Technical Communication
Engineering 100.250
Winter 2015

Visuals

Erik Hildinger
Visuals

Choosing, Finding and Using What You Need
Please describe a potato peeler
Here’s one...

www.istockphoto.com/file_closeup/food/cooking/utensils/563651_potato_peeler.php?id=563651
When do you use visuals?

When you need to teach people about something that’s difficult to put in words
When do you use visuals?

When you need to teach people about something that’s difficult to put in words

- *But always recall that visuals are an adjunct, not a replacement of text.*
What things might you use a visual to help you describe?

Why? Which sort of visual?
Visually are used for two purposes

If you keep them in mind, you will know what to use
The two purposes

- Informative
- Dramatic
Visuals: Two Purposes

- Informative
  
  www.ukbikestore.co.uk/acatalog/HOPE_M4_CALIPER.html

- Dramatic
  
  www.swanyachts.co.uk/
Keep in mind your purpose

- Purpose determines what visual is used

The mere fact that you can make a visual does not mean you should use one.
Purpose determines what visual is used

And even whether you use one.
Examples of visuals

- Graphs
- Pictures
  - Photos
  - Drawings
- Maps
- Diagrams
  - Exploded diagrams
- Tables
Graphs (Charts)

- Line graphs
- Bar graphs
- Pie charts
- Organizational charts
- Gantt charts
Line graph

- Shows continuing data
- Show the relationship between a dependent and independent variable
Line graph

- X axis shows the independent variable
- Y axis shows the dependent variable
What might independent variables be?

Dependent variables?
Bar graphs are useful for showing relative amounts of different things at the same time.
Bar graphs are useful for showing relative amounts of different things at the same time.

The are good for showing big differences.
Vertical Bar Chart

Pie charts

Are useful to show a series of parts that add up to 100%

But they must not have too many slices.
The world’s most accurate pie chart?

http://www.makefive.com/categories/entertainment/other/pie-charts-that-explain-simple-material/pie-i-have-not-eaten
As a rule, avoid 3-D pie charts

http://lilt.ilstu.edu/gmklass/pos138/datadisplay/
Can you see a problem?

http://www.math.yorku.ca/SCS/Gallery/
Pictures: vivid but not always informative.
But be sure that the data presented are meaningful.
Make sure that data presented are meaningful

<table>
<thead>
<tr>
<th>City</th>
<th>Murders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago</td>
<td>703</td>
</tr>
<tr>
<td>New York</td>
<td>633</td>
</tr>
<tr>
<td>Detroit</td>
<td>430</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>426</td>
</tr>
<tr>
<td>Philadelphia</td>
<td>338</td>
</tr>
<tr>
<td>Houston</td>
<td>254</td>
</tr>
<tr>
<td>Dallas</td>
<td>252</td>
</tr>
<tr>
<td>Phoenix</td>
<td>185</td>
</tr>
<tr>
<td>San Antonio</td>
<td>89</td>
</tr>
<tr>
<td>San Diego</td>
<td>42</td>
</tr>
</tbody>
</table>

*Murder and non-negligent manslaughter*

http://lilt.ilstu.edu/gmklass/pos138/datadisplay/sections/goodtables.htm
But be sure that the data presented is meaningful

<table>
<thead>
<tr>
<th>1a: Murders* in Ten Largest US Cities, 1998</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago</td>
</tr>
<tr>
<td>New York</td>
</tr>
<tr>
<td>Detroit</td>
</tr>
<tr>
<td>Los Angeles</td>
</tr>
<tr>
<td>Philadelphia</td>
</tr>
<tr>
<td>Houston</td>
</tr>
<tr>
<td>Dallas</td>
</tr>
<tr>
<td>Phoenix</td>
</tr>
<tr>
<td>San Antonio</td>
</tr>
<tr>
<td>San Diego</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1b: Murder Rates* in Ten Largest US Cities, 1998</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detroit</td>
</tr>
<tr>
<td>Chicago</td>
</tr>
<tr>
<td>Philadelphia</td>
</tr>
<tr>
<td>Dallas</td>
</tr>
<tr>
<td>Phoenix</td>
</tr>
<tr>
<td>Houston</td>
</tr>
<tr>
<td>Los Angeles</td>
</tr>
<tr>
<td>New York</td>
</tr>
<tr>
<td>San Antonio</td>
</tr>
<tr>
<td>San Diego</td>
</tr>
</tbody>
</table>

