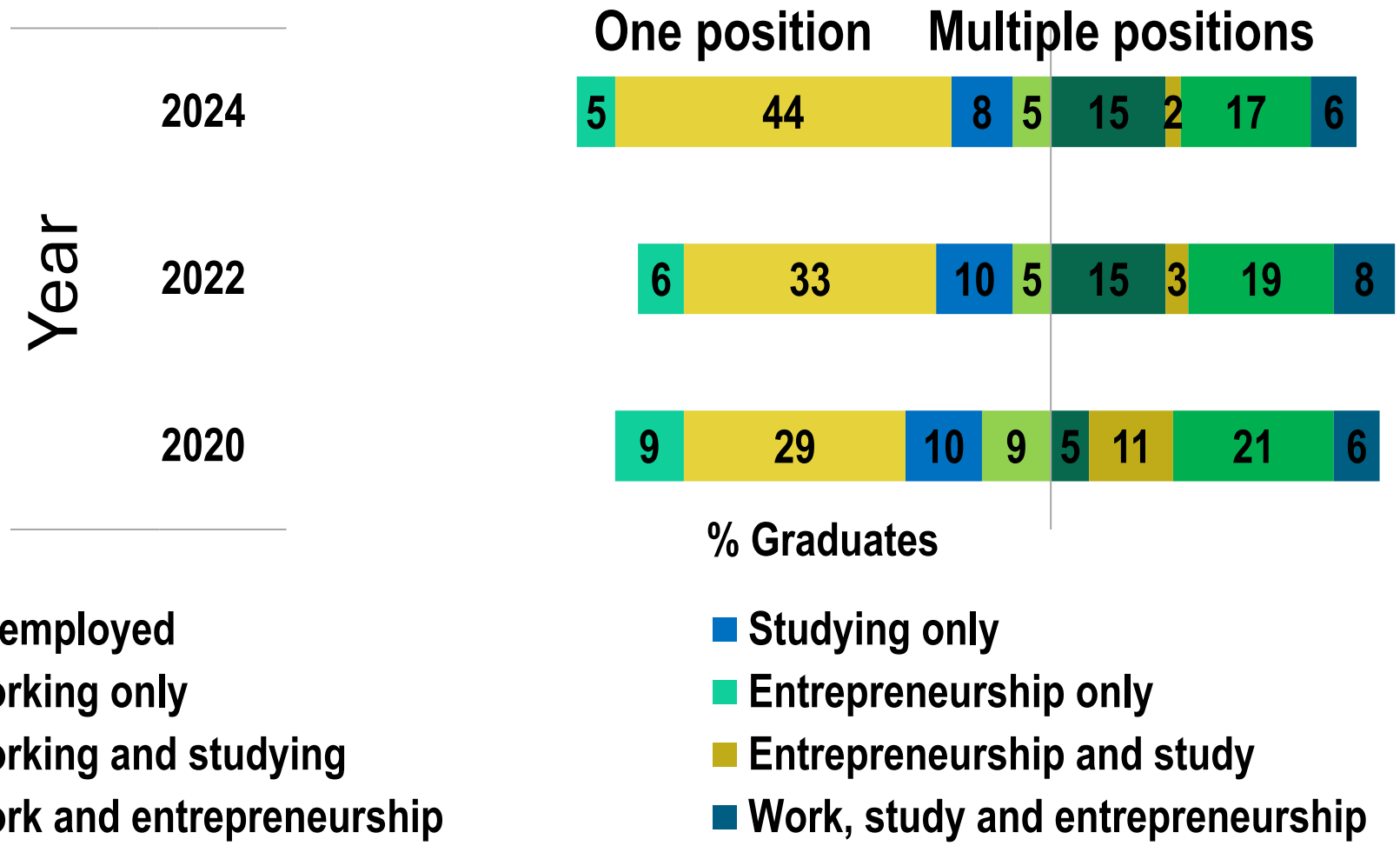
Legend

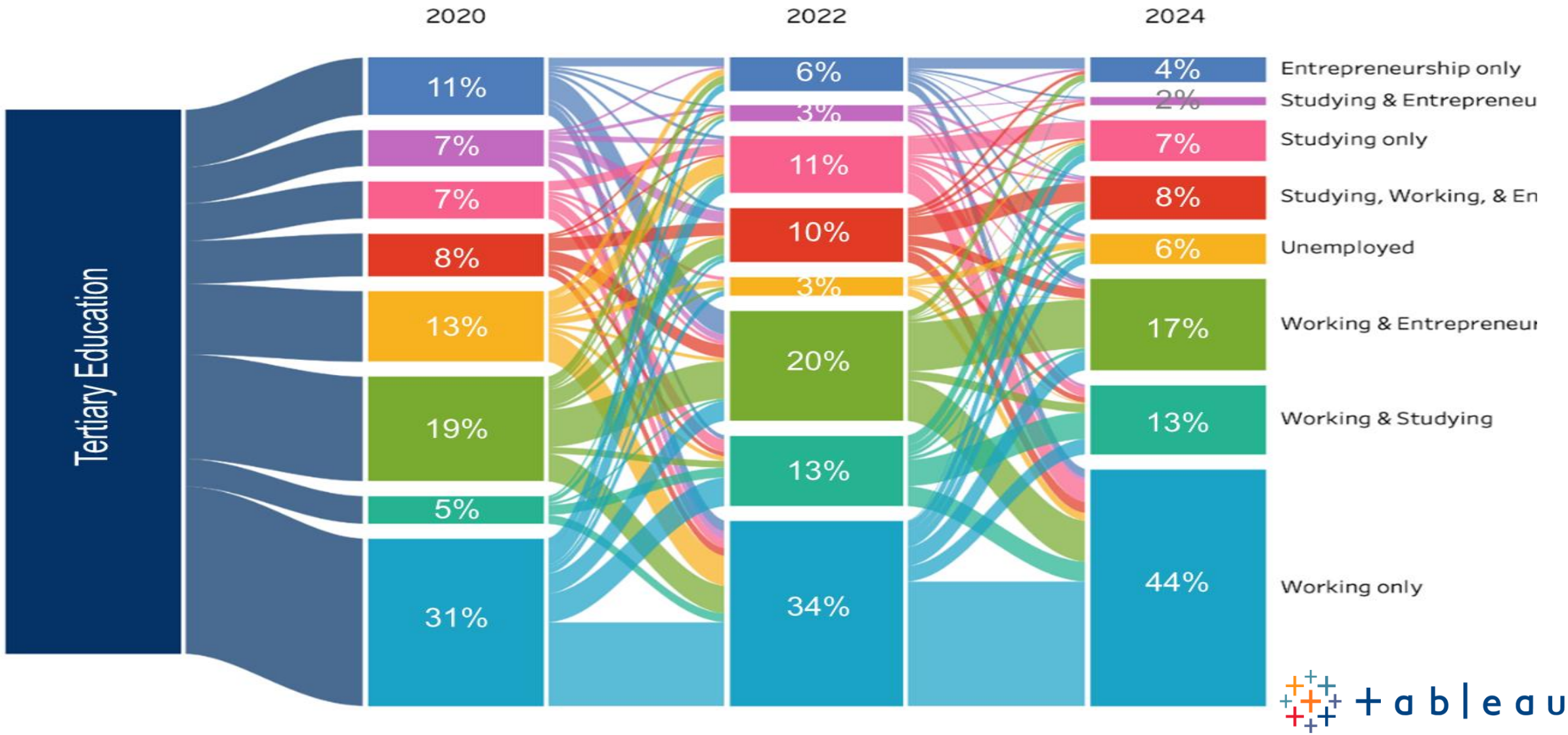
- In country of birth
- In another African country
- Either country of birth/in Africa
- Either country of birth/in Africa/outside Africa
- Outside Africa

Matrix chart

- Modified heatmap
- Shows common pathways
- Can be done manually in Word
- Does not show proportion visually but in text

