

DESIGN LANGUAGE

A PRESENTATION ON PRESENTATIONS

WE EXIST IN AN AGE OF INFORMATION OVERLOAD



"There was 5 Exabytes of information created between the dawn of civilization through 2003, but that much information is now created every 2 days, and the pace is increasing."

Eric Schmidt – former Google CEO

Our projects are not the only thing our clients have to manage.

Managing info fatigue must be part and parcel of what we do. We deal in information. We present information. Our stock in trade is representing the information we collect such that it *aids the client's ability to make a decision*.

OBJECTIVE: DECREASE THE INFORMATION BURDEN

We want to give our clients their results in an accessible manner. Success is measured by the ability to show these data to anyone in their organization – from senior executives to product reps – and have them grasp what they are seeing with just a few minutes of explanation.

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Gladwell, Malcolm. *Blink : the power of thinking without thinking*. New York: Back Bay Books, 2007.

INTELLIGENT DESIGN

Our goal should always be to **decrease the burden the data glut has on our clients**. We must make it easy to read, understand, digest, and utilize the material we present.

- Easy to read and digest:
Presentations must achieve project objectives while minimizing information overload.
- Communication is key:
Effective communication combined with clear, concise graphics enables participation from all parties regardless of technical ability or background

Context & Objectives	
Design Concepts	
1. Be True to the Data	
2. Tell a Story	
3. Consider Data-Ink Ratio	
4. Color Theory	
5. Font & Legibility	
Appendix	

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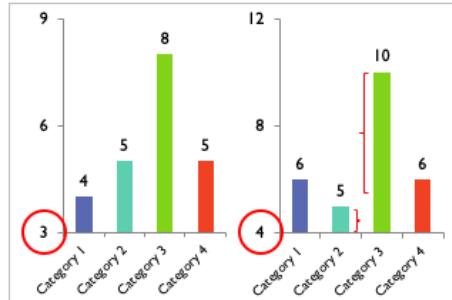
Be True to the Data

- 1** Scale appropriately.
- 2** Help the eye compare the data.
- 3** Data accuracy must be depicted visually.
- 4** Ensure the visuals tell the intended story.

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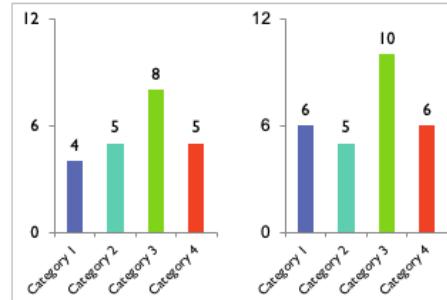
TELL THE TRUTH

1. Use the same scale every time
2. Start charts at the origin if possible



Our clients hire us to do quality research and present the findings accurately. Our reputation, brand, and business are based on the faith and trust that we will do so.

- Use quality survey methodologies
- Don't alter the raw data
- Use quality analytical methods
- Report the results accurately and with appropriate visual representation



HELP THE EYE COMPARE THE DATA

In 1984, W.S. Cleveland published an article in JASA entitled, *Graphical perception: Theory, experiments, and application to the development of graphical methods*, in which he studied various forms of representing data. Key takeaways:

- 👉 The human eye is great at comparing distances and heights, and understanding *linear* graphics
- 👉 It's not so great at judging or comparing angles, curves, area, or orthographic / "3D" graphics



*"Judgements about position relative to a baseline are dramatically more accurate than judgments about angles, area, or length (with no baseline). Hence, he [Cleveland] suggests that we replace pie charts with bar charts or dot plots and that we substitute stacked bar charts for grouped bar charts."*¹

Solomon Messing

¹ Messing, Solomon. "Visualization series: Insight from Cleveland and Tufte on plotting numeric data by groups" solomonmessing.wordpress.com. Web. 14 Oct. 2014.

