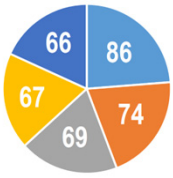
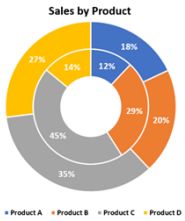
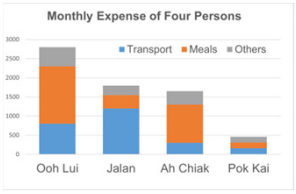
Chapter 1.5 – Visualising Composition in Data

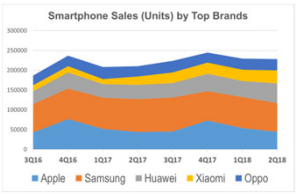
Contents

- Basic Composition Plots
- Pie Charts
- Stacked Bar Charts
- Stacked Area Charts









1

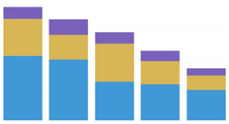
Basic Composition Plots

Part-to-Whole Analysis

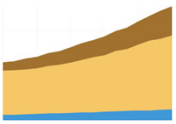
- Composition plots help visualise how individual parts comprise a whole.
- **Pie and donut charts** – are used for visualising compositions that are **static**.
- **Stacked charts** – are for composition that are **changing** with **another dimension** like time or category. Stacked **bar** or stacked **area** charts are common examples.
- Some other charts for viewing composition include the **treemap** and **funnel** chart.

Pie Chart

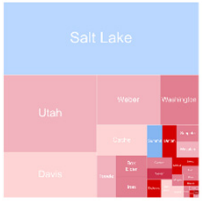
Donut Chart



Stacked Bar Chart



Stacked Area Chart



Treemap

Funnel Chart

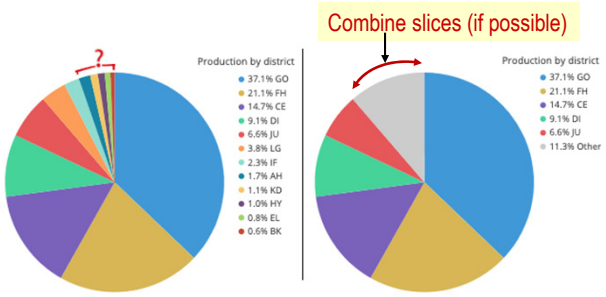
[1] How to Choose Charts to Show Data Composition (2019), https://www.webdatarocks.com/blog/how-to-choose-charts-to-show-data-composition/

2

Pie Charts

When Should I Not Have A Pie?

- Pie charts are not suitable when the slices have **little variations**. **Bar** charts provide more accurate **visualisation of values** if they are deemed important and of interest.
- Pie charts are not suitable when there are **too many slices**. Consider if some of the smaller slices can be combined into an 'Other' category[2].

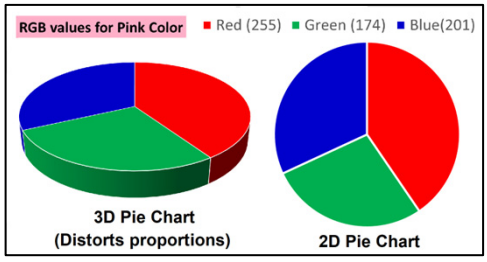


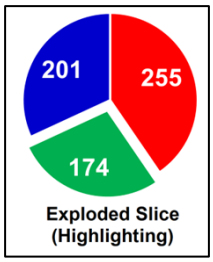
[2] Mike Yi, A Complete Guide to Pie Charts (2019), https://chartio.com/learn/charts/pie-chart-complete-guide/

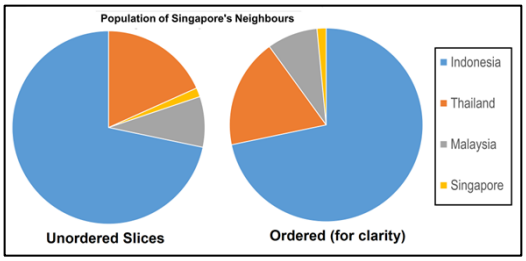
Pie Charts

What Type Of Pie Should I Have?

- It is generally good practice to keep your pie charts **simple** for visual clarity.
- **Exploding** can help **highlight** slice of interest but use this carefully as such gaps can distorts part-to-whole comparison[2]. Annotating the slices will help in this case.
- **Ordering slices** (e.g. largest to smallest slice) usually aid easier understand, especially if categories do not have inherent ordering to comply with.