Basic stacked bar graph of changes in labour market activity





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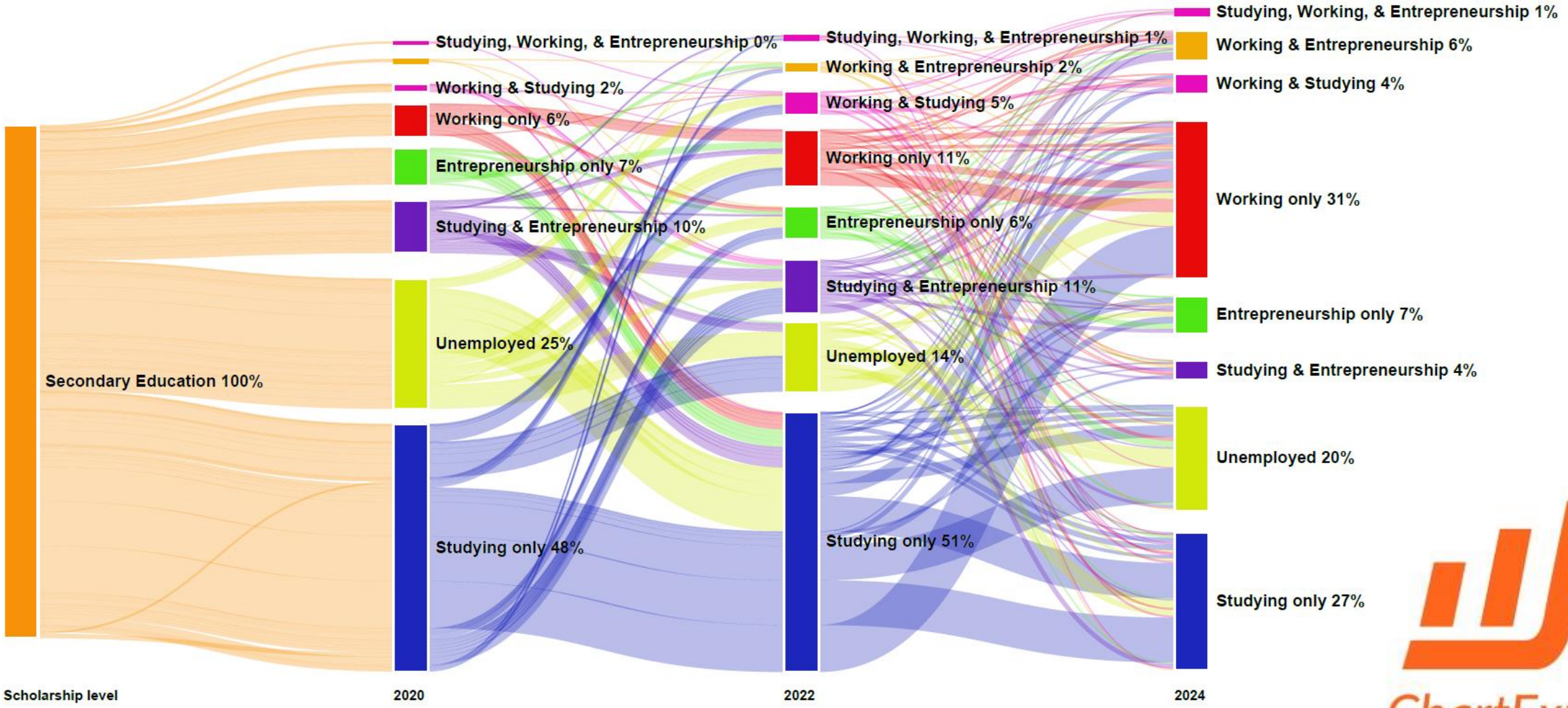

ChartExpo

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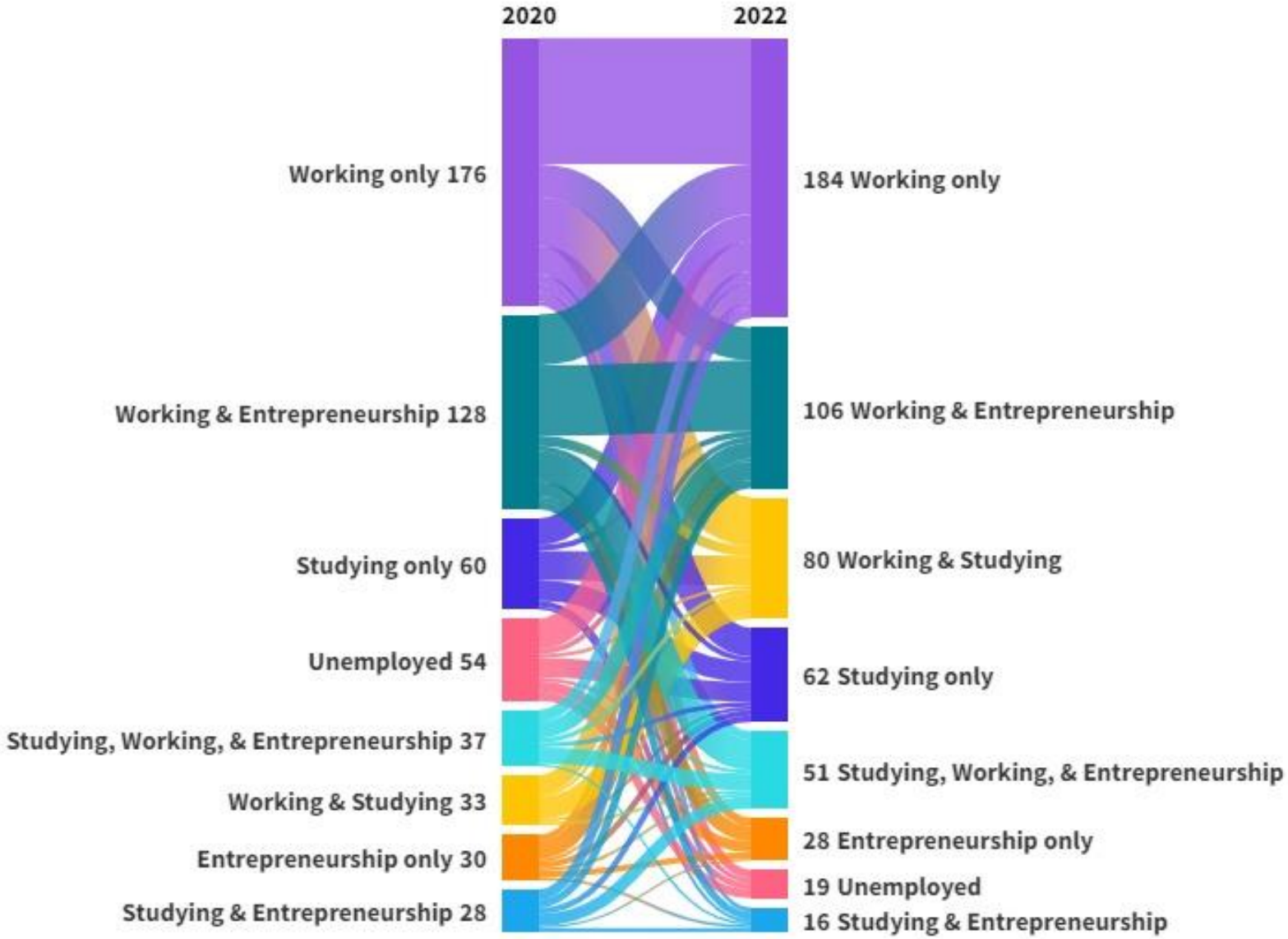
Flourish



