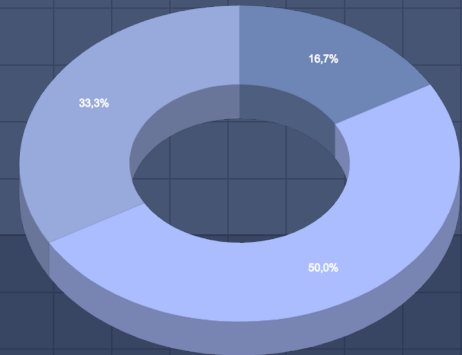


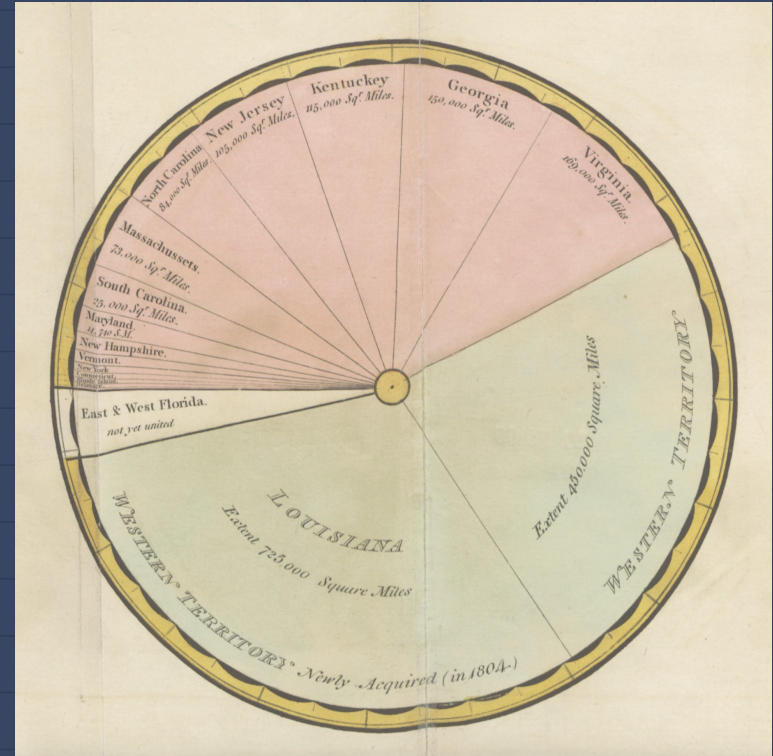
The History and Data Encoding of Pie and Donut Charts

