Visual Display of Quantitative Information

Neville Churcher
(Thanks to Andy Cockburn)

Department of Computer Science & Software Engineering
University of Canterbury

2014
Why?

- Explore data
- Reveal information in data (distribution, relationships, ...)
- Make a point
- Illustrate an idea
- Give an example
- Condense information
- Provide interest
- ...

✓ > 1 of the above
Metadata & Meta-considerations

☆ Sources
☆ Highlight original contributions, cite sources
☆ Integration with text
☆ Experimental conditions (equipment, subjects, settings, parameters, ...)
☆ Spell check
☆ ...
Considerations

- Big picture (focus + context)
- Size
- Location
- Title, caption
- Uncertainties
- Origin
- Scale
- Outliers
- Labels
- Significant figures
- Artifacts (avoid bitmaps, ...)
- Avoid misleading
Example

Graph of $y$ against $x$
Example

Figure 12.21: Capital City Pollution Index, 1982–1994 (July averages)
Example

Potential Gains
Orion's profit will rise by more than a third if its proposed price increases are approved.

- Potential impact on profit after tax of application to Commerce Commission
- Profit after tax ($m)
- Capex ($m)
- Rank cost ($m)
Example

Pie I have eaten
Pie I have not yet eaten
Example

Bar Chart:
- 1: 3
- 2: 5
- 3: 6
- 4: 32
- 5: 4

Pie Chart:
- Category 1
- Category 2
- Category 3
- Category 4
- Category 5

- 1: 2
- 2: 5
- 3: 6
- 4: 32
- 5: 4
Tables

☆ Good for showing exact (numeric) values
☆ Multiple local comparisons practicable
☆ Supplement text explanation
☆ Not so good for trends
☆ Left-justify text
☆ Right-justify numbers (align decimal points)
☆ Significant figures

☆ Avoid data prisons (too many grid bars)
☆ Unnecessary for few data values—minimum viable size?
### How Different Groups Voted for President

Based on 12,782 interviews with voters at their polling places. Shown is how each group divided its vote for President and, in parentheses, the percentage of the electorate belonging to each group.

<table>
<thead>
<tr>
<th>Group</th>
<th>Carter</th>
<th>Reagan</th>
<th>Anderson</th>
<th>Carter-Ford in 1976</th>
</tr>
</thead>
<tbody>
<tr>
<td>Democrats (43%)</td>
<td>66</td>
<td>26</td>
<td>6</td>
<td>77 - 22</td>
</tr>
<tr>
<td>Independents (23%)</td>
<td>30</td>
<td>54</td>
<td>12</td>
<td>43 - 54</td>
</tr>
<tr>
<td>Republicans (28%)</td>
<td>11</td>
<td>84</td>
<td>4</td>
<td>9 - 90</td>
</tr>
<tr>
<td>Liberals (17%)</td>
<td>57</td>
<td>27</td>
<td>11</td>
<td>70 - 26</td>
</tr>
<tr>
<td>Moderates (46%)</td>
<td>42</td>
<td>48</td>
<td>8</td>
<td>51 - 48</td>
</tr>
<tr>
<td>Conservatives (28%)</td>
<td>23</td>
<td>71</td>
<td>4</td>
<td>29 - 70</td>
</tr>
<tr>
<td>Liberal Democrats (9%)</td>
<td>70</td>
<td>14</td>
<td>13</td>
<td>86 - 12</td>
</tr>
<tr>
<td>Moderate Democrats (22%)</td>
<td>66</td>
<td>28</td>
<td>6</td>
<td>77 - 22</td>
</tr>
<tr>
<td>Conservative Democrats (8%)</td>
<td>53</td>
<td>41</td>
<td>4</td>
<td>64 - 35</td>
</tr>
<tr>
<td>Politically active Democrats (3%)</td>
<td>72</td>
<td>19</td>
<td>8</td>
<td>—</td>
</tr>
<tr>
<td>Democrats favoring Kennedy in primaries (13%)</td>
<td>66</td>
<td>24</td>
<td>8</td>
<td>—</td>
</tr>
<tr>
<td>Liberal Independents (4%)</td>
<td>50</td>
<td>29</td>
<td>15</td>
<td>64 - 29</td>
</tr>
<tr>
<td>Moderate Independents (12%)</td>
<td>31</td>
<td>53</td>
<td>13</td>
<td>45 - 53</td>
</tr>
<tr>
<td>Conservative Independents (7%)</td>
<td>22</td>
<td>69</td>
<td>6</td>
<td>26 - 72</td>
</tr>
<tr>
<td>Liberal Republicans (2%)</td>
<td>25</td>
<td>66</td>
<td>9</td>
<td>17 - 82</td>
</tr>
<tr>
<td>Moderate Republicans (11%)</td>
<td>13</td>
<td>81</td>
<td>5</td>
<td>11 - 88</td>
</tr>
<tr>
<td>Conservative Republicans (12%)</td>
<td>6</td>
<td>91</td>
<td>2</td>
<td>6 - 93</td>
</tr>
<tr>
<td>Politically active Republicans (2%)</td>
<td>5</td>
<td>89</td>
<td>6</td>
<td>—</td>
</tr>
<tr>
<td>East (32%)</td>
<td>43</td>
<td>47</td>
<td>8</td>
<td>51 - 47</td>
</tr>
<tr>
<td>South (27%)</td>
<td>44</td>
<td>51</td>
<td>3</td>
<td>54 - 45</td>
</tr>
<tr>
<td>Midwest (20%)</td>
<td>41</td>
<td>51</td>
<td>6</td>
<td>48 - 50</td>
</tr>
<tr>
<td>West (11%)</td>
<td>35</td>
<td>52</td>
<td>10</td>
<td>46 - 51</td>
</tr>
</tbody>
</table>
For further ideas ...

★ Books by Tufte e.g. *The Visual Display of Quantitative Information*
★ http://www.datavis.ca/gallery
★ http://www.informationisbeautiful.net
★ http://memebase.cheezburger.com/graphjam
★ COSC415
★ ...
Summary