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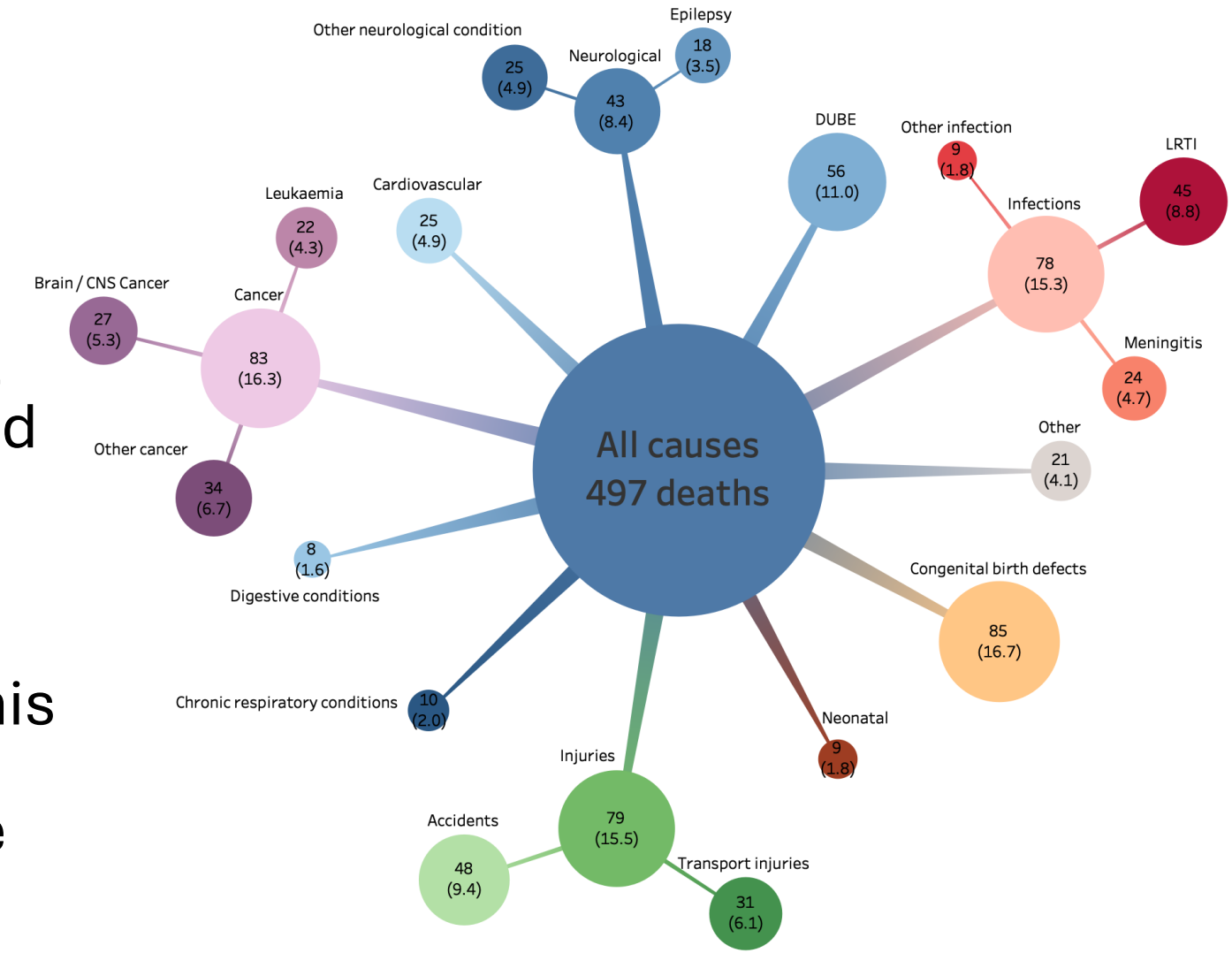
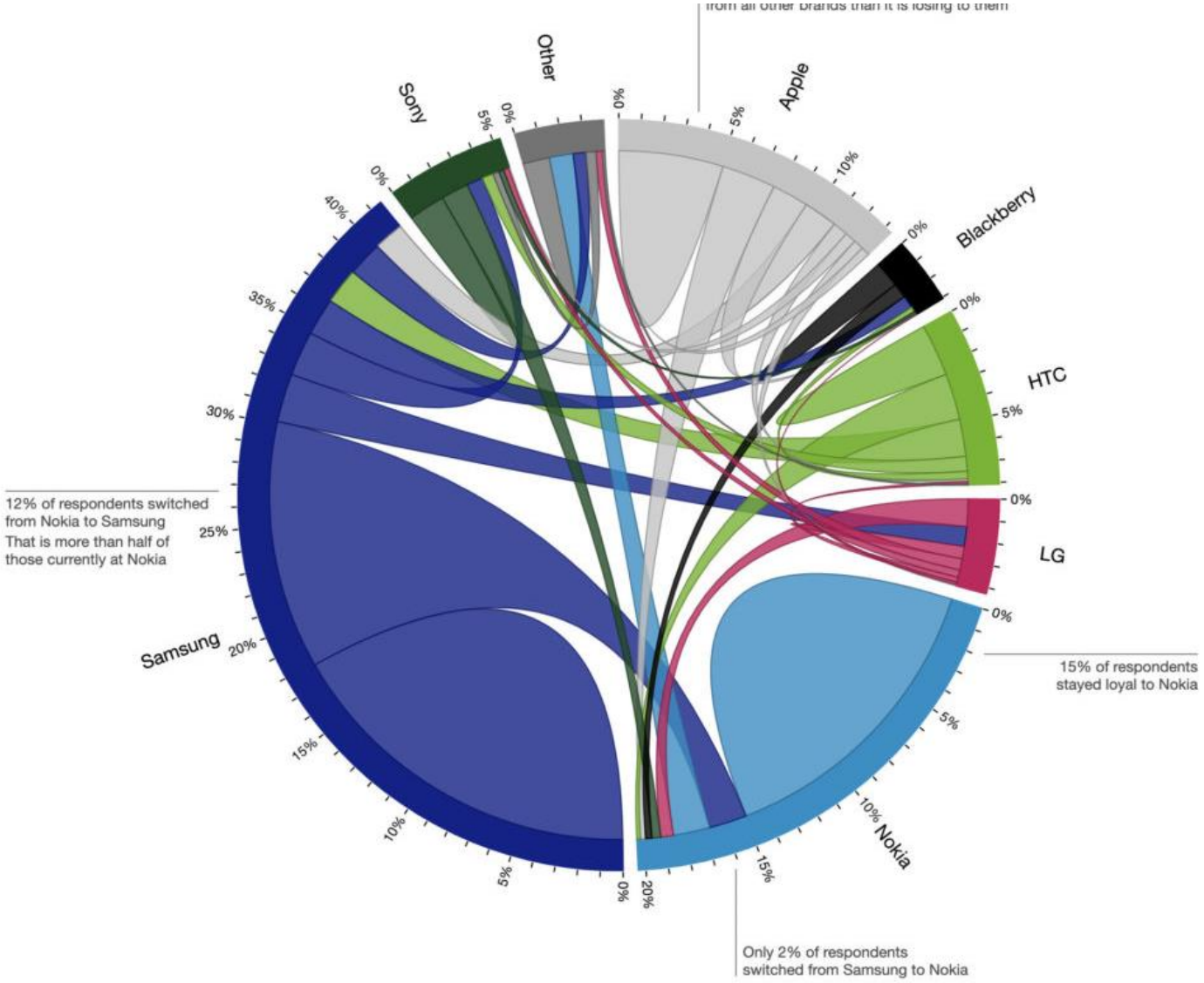
Cluster diagram

- Begins with a central node or theme placed at the center of the diagram.
- All other data branches out from this core- further disaggregation of the data



- Arcs around the circle represent categories; curved lines (chords) connect related groups.
- The thickness of the chords indicates the strength or volume of the relationship.
- Commonly used for flow or migration data.