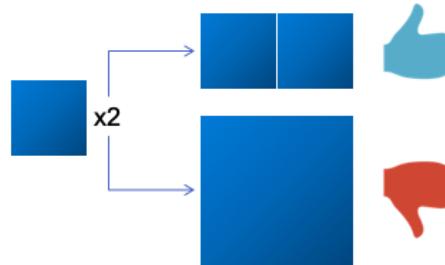
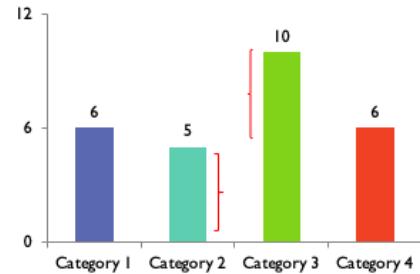
For more: https://web.cs.dal.ca/~sbrooks/csci4166-6406/seminars/readings/Cleveland_GraphicalPerception_Science85.pdf

ENSURE VISUALS ACCURATELY REPRESENT THE COMPARISON

Ensure that the shapes used to represent the data accurately represent the differences between the data points being compared

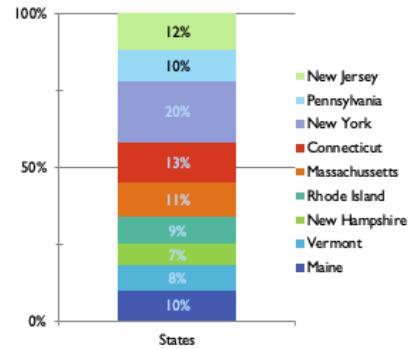
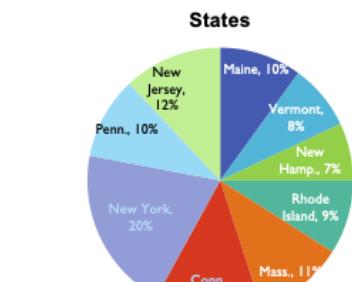
If X is twice Y, X should be represented by a bar that is twice as long/high as Y (if length is the comparative metric)

If possible, avoid using area to represent data; if you do use area, ensure you use area is the comparative metric and not length/height



HELP THE EYE COMPARE THE DATA: PIE CHARTS

While our eyes have difficulty comparing angles and distances along a curve, we understand area proportions with up to 4 or 5 pieces. Thus, pie charts may be acceptable means of displaying information for **up to 5 breaks**; however, a bar chart should be used if there are more than 5 breaks.

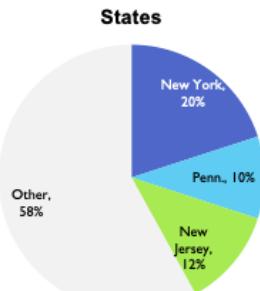


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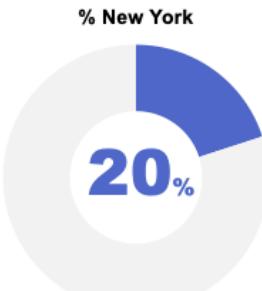
<http://www.excelcharts.com/blog/data-visualization-excel-users/excel-charts-pie-charts/>

HELP THE EYE COMPARE THE DATA: PIES AND DONUTS

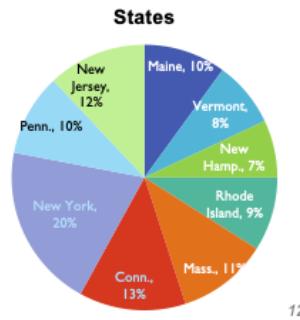
Use a Pie Chart when comparing between 2 and 5 distinct breaks



Donut Charts are permissible ONLY when comparing a Fit/Not-fit binary (i.e., % NY vs. % not NY)