*Murder and non-negligent manslaughter

NOTE: *Murder and non-negligent manslaughter per 100,000 population
Numbering conventions for tables and visuals
Tables are numbered this way

- Table 1
- Table 2
- Table 3
All other visuals are numbered this way

- Figure 1
- Figure 2
- Figure 3
Tables and figures are numbered independently of each other

- Figure 1
- Figure 2
- Table 1
- Figure 3
- Table 2
So, then what are the advantages of drawings over photographs?
Maps: You should already have some idea of what they are.
Order and Relationship in Time of Bus Stops

- North University Stop
- North Campus Commuter Lot: 2 minutes, 8 seconds
- North Campus Student Union: 8 minutes, 11 seconds
- FXB Stop: 3 minutes, 10 seconds
Diagrams

http://www.ukbikestore.co.uk/acatalog/HOPE_M4_CALIPER.html
Tables

Good for setting out figures.

Not good for showing trends.
Visuals do not speak for themselves: you must title them and label them adequately.
For example, what’s this?
Shimano bike
derailleur

http://www.light-bikes.de/website/new/
wp-content/uploads/2007/06/
shimanoshadowtechnology.jpg
Beware of Excel

It will make graphs for you very easily
Beware of Excel

It will make graphs for you very easily.

It will make bad graphs for you very easily.
Excel will make bar charts like this.

Why is this a poor visual?
Or like this…
Why not use a table instead?
### Selected new car prices for 2012

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercedes-Benz C Class Coupe</td>
<td>$37,220</td>
</tr>
<tr>
<td>Chevrolet Volt</td>
<td>$39,145</td>
</tr>
<tr>
<td>Cadillac CDS Coupe</td>
<td>$40,615</td>
</tr>
<tr>
<td>Maserati Gran Turismo</td>
<td>$137,300</td>
</tr>
<tr>
<td>BMW 1 Series 128i</td>
<td>$36,900</td>
</tr>
</tbody>
</table>

[http://www.nadaguides.com/Cars](http://www.nadaguides.com/Cars)
Honesty and Clarity
Wrong

SPAD S.XIII
Right

SPAD S.XIII

Honesty: you must credit the creator or owner of any visual that you use
Honesty and clarity

Obviously, you must be honest in presenting your data.

If you are not careful you may produce a deceptive visual
Fig. 2 | Comparison of peak emitted sound levels (dB) between thicker faced stainless steel (yellow) and thin faced titanium (red) golf drivers when hit three times by a professional golfer.
Fig 2 | Comparison of peak emitted sound levels (dB) between thicker faced stainless steel (yellow) and thin faced titanium (red) golf drivers when hit three times by a professional golfer.

“There are lots of things wrong with this graph, but let’s look at the golf tees. The ratio of the area of the tees distorts the visual impression, giving an illusion of a much greater difference between the minimum and maximum values (compounded by the break in the Y-axis). This effect is much worse because the golf tees do not represent any data at all. The data is represented by the golf balls. Delete the golf tees and you lose no data at all. Lose all the ink except the pixels at the centre of each of the golf balls and you don’t lose any information.”

### THE SHRINKING FAMILY DOCTOR

**In California**

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage of Doctors Devoted Solely to Family Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>1964</td>
<td>27%</td>
</tr>
<tr>
<td>1975</td>
<td>16.0%</td>
</tr>
<tr>
<td>1990</td>
<td>12.0%</td>
</tr>
</tbody>
</table>

**RATIO TO POPULATION**

- **1: 2,247** RATIO TO POPULATION
- **1: 3,167**
- **1: 4,232**
- **1: 6,212**
- **8,023 Doctors**

*Los Angeles Times, August 5, 1979, p. 3.*

Tufte, 1983, p. 69
A majority of residents of the red states voted for George Bush in the 2004 election, while a majority of the residents in the blue states voted for John Kerry.
Politics!

Consider the previous visual in light of these facts:

Of those who voted in the 2004 election, 50.7% voted for George Bush and 48.3% voted for John Kerry, a difference of 2.4%.
Previous map redrawn to reflect the size of states by population instead of land area

www.cscs.umich.edu/~crshalizi/election/
Texts reads: “This line, representing 18 miles per gallon in 1978, is 0.6 inches long.”

