

Introduction to Data Visualization and Infographics

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*Note: This handout remixes some information in chapter 1 & 8 of the book *Infographics: The Power of Visual Storytelling* and chapter 1 & 7 of the book *Cool Infographics: Effective Communication with Data Visualization and Design*. No claim is made for originality.*

I. What is Infographics? What is Data Visualization?

Infographic is an abbreviation of "information graphic". It combines data visualizations, illustrations, text and images together into a format that tells a complete story (Krum, 2014, p. 6). It uses visual cues to communicate information.

Data visualization is a visual representation of data or the practice of visualizing data. Common forms include pie charts, bar graphs, line charts, and so forth. It is a powerful tool that designers often use to help tell their story visually in an infographic (Krum, 2014, p. 6).

II. Why Infographics? Why visual information is a more effective form of communication for humans? – The science of Infographics (Krum, 2014, pp. 12–26).

1. Vision is the strongest form of input that we use to perceive the world around us.
 - a. Vision is by far our most dominant sense, taking up half of our brain's resources.
 - b. Studies estimate that between 50-80 percent of the human brain is dedicated to forms of visual processing, such as vision, visual memory, colors, shapes, movement, patterns, spatial awareness and image recollection.
2. A simple text message combined with a relevant image can make a lasting, memorable impression on your audience.
 - a. When we read text alone, we are likely to remember only 10 percent of the information 3 days later.
 - b. If that information is presented to use as text combined with a relevant image, we are likely to remember 65 percent of the information 3 days later.
3. Data visualization leverages humans' pattern recognition abilities and significantly accelerates the understanding of the data.

III. What makes a good Infographic?

A good infographic has all three(Lankow, Ritchie, & Crooks, 2012, p. 52):

1. Utility - it should be useful, enabling the viewer to derive meaning from it.
2. Soundness
 - a. An infographic that is sound is one that has meaning and integrity.
 - b. In contrast, an infographic that is not sound is incomplete and untrustworthy.
3. Beauty - the design should have aesthetic appeal that attracts the viewer's attention and provides a pleasing visual experience.

IV. Information design best practices

Illustration and data visualization are the two major components of infographic design. Based on your objectiveness, you will use one or both to varying degrees.

Information design

1. Keep it simple
2. Use a simple text message combined with a relevant image
3. Make it unique

Illustration - utility, soundness, attractiveness - should apply to the individual visual elements.

Data visualization

Graphs are a representation of the relationships in quantitative information. The shape the information should take-or the graph type that you should use - is thus based on the type of relationship. As such, different types of graphs can display some types of relationships better than others. You can almost always determine the appropriate graph type based on the relationship type, but in most cases there are a number of acceptable options. Figuring out which graph makes the most sense to you is sometimes about what you think is the best (most effective) way to convey your message to your audience(Lankow et al., 2012, p. 213).

1. Bar graph (vertical)
 - a. Use for:
 - nominal comparisons
 - time series
 - ranking
 - part-to-whole
 - b. must have a zero baseline
 - c. each bar within a graph should be the same color
 - d. avoid 3-D and shading of the vertical bars because 3-D bars can't display value accurately.
2. Stacked bar graph
 - a. to display multiple part-to-whole relationships.
 - b. used when there are more than a handful of subcategories

- c. one variation is known as the 100 percent stacked bar, of which all of the subcategories add up to 100 percent.
 - d. easier to understand than multiple pie charts as it enables the viewer to directly compare segments on the same axis with relative ease.
3. Pie chart
- a. part-to-whole comparisons
 - b. communicate big idea quickly
 - c. all subcategories quantitative values must always equal to 100 percent - no exceptions
 - d. no more than five slices
 - e. the largest section start at the top, go clockwise from 12 o'clock, the second largest section start at the top and go counter clockwise from 12 o'clock. The readers read top down and read the most important subcategories first.
 - f. Avoid 3-D pie chart since the addition of 3-D perspective affects your perception of data.
4. Line chart
- a. used for time series
 - b. x-axis should always represent time, while y-axis should represent a quantitative value that changes over time.
 - c. keep the chart to four or fewer clearly labeled lines or use the practice of paneling and a constant scale for consistency.
5. Use color schemes that are color-blind friendly
- A good practice is to make sure your graphical information is compliant with Color Universal Design, which means the graphical information is conveyed accurately to people with various types of color vision, including people with color blindness.
- a. Refer to [Choices of colors in print and graphics for color-blind readers](#) on Edward Tufte's website.
 - b. Proofing colors at Adobe website is also very helpful
http://help.adobe.com/en_US/creativesuite/cs/using/WS3F71DA01-0962-4b2e-B7FD-C956F8659BB3.html
 - c. Color Brewer 2.0 <http://colorbrewer2.org/> is a great website for generating map color schemes that are color-blind friendly. A very good reference resource too.

V. Tools for creating Infographics and Data Visualization

- 1. Desktop Software Tools
 - i. Vector Graphics
 - 1. **Microsoft PowerPoint** - it allows users to create floating text blocks, insert vector object shapes and import images to arrange in an infographic design.
 - 2. **Microsoft Excel**
 - a. Chart Style -> Solid color is more color-blind friendly than gradient color (i.e. automatic).