Avoid Pie Charts if comparing >5 distinct breaks



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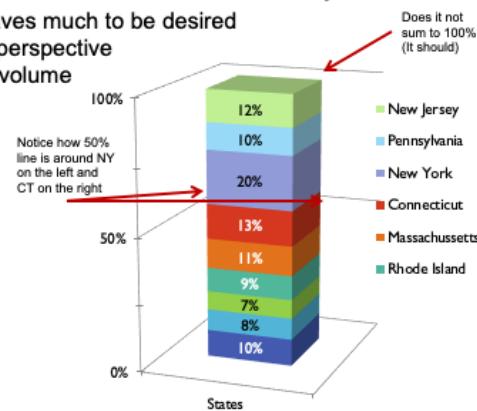
<http://www.excelcharts.com/blog/data-visualization-excel-users/excel-charts-pie-charts/>

HELP THE EYE COMPARE THE DATA: AVOID 3D

1. We're trying to help the eye compare data, *not* to confound the brain and eye
2. PowerPoint's representation of 3D data leaves much to be desired
 - Inconsistent scales and orthographic perspective
 - Confusion between length, area, and volume

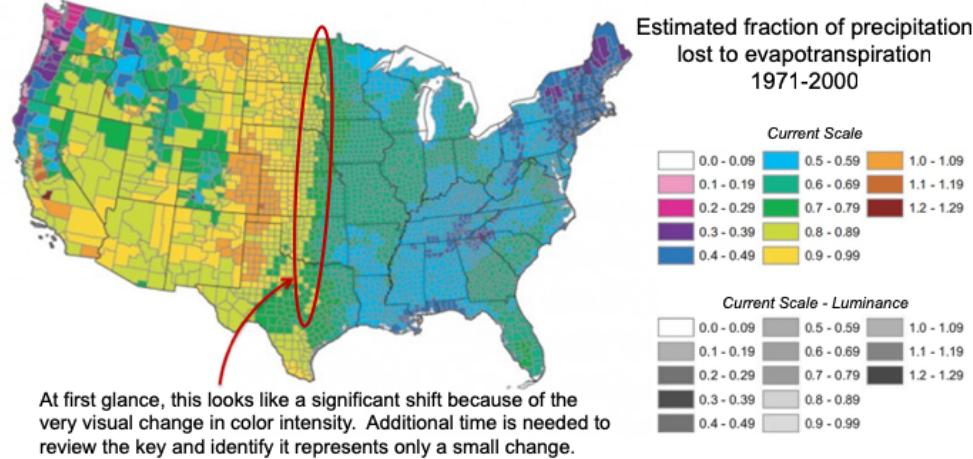


Relativity¹



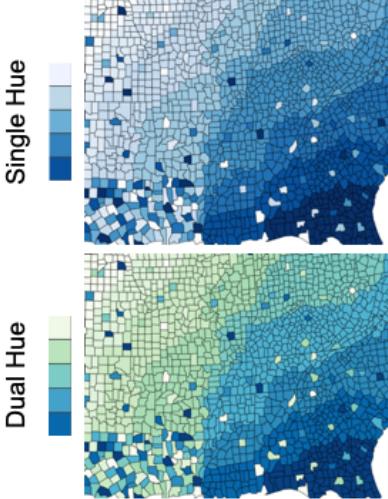
1. M.C. Escher. "Relativity," 1953. <http://www.mcescher.com/gallery/impossible-constructions/relativity/> Web. 14 Oct. 2014.

AVOID MISLEADING BY CHOOSING COLOR CAREFULLY



<https://eagereyes.org/basics/rainbow-color-map>

CHOOSE COLOR CAREFULLY



Single Hue Color Scheme

Uses different saturations or values of single color

Pro: Effectively shows difference without creating artificial distinctions

Con: Bland. Cannot search for or identify individual values easily.

Dual Hue Color Scheme

Uses different saturations or values of two colors

Pro: Same as Single Hue; also easier than single hue scheme to identify individual values

Con: Depending on number of gradients, cannot search for or identify individual values easily. May be challenging for colorblind viewers.