Text reads: “This line, representing 27.5 miles per gallon in 1985, is 5.3 inches long.”

from Tufte, 1983, p. 57
“Standard deviation of batting averages for all full-time players by year for the first 100 years of professional baseball. Note the regular decline.”

adapted
Beware of Excel

- It will make pie graphs from data that do not add up to 100%
- It will make 3-D graphs
- It will make bar graphs with too many bars
Visuals can be dangerous

Visuals can be dangerous if you rely on them without considering a certain fact: many people cannot understand graphs.

This means they can be not only useless to the reader, but dangerous you.
Remember: Many people have difficulty with graphs

“Another psychologist tested grownups. . . . The vast majority were unable to see what the charts and graphs were supposed to show: they couldn't even grasp general facts or spot basic trends.”

Don’t assume your reader will understand your visual.

“Try to teach people with a picture and you may find that you need a thousand words to tell them exactly what to look at and why.”

Visuals are distracting during presentations (though often necessary)

- People naturally look at bright colored screens
- People often prefer the visual to the speaker
- People will try to read the text of a slide rather than listen to what you say

Therefore?
When using visuals during presentations

- Them simple
- Consider (and try to observe) the “Seven by Seven Rule”:
  - “Use no more than seven words per line of text and no more than seven lines per slide”
Our vocal distortion device will

- Amuse people who don’t have satisfying hobbies
- Be cheap enough to produce in huge quantities
- Bring in a great deal of so that we can expand this division widely
- Help advertise a popular film
Some interesting historic visuals
The text at the top of the following graph reads:

Visual map of the successive losses of men in the French army during the campaign in Russia, 1812-1813.

The numbers of the men are represented below by the widths of the colored zones at the scale of one millimeter for ten thousand men; they are also written in the area. The red designates the men who enter Russia, the black those who leave...
Florence Nightingale
1820-1910
Diagram of the Causes of Mortality
In the Army in the East.

The areas of the blue, red, & black wedges are each measured from the centre as the common vertex.

The blue wedges measured from the centre of the circle represent areas for: the deaths from Preventable or Mitigable Zymotic disease; the red wedges measured from the centre; the deaths from wounds; & the black wedges measured from the centre; the deaths from all other causes. The black line across the red triangle in Nov 1854 marks the boundary of the deaths from all other causes during that month.

In October 1854, & April 1855, the black area commences with the red; in January & February 1855, the blue commences with the black.

The entire areas may be compared by following the blue, the red & the black lines enclosing them.
In this diagram, Nightingale resolved the problem of the "bat's wing" by using *areas* to represent the variation in the death rate, instead of the length of radial lines. The blue wedges, representing death by sickness, are far bigger than those representing wounds. The message of this graphic is twofold: first, most of the fatalities during the war were from sickness and second, improvements in hygiene dramatically reduced the death rate.

From Hugh Small. Paper from *Stats & Lamps* Research Conference organised by the Florence Nightingale Museum at St. Thomas' Hospital, 18th March 1998.
“The greatest number of ideas in the shortest time with the least ink in the smallest space.”

Edwin R. Tufte on what makes an excellent visual.
Visual pointers

- Visuals, by themselves, are not clear
Visual pointers

- Visuals, by themselves, are not clear
- Visuals never take the place of text; they are an adjunct to it
Visual pointers

- Visuals, by themselves, are not clear: you must explain what you want the viewer to understand.
- Visuals never take the place of text; they are an adjunct to it.
- Visuals need to be introduced and explained.
Visual pointers

- Visuals, by themselves, are not clear
- Visuals never take the place of text; they are an adjunct to it
- Visuals need to be introduced and explained
- Visuals need to be labelled properly
Visual pointers

- Visuals, by themselves, are not clear
- Visuals never take the place of text; they are an adjunct to it
- Visuals need to be introduced and explained
- Visuals need to be labelled properly
- If a visual is not yours, you must attribute it, or you are plagiarizing
Summary

- Decide what you are trying to convey before choosing a visual
  - Information
  - Dramatic effect
- If you wish to convey information, decide which visual is the most efficient means
- Introduce the visual
- Explain to the audience what they are to understand from the visual