- b. Right click over the chart/graph, Save as Picture... in the format of PNG, JPG, PDF, BMP, GIF.
 - i. **JPG**, the same pixel dimension as a screen captured image, resolution at 72. If your picture in normal 100% view is smaller, your saved as JPG will be smaller. If your picture is bigger, then your saved as JPG will be bigger.
 - ii. **PNG**, double the pixels of a screen captured image (i.e. the JPG pixel dimensions), resolution at 150.
 - iii. **PDF**, very clear, a vector graphics file.
 - iv. **Convert PDF to Tiff**, open the PDF with Illustrator, File -> Export -> Tiff, choose color space and dpi (i.e. 300) and save the file.
 - v. Right click over the chart/graph, Copy..., PowerPoint -> Paste Special... -> Microsoft Drawing Object - (the best, vector based graphics)

3. Adobe Illustrator

It is application for creating graphics.

4. Adobe InDesign

It is an application to layout text and images/graphics. It is especially useful for its txt wrapping around images.

5. **Gephi**(free) <http://gephi.github.io/>

It is like Photoshop for data, and it is powerful for large, imported data sets of more than 50,000 nodes.

6. OmniGraffle <https://www.omnigroup.com/omnigraffle>

7. InkScape(free) <https://inkscape.org/en/>

ii. Image Editing

1. Adobe Photoshop

2. Gimp (free) <http://www.gimp.org/>

3. Pixelmator <http://www.pixelmator.com/mac/>

4. Acorn <http://www.flyingmeat.com/acorn/>

2. Online Tools

i. **Wordle.net** <http://www.wordle.net/>

A free tool online for creating word clouds out of any text you have available. Word clouds size the font of each word is based on its frequency in your text.

ii. **Google Chart** <https://developers.google.com/chart/>

1. It is not a standalone application. You have to access it through Google Spreadsheet.

2. Chart are created in SVG format (i.e. vector based). However, it doesn't give you an option to save as a SVG such as a PDF option. It only allows you to save as a PNG file.

3. You can publish or embed the chart to your website.

4. Google Chart Gallery

<https://developers.google.com/chart/interactive/docs/gallery>

iii. **Tableau Public** <https://public.tableau.com/s/>

1. It is a free service that lets anyone publish interactive data to the web.
2. A Rice web page with interactive chart created by Tableau Professional <http://oir.rice.edu/Factbook/Resources/Budget/>
- iv. Chartle.net <http://www.chartle.net/>
easy to use and free. create pie charts, line charts, bar charts, maps, and Venn diagrams and gauges.
- v. ChartsBin <http://chartsbin.com/>
online web-based visualization tool mainly used for visualizing data on a world map.
- vi. Gliffy <https://www.gliffy.com/>
for diagrams than traditional charts, such as flowcharts, Venn diagrams, network diagrams, and org charts.

VI. Online Infographics Resources

1. **Periodic Table of Visualization Methods**
http://www.visual-literacy.org/periodic_table/periodic_table.html, Get inspiration to model your data.
2. **The Noun Project**
<https://thenounproject.com/>. A fantastic resources to find icons related to the concepts you need to visualize in your infographic design. Most of the icons are free for use under CC.
3. 22 free tools for data visualization and analysis
<http://www.computerworld.com/article/2507728/enterprise-applications/enterprise-applications-22-free-tools-for-data-visualization-and-analysis.html?nsdr=true>
4. Cool infographics <http://www.coolinfographics.com/>
5. Edward Tufte
<http://www.edwardtufte.com/tufte/posters>
6. Information is beautiful <http://www.informationisbeautiful.net/>
by David McCandless, an author and designer.
7. infographics world <http://infographicworld.com/our-work/>
Get inspiration from sample infographics works.
8. Datavisualization.ch Selected Tools <http://selection.datavisualization.ch/>

VII. Data sources

1. **data.gov**
<http://www.data.gov/>. **This is the official data website of the U.S. Government.**
2. FactBrowser
<http://www.factbrowser.com/>
It is a search engine dedicated to indexing the statistics quoted in news articles and press releases from companies and organizations.

3. Google Public Data
<http://www.google.com/publicdata/directory>
 It has data sets and metrics from many world governments and global organizations.
4. Wikipedia
https://en.wikipedia.org/wiki/Main_Page
 It is a data source for infographics.
5. Wolfram Alpha
<http://www.wolframalpha.com/> It has some statistics or data related to the topic.

VIII. On Campus Resources

1. Digital Media Commons
<http://dmc.rice.edu>. It supports digital media projects including infographics work.
2. Data Visualization Center
<https://www.crc.rice.edu/visualization/>. It supports high performance computing and visualizing big scientific data.
3. Kelly Center for Government Information, Data, and Geospatial Services
<http://library.rice.edu/gov>. It provides access to government information.
4. GIS Data Center
<http://library.rice.edu/gdc>. It offers access to GIS software and data resources.

IX. References and Resources

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