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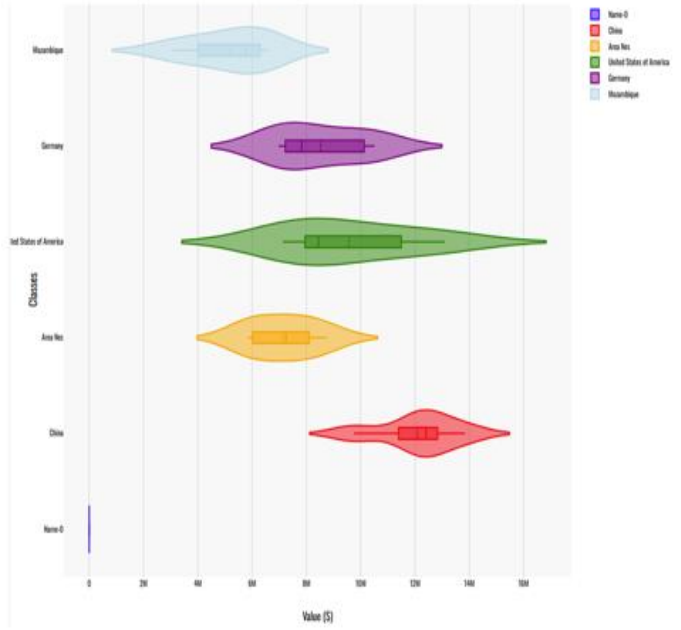
Distributions and Patterns
What are the trends?

- Identifies variation and distribution
- Includes heatmaps, ridgelines, violins
- Reveals hidden data patterns



	All Products	Live Animals	Meat Offal	Seafood	Dairy Products	Animal Products	Live Plants	Vegetables	Fruits & Nuts
2010	82,328,530	54,637	277,028	471,292	232,246	18,873	70,007	173,672	2,187,637
2011	107,956,344	49,308	220,974	507,448	241,074	22,093	67,844	190,115	2,301,978
2012	98,782,056	52,207	181,891	453,591	263,890	22,378	76,229	184,672	2,357,942
2013	95,115,323	49,654	183,662	434,689	287,659	19,732	64,806	186,312	2,641,638
2014	92,590,712	57,991	254,712	483,239	296,229	21,931	68,284	189,185	2,834,115
2015	81,791,370	69,850	288,799	418,275	253,873	23,109	65,336	172,869	2,925,422
2016	76,586,727	62,336	280,977	443,138	220,754	25,565	67,678	199,437	2,898,098
2017	89,555,817	60,823	296,360	448,005	272,744	24,866	81,262	214,335	3,394,145
2018	95,179,154	72,316	268,526	545,013	247,983	24,563	90,979	213,779	3,707,486
2019	90,419,473	71,420	236,486	497,033	234,777	24,388	93,396	213,358	3,425,443
2020	85,686,133	70,267	275,620	438,947	219,363	16,115	81,929	203,854	3,823,560
2021	123,734,050	67,844	305,119	532,336	260,466	18,278	120,695	224,371	4,424,139
2022	123,614,816	49,686	309,919	490,034	266,467	18,043	113,284	206,006	4,453,653
2023	110,662,795	58,193	308,471	453,528	260,757	25,412	111,965	190,454	4,358,241
2024	110,390,555	55,416	409,664	495,965	282,334	28,984	107,162	218,091	4,946,288

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Heatmap – intensity or frequency across two variables

- Shows intensity or frequency
- Compares across two variables
- Useful for time-based trends

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Excel

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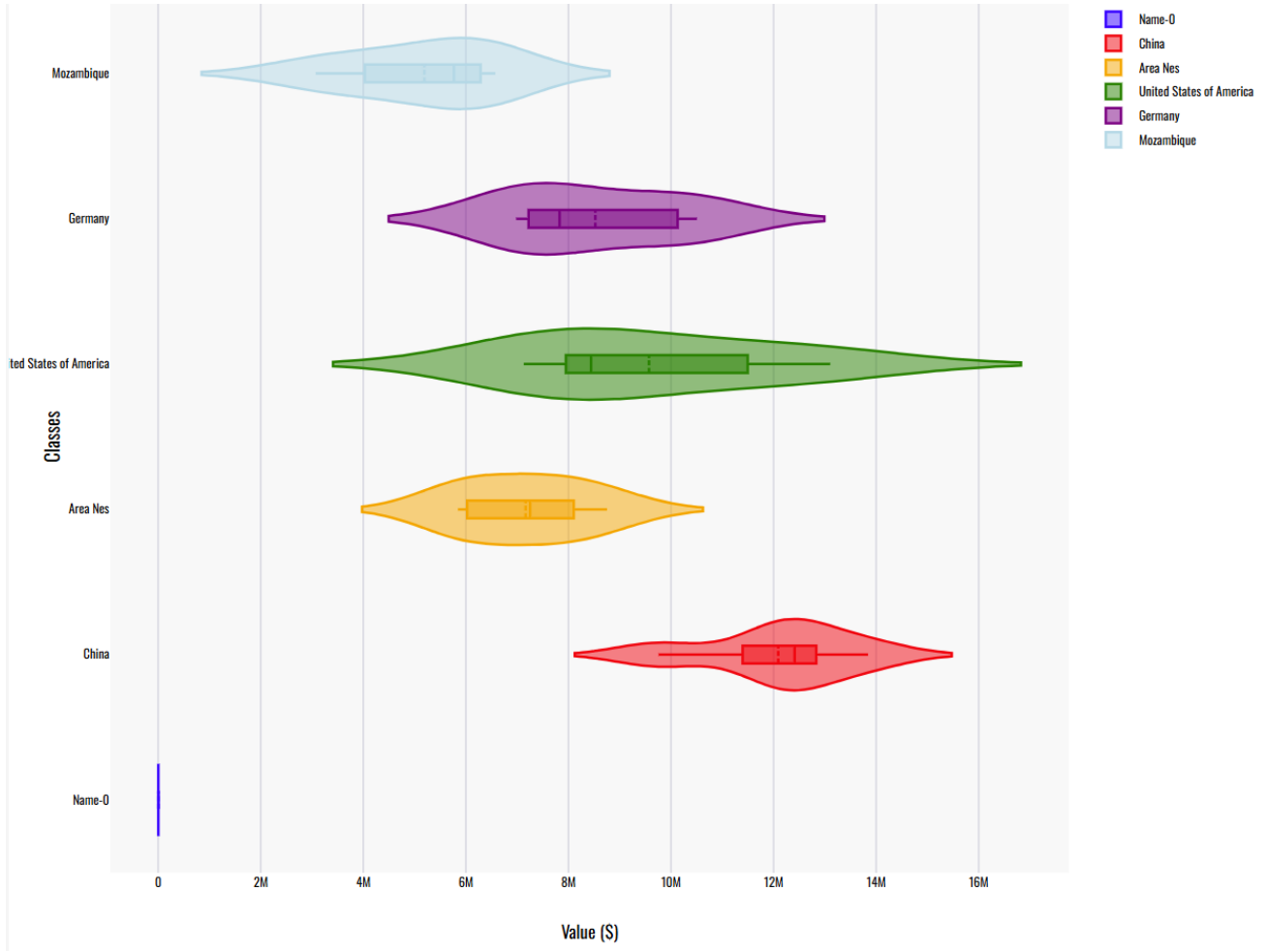
Violin plot – combining box plot and density

- Combines box and density plots
- Shows spread and central value
- Useful for group comparisons



Data Viz Platforms

Tool Name	Website	Free Version Available?
Tableau Public	tableau.com	Yes
Power BI	powerbi.microsoft.com	Yes (limited)
Flourish	flourish.studio	Yes
RAWGraphs	rawgraphs.io	Yes (open source)
Datawrapper	datawrapper.de	Yes
Canva	canva.com	Yes (Pro has more features)
Infogram	infogram.com	Yes
Piktochart	piktochart.com	Yes
ChartBlocks	chartblocks.com	Yes
D3.js	d3js.org	Yes (open source)
Plotly	plotly.com	Yes (Python/R/JS API)
Observable	observablehq.com	Yes
Excel		
Google sheets		

Quiz/ poll

Qualitative data visualisation

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Qualitative Data Visualisation

Why visualize qualitative data

- Reveal patterns and relationships
- Support interpretation and analysis
- Communicate findings clearly
- Enhance collaboration e.g. participatory analysis

What makes qualitative visualization different?