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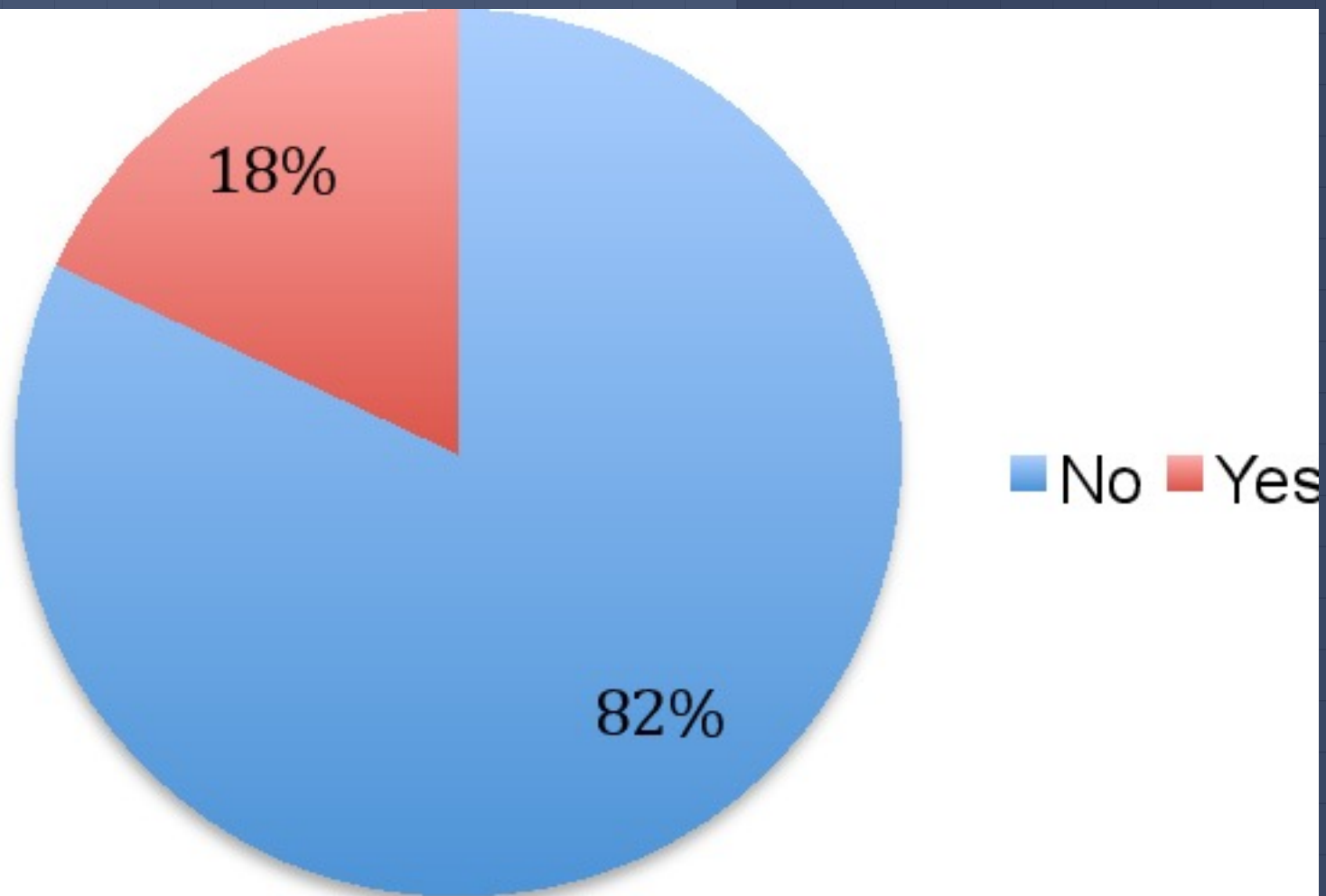


History

- William Playfair is usually credited with the invention of the pie chart (see 1801 *Statistical Breviary*)
- **1914:** Brinton complaining about its use as a popular display for data
- **1993:** “Dumb.” – *Tufte*
- “There is no data that can be displayed in a pie chart that cannot be displayed better in some other type of chart.” - *Tukey*

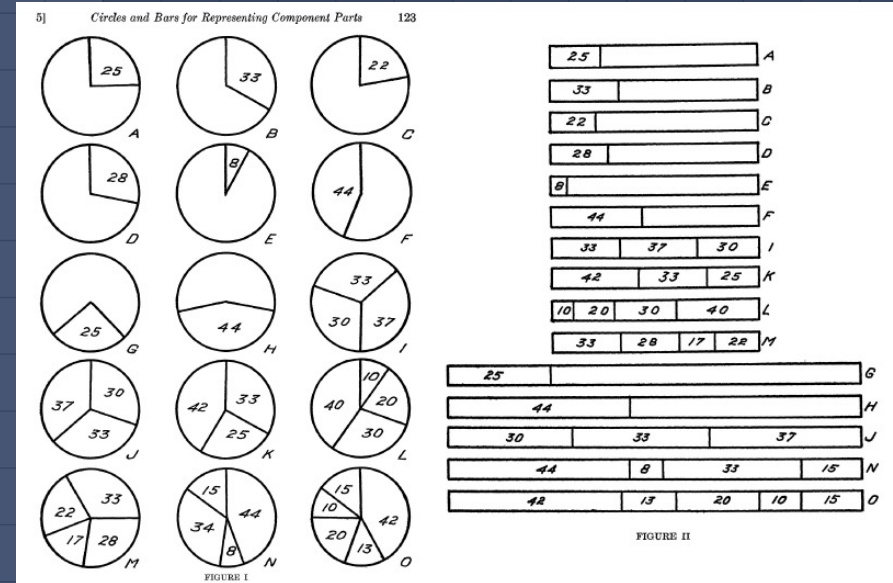


“This newly invented method is intended to show the proportions between the divisions in a striking manner.” - *Playfair*