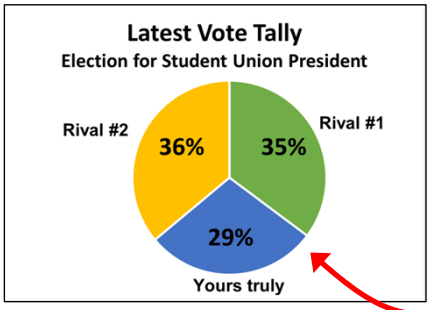


[2] Mike Yi, A Complete Guide to Pie Charts (2019), https://chartio.com/learn/charts/pie-chart-complete-guide/

Ethical Visualisation
Be Visually Truthful

- You are participating in a week-long election for the position of President of the Students' Union. You decided to put in some last-minute effort to get people to vote for you using this visual pitch...

3D pie chart visual to canvas for last minute votes



This is the true picture that a plain pie chart would show.

Has ethical visualisation been violated here?

NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

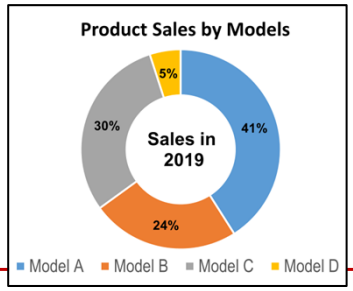
Remember, people are not fools and they are voting for your honesty as well

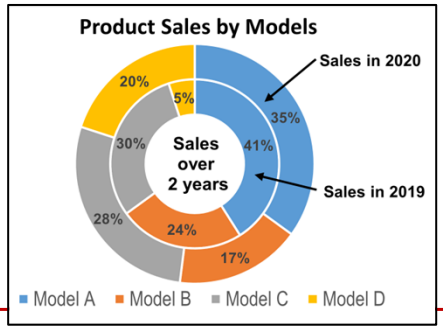
5

5

Pie Charts
Can I Have a Doughnut Instead?

- A doughnut (donut) chart is basically a pie chart with a central circle removed and there are **no significant differences** in readability between the two types of plots.
- The central area of a donut chart can be used for **additional information**.
- It can also show more than one set of data to allow **comparisons** over two different compositions[2].





NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

[2] Mike Yi, A Complete Guide to Pie Charts (2019), https://chartio.com/learn/charts/pie-chart-complete-guide/

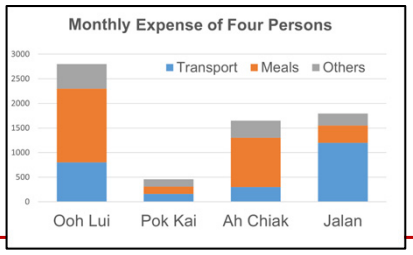
6

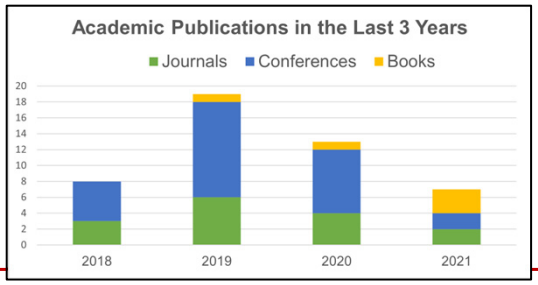
6

Stacked Bar Charts

Visualising Multiple Compositions

- Stacked bar charts show relative decomposition of each primary bar (e.g. Persons) based on the levels of a **second categorical variable** (e.g. Expense type)[3].
- The stacked sub-bars of each **secondary variable** is **coloured** based on the category of the parts that make up the whole bar.
- If the primary bars are drawn across a time series (e.g. years), they express how the composition is **changing over time**.





NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

[3] Mike Yi, A Complete Guide to Stacked Bar Charts (2019), https://chartio.com/learn/charts/stacked-bar-chart-complete-guide/

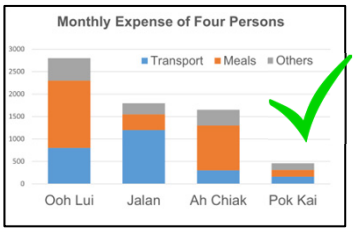
7

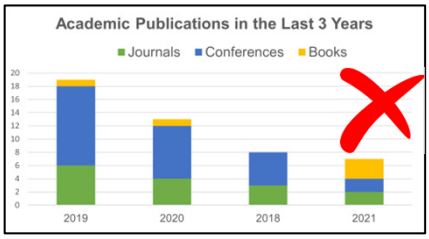
7

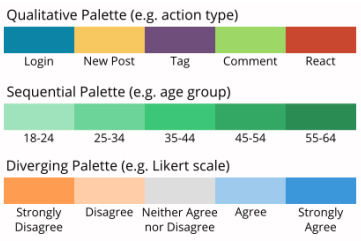
Stacked Bar Charts

Ordering and Colouring the Bars

- **Ordering** stacked bar charts can help make the chart **easier to comprehend**.
- The rule of thumb is to order the bars from largest to smallest unless there is an intrinsic order in the primary bar (e.g. this is a time-varying stacked bar chart).
- The choice of colour palette to assign to each categorical level should match the variable type: a qualitative palette for purely categorical variables, and sequential, or diverging for variables with a meaningful order[3].







NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

[3] Mike Yi, A Complete Guide to Stacked Bar Charts (2019), https://chartio.com/learn/charts/stacked-bar-chart-complete-guide/

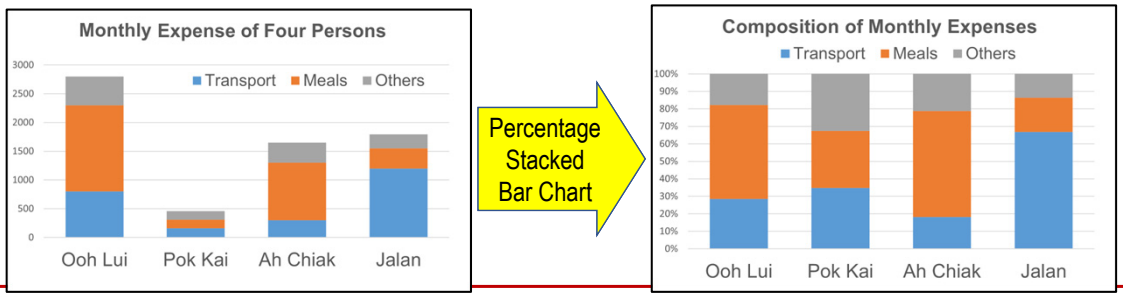
8

8

Stacked Bar Charts

Visualising Percentages

- In the percentage stacked bar chart, each primary bar is scaled to the **same height** with each **sub-bar** encoding its **percentage** contribution to the primary whole.
- A uniform height makes it easier to visually compare the **percentage contributions** of each sub-bar category to the whole. But this removes the ability to visualise the actual values of each of the sub-bar category)[3].



[3] Mike Yi, A Complete Guide to Stacked Bar Charts (2019), https://chartio.com/learn/charts/stacked-bar-chart-complete-guide/

Stacked Area Charts

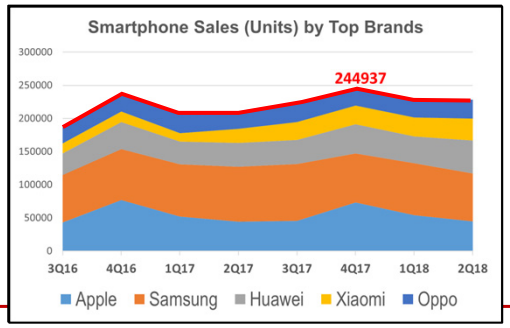
Visualising Composition Trends

- A **stacked area chart** can be considered if the x-axis is **interval** or **ratio** scale.
- It is created by plotting lines (and filling its area below) one at a time. The height of the most recently plotted line serves as a **moving baseline** for the next line plot[4].
- Height of the topmost line encodes the total sum across all composition categories.