- Focus on **meaning**, **relationships** and **narratives** rather than numbers
- Need to preserve **context** and **nuance**

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Visualization techniques for qualitative data

Thematic maps & concept maps

- Visualize how themes connect
- Use during or after coding
- Best for theory building, theme structuring

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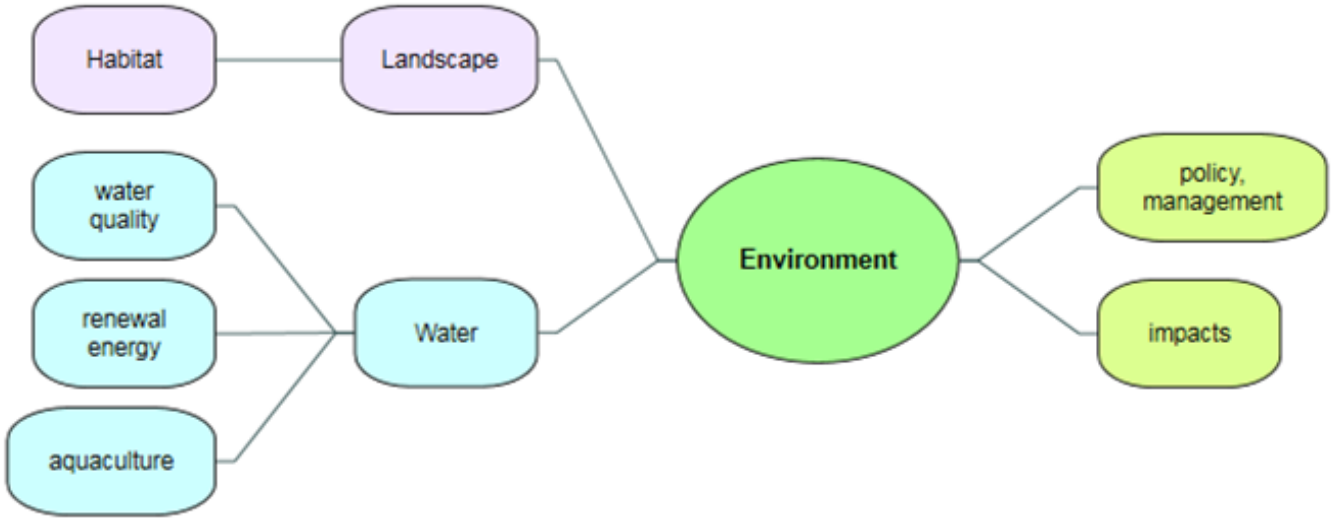
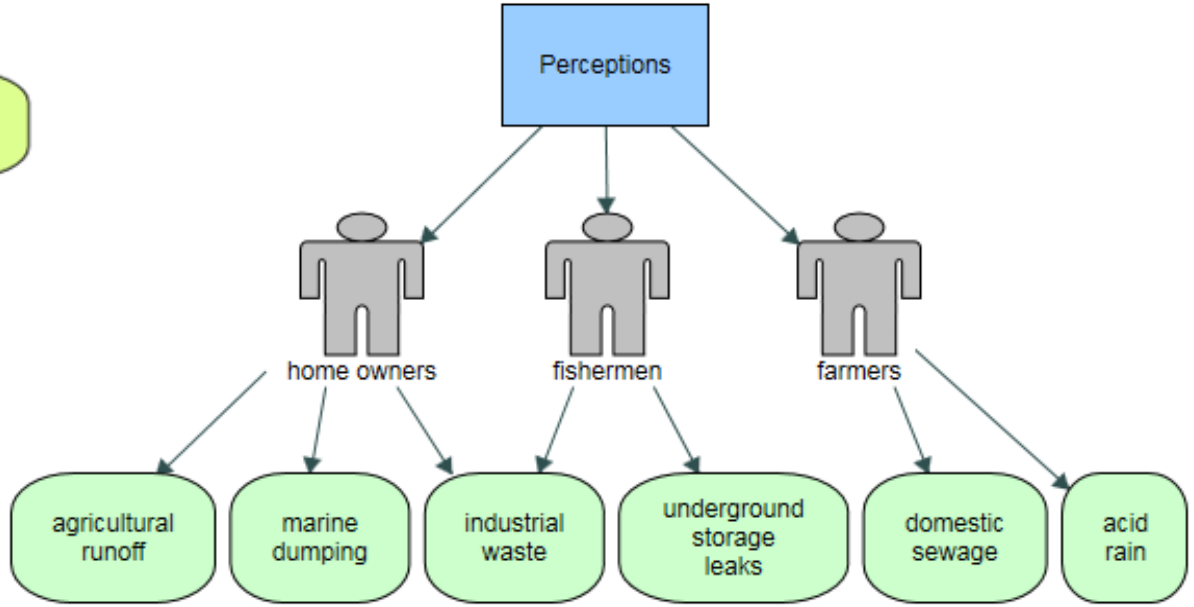
Brainstorm your ideas and visualize your thoughts with mind maps