Reading accuracy with pie charts

- Pie charts are equivalent or more effective than stacked/divided bar graphs at helping the viewer determine the percentage of the whole (Eells, 1926; Simkin & Hastie, 1987; Spence & Lewandowsky, 1991)



An image from Eells's 1926 study. Participants were asked to estimate segment proportions between a group of pie charts (left) and bar charts (right).

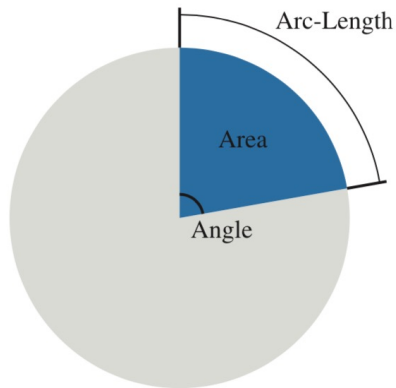


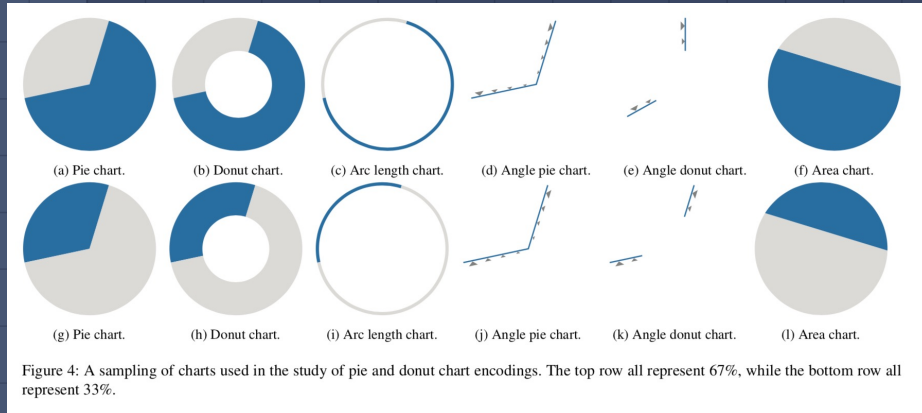
Figure 2: The three different encodings representing data in a pie or donut chart: central angle, wedge area, and arc length.

1. Arc length
2. Centre angle
3. Segment area

The Perceptual Mechanism

Skau & Kosara

1. Designed a study to separate the 3 visual cues and compare how well each of them would do on its own.
2. Designed a second study to measure the difference between pie and donut charts and the impact of the size of the donut hole.



Arc length alone > angle alone
 Area > angle alone
 Complete > parts

Summary

- The use of the pie chart has a controversial history despite their commonplace use today.
- The angle is not the primary factor when reading pie and donut charts.
 - The center of the pie can be removed without affecting how precisely it can be read. The popular donut chart is thus no worse than the pie chart (though both are less accurate than bar charts).

Resources

Skau, D., & Kosara, R. (2016). Arcs, Angles, or Areas: Individual Data Encodings in Pie and Donut Charts. *Computer Graphics Forum*, 35(3), 121-130. doi:10.1111/cgf.12888

- <https://github.com/dwskau/arcs-angles-area>
- <https://github.com/dwskau/donut-radii>

Lima, M. (2018, July 26). Why humans love pie charts. Retrieved from <https://blog.usejournal.com/why-humans-love-pie-charts-9cd346000bdc>