Quarter	Apple	Samsung	Huawei	Xiaomi	Oppo	TOTAL
3Q16	43001	71734	32490	14926	24591	186742
4Q16	77039	76783	40804	15751	26705	237082
1Q17	51993	78776	34181	12707	30922	208579
2Q17	44315	82855	35964	21179	26093	210406
3Q17	45442	85605	36502	26853	29449	223851
4Q17	73175	74027	43887	28188	25660	244937
1Q18	54059	78565	40426	28498	28173	229721
2Q18	44715	72336	49847	32826	28511	228235

[2] Data from M.Dobler & T.Grossmann, The Data Visualization Workshop, Packt Publishing (2020) - https://github.com/PacktWorkshops/The-Data-Visualization-Workshop

Stacked Area Chart

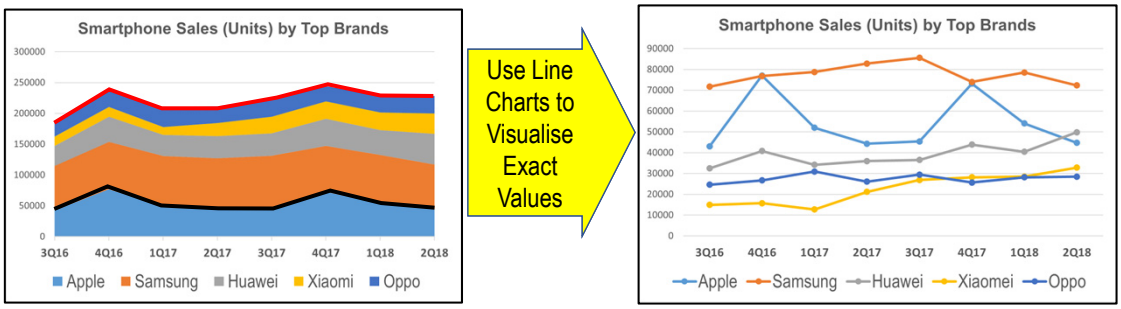


[4] Mike Yi, A Complete Guide to Stacked Area Charts (2019), https://chartio.com/learn/charts/area-chart-complete-guide/

Stacked Area Charts

To Stack or Not to Stack

- Stacked area chart are useful for tracking the total value and analysing the varying breakdown of the parts making up this total[4].
- Only the exact values of the overall **total** and **bottommost** categories are easy to gauge as intermediate categories are plotted against varying baselines.
- If exact values are required for all categories, consider using **multiple line charts**.



[4] Mike Yi, A Complete Guide to Stacked Area Charts (2019), https://chartio.com/learn/charts/area-chart-complete-guide/

11

11

Summary

Composition Plots

- Composition plots help us visualise the **individual parts** comprising the **whole**.
- Pie and donut charts are effective for visualising **small number** of individual parts, especially if the **variations** in the composition is **distinct** and **precision** in reading the values is not important.
- Stacked bar charts are effective in visualising **multiple compositions**.
- Stacked area chart can be used to visualise **composition trend** changes and when **precise** values at every interval is not critical to the analysis.

NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

12

12

References for Composition Plots

[1] How to Choose Charts to Show Data Composition (2019), https://www.webdatarocks.com/blog/how-to-choose-charts-to-show-data-composition

[2] Mike Yi, A Complete Guide to Pie Charts (2019), A Complete Guide to Pie Charts | Atlassian

[3] Mike Yi, A Complete Guide to Stacked Bar Charts (2019), https://www.atlassian.com/data/charts/stacked-bar-chart-complete-guide

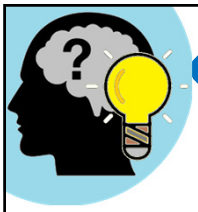
[4] Mike Yi, A Complete Guide to Stacked Area Charts (2019), https://www.atlassian.com/data/charts/area-chart-complete-guide

NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

Note: All online articles were accessed on 19 Nov 2025

13

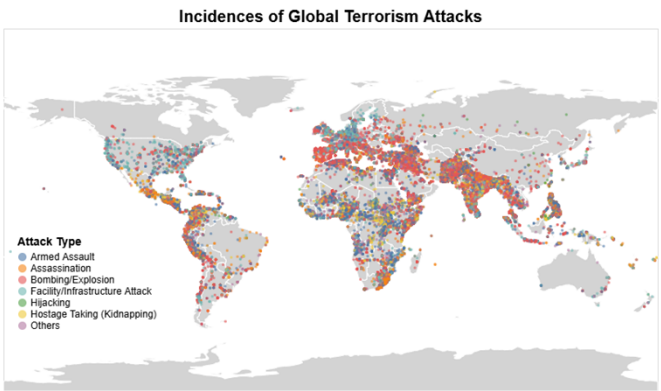
13



Think and Apply

Visualising Global Terrorism

- Have the numbers and types of terrorist attacks changed over time?
- Have the relative incidences of terrorist attacks in the different regions of the world changed over the years?
- How can you create appropriate **composition plots** to answer these question?



NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

14

14