Define concepts and think through their connections with concept maps

NVIVO





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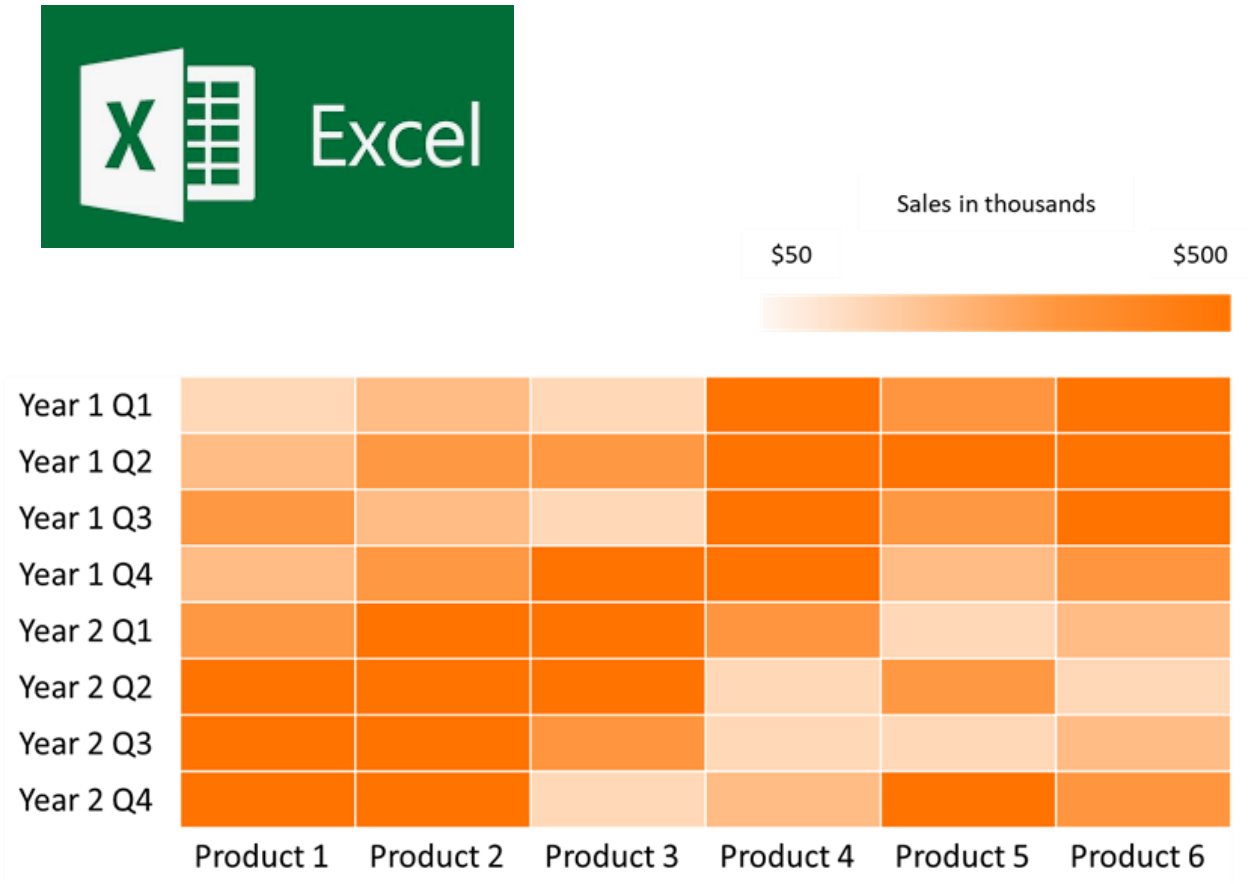
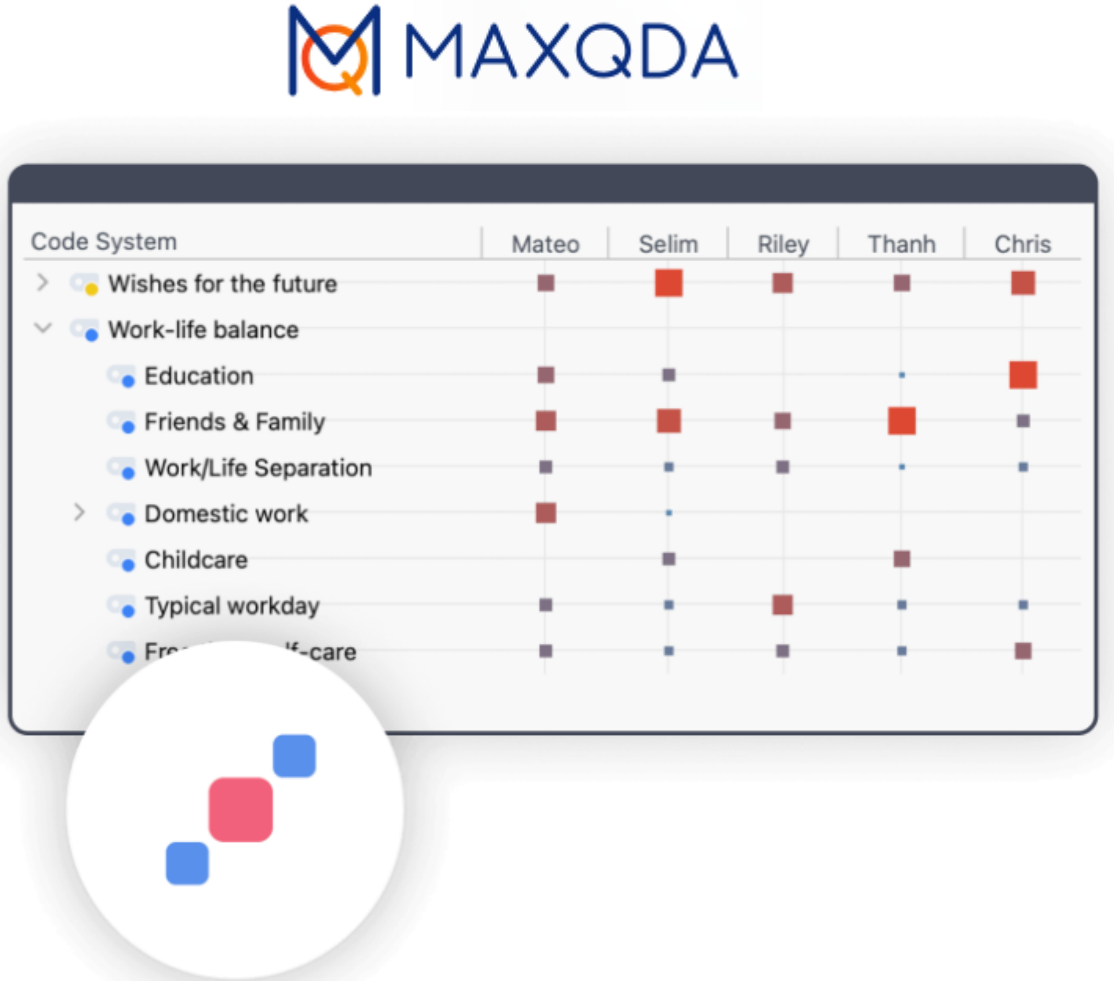
Visualization techniques for qualitative data

Matrices and heatmaps

- Compare themes across individuals or groups
- Especially useful for framework analysis
- Best for cross-case comparison

Heat maps in Excel or matrices in MAXQDA





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Visualization techniques for qualitative data

Word clouds and code frequencies

- Word clouds give quick insight into dominant language
- Code frequency charts show which ideas come up most often
- If you use both side-by-side you can contrast snapshot vs. Depth
- Best for presentations, initial scans of your data and audience engagement

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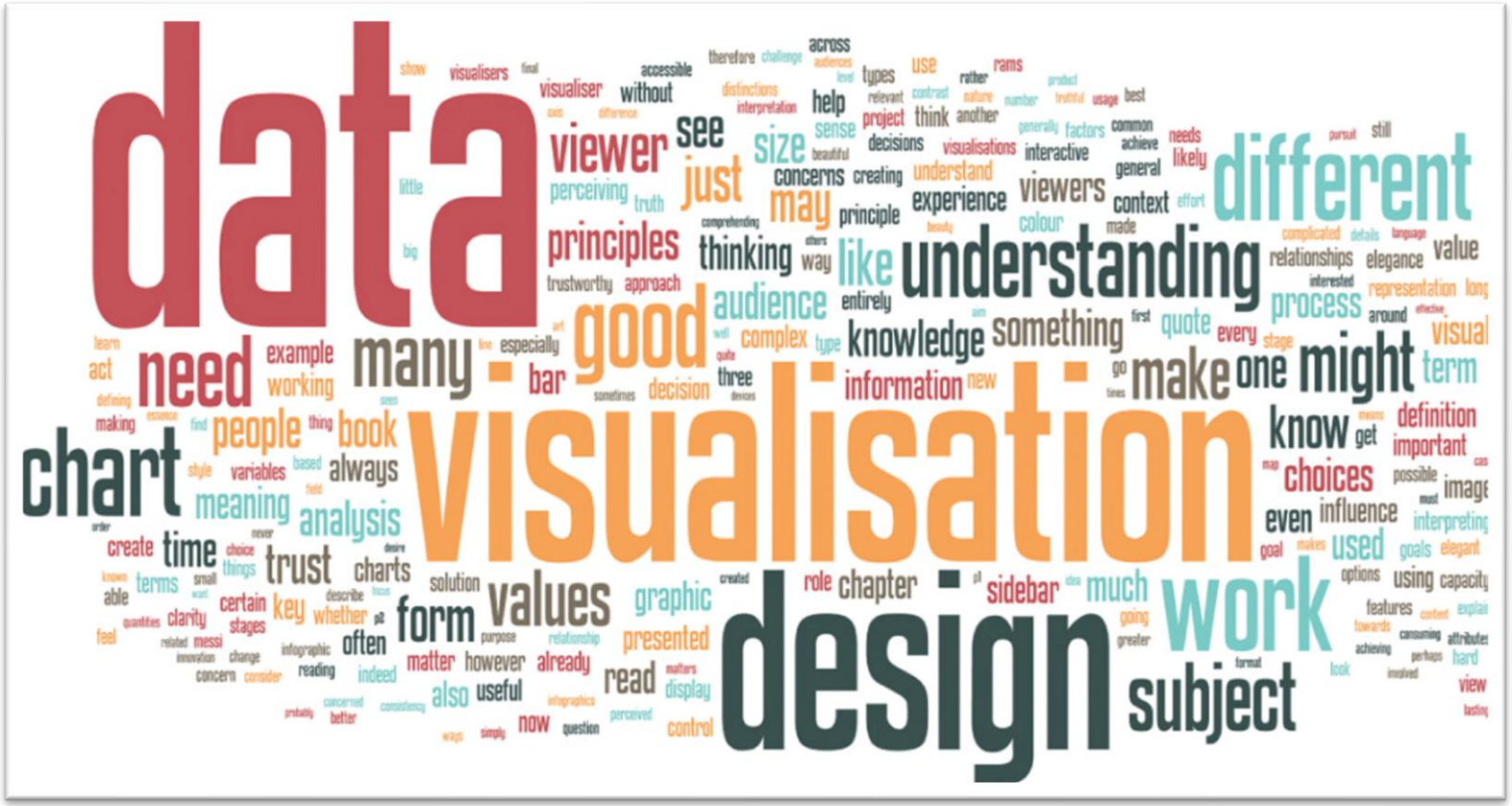

Mentimeter

EdWordle

WordClouds.com

WORDART

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A **code frequency chart** is a **quantitative summary of qualitative data**, showing **how often specific themes or codes** appear in your dataset. It's typically used **after coding interviews, focus groups, or open-ended responses**.

- Quickly show **dominant topics**
- Compare **which issues matter most** across groups
- Useful in **mixed methods**: bridges qual & quant
- Adds visual appeal for **policy briefs or reports**

Cuisine	Number of Residents
Filipino	93
Chinese	39
American	45
Japanese	16
Undecided	7
	N=200

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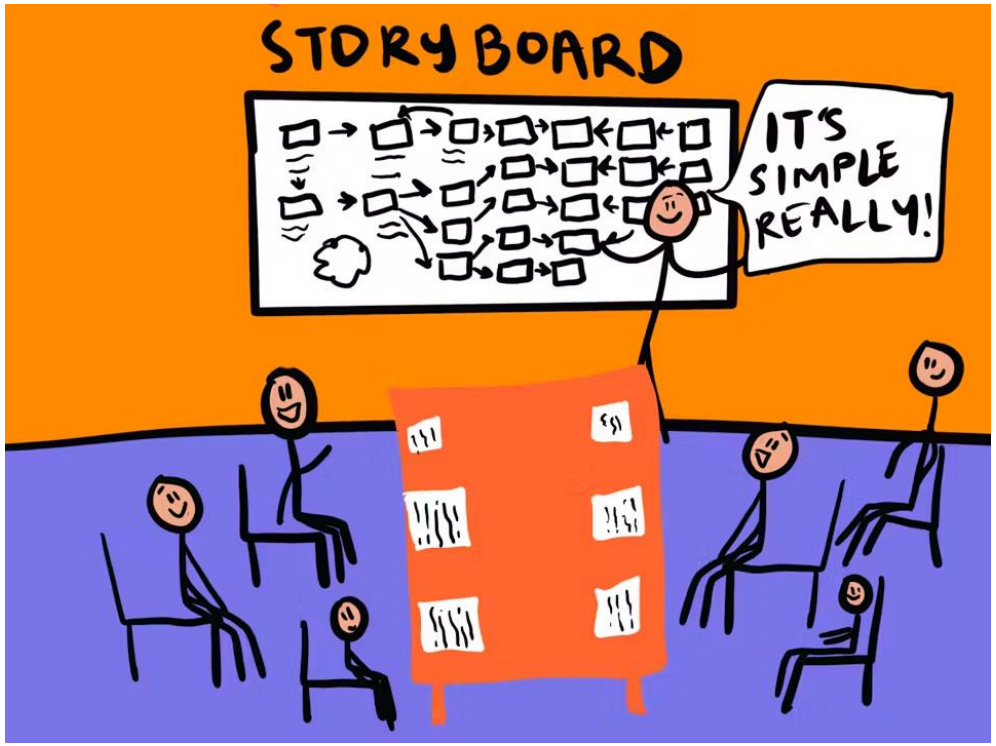
Visualization techniques for qualitative data

Storyboards, diagrams and visual poems

- Rich, creative methods to convey meaning and emotion
- Used in participatory or arts-based research
- Optional image: Photovoice, visual quote collage, or a storyboard
- Best for youth research, advocacy, community feedback



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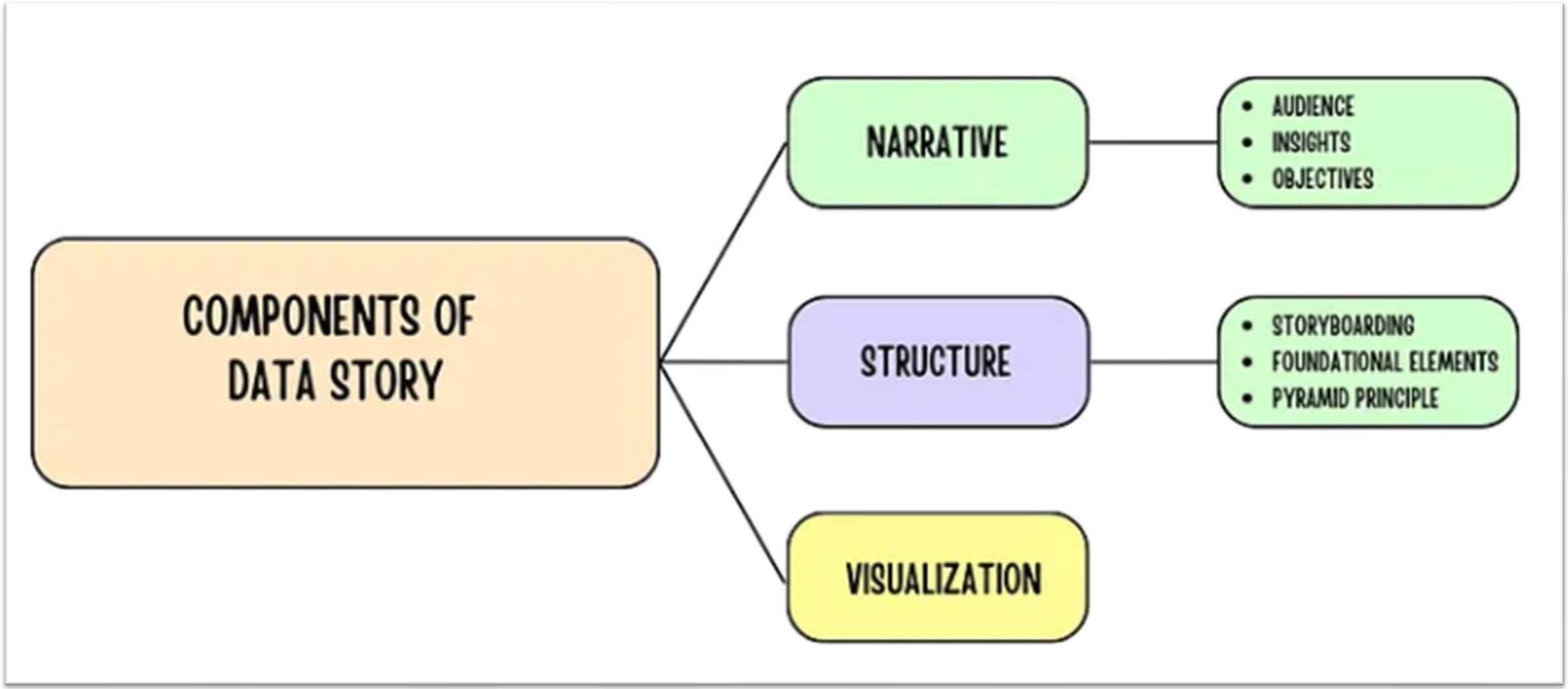

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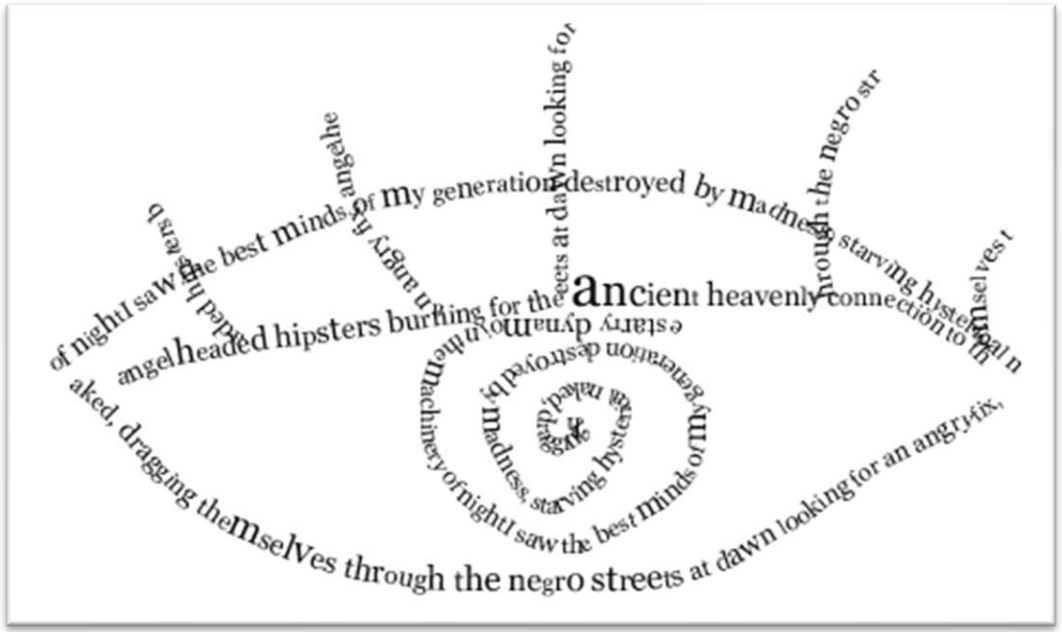

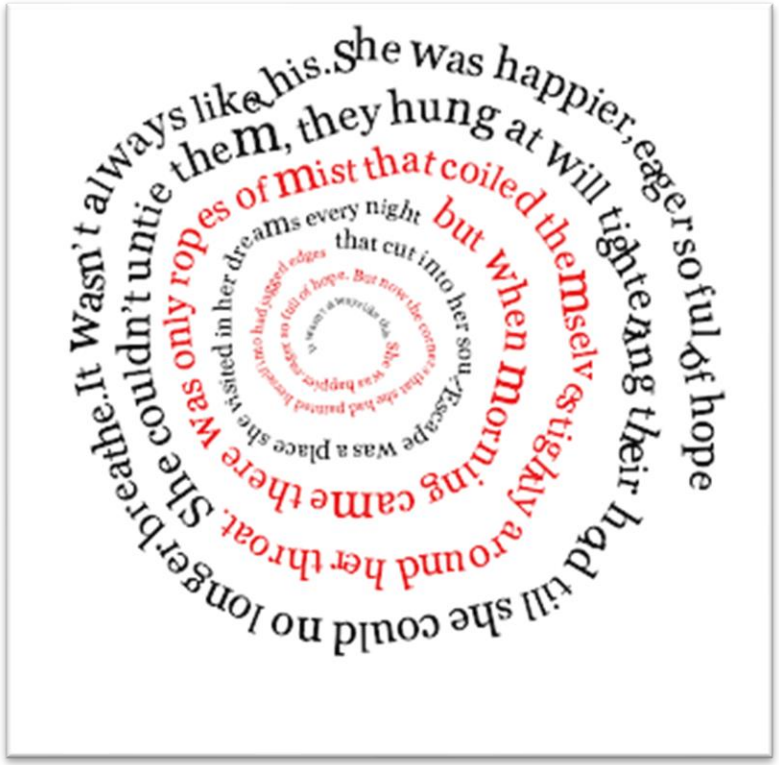

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Technique	Tools	Best for	Notes	Cautions/Limitations
Word Clouds	NVivo, WordArt, WordClouds.com	Quick thematic overviews, audience engagement	Easy and visually appealing	Superficial – lacks nuance or context
Code Frequency Charts	MAXQDA, NVivo, Excel	Comparing theme prevalence across groups	Good quant summary of qual data	Frequency ≠ importance
Matrices & Heatmaps	NVivo, MAXQDA, Excel	Framework analysis, cross-case comparison	Easy to customize and compare	Manual setup can be time-consuming
Thematic & Concept Maps	Miro, MURAL, NVivo	Visualizing theme relationships and theory building	Collaborative and participatory	Requires subjective interpretation
Timelines & Process Maps	Lucidchart, Canva, TimelineJS	Longitudinal or narrative research	Good for story-based or lifecycle data	Harder to standardize across participants
Network Maps, Relationship Diagrams	Kumu, Gephi, Atlas.ti	Mapping social, thematic, or institutional links	Great for complexity and systems analysis	Requires structured input; steep learning curve
Visual Storyboards / Data Poems	Canva, hand-drawn, creative tools	Participatory methods, arts-based outputs	Amplifies participant voice and emotion	Less formal; harder to systematize or compare

AI and data visualisation

- Saves time by automating chart generation from raw data
- Suggests optimal chart types based on data structure and goals
- Enhances insight through pattern detection and visual summarization
- Improves accessibility for non-technical researchers

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AI and data visualisation

How to Use AI Tools

- Upload or paste data into tools like ChatGPT, Tableau AI, Power BI Copilot, ChartExpo, or Flourish
- Use natural language prompts (e.g., “Visualise trends in graduate mobility over time”)
- Refine or regenerate charts based on feedback and research purpose
- Export visuals for use in reports, presentations, and publications

ChatGpt example

Student	Gender	Age	Maths	English	Science
159654	F	14	78	85	88
456323	F	15	65	70	75
752992	F	14	92	89	94
1049661	M	15	58	60	65
1346330	F	14	88	91	90
1642999	M	14	74	72	78
1939668	F	15	84	87	89
2236337	M	15	68	65	70

Uploaded this graph

Prompt:

Please calculate the average Maths, English and science score by gender from his table. Visualise the average scores by gender

Output

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Best Practices for Researchers Using AI

- Always **validate and review** and cross-check AI-generated analysis or writing.
- Do not upload **identifiable data/ transcripts** onto AI platforms.
- **Disclose Use of AI** in methodology or acknowledgments where applicable.
- Use **Ethically Approved Tools** that comply with data security and ethical standards.
- **Avoid Over-reliance.** Use AI as a support tool—not a replacement for critical thinking or scholarly judgment.

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Exercise

- Materials:
  - Blank piece of paper and coloured pens/pencils
  - Use Excel to create your visualisation
    - Save it as an image to share in the chat

- Goal:
  - Design a meaningful data visualisation based on a research problem

Visualising your data

- **Step 1:** Choose a research problem based on your work
- **Step 2:** Define your focus
  - What kind of data are you using?(e.g. survey, interview transcripts, time series data, ranking data, etc.)
  - What is the key research finding or message you want to communicate?
  - Who is your target audience? (e.g. policymakers, school leaders, NGO partners, fellow researchers, public)
- **Step 3:** Create your visualisation
- **Step 4:** Peer share (upload a picture/image in the chat)
  - Explain how it helps your audience understand your message

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Thank you!

Do you have any questions?

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