<https://eagereyes.org/basics/rainbow-color-map>
<http://colorbrewer2.org/#>

HELP THE EYE COMPARE THE DATA: SUMMARY

	Demo	Best to Show	Application
Shape	   	Qualitative difference	Categories; indicating different phases / categories in a flowchart
Size	   	Quantitative differences	
Hue RGB / CMYK	   	Qualitative difference	Categories (i.e., product classes, brands)
Intensity/Saturation Brightness or Force of the color	   	Qualitative difference	Differences within one category (i.e., products w/in a class, progression over time)
Value Lightness or Darkness of color	   	Qualitative difference	Differences within one category (i.e., products w/in a class, progression over time)

<http://blog.plot.ly/post/125942000947/how-to-analyze-data-6-useful-ways-to-use-color-in>

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Tell A Story

- 1** Let the Story lead the Visual.
- 2** Create a structure
- 3** Show Trends, not Specifics (unless required)

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TELL A STORY

Data is our friend. On a fundamental level, the job of an analyst is to collect and analyze data in such a way that it contributes to a positive decision-making process.

Our clients may not be as at home with data. They:

1. Need to know *what it means* – our reports must be intelligent and educational.
2. Need to know *what to do* – our presentations must be actionable.

Thus, we must present the data in such a way that it is useful.

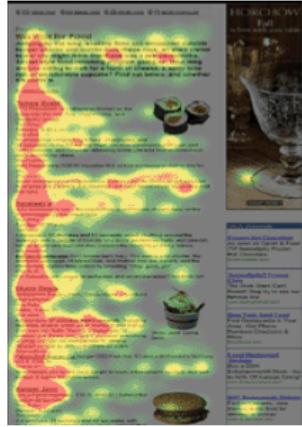
We have to put the data in context.

We must **tell a story**.

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- Each slide should aid one of these two goals
- If I drop a deck on the floor and the pages scatter, the goal is that each slide can stand on its own and tell an individual story without the rest of the deck, but still contribute to the overarching story and intelligence developed in the

DESIGN VISUALS AROUND CONTENT



Item Placement: If people read top down, left to right, then items on top or left of the page will be viewed first*.

Use this to structure the view order (i.e., organize items by importance, etc.).

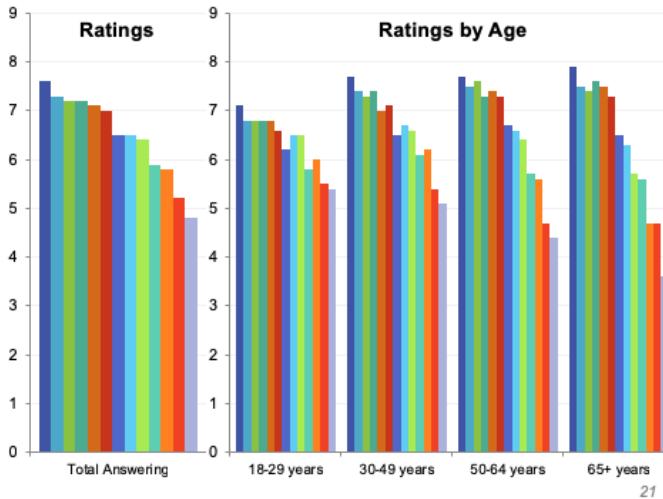
*Eyes will be drawn to images / color before text

DESIGN VISUALS AROUND CONTENT

Consider the data and the key comparisons you want to show when deciding how to organize the slide– Do you need to show:

- Change over time for the class?
- By brand?
- Differences across respondent groups?

Then, show *only what you need* to communicate your point.



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<http://www.excelcharts.com/blog/why-dont-like-bar-charts/>

CREATE STRUCTURE TO AID STORYTELLING



Create and use **themed elements and structures** throughout the presentation to provide a framework that allows for rapid recognition of data shown.

For recurring products, companies, or respondent groups, use common elements so its representation remains consistent throughout

Represent recurring products/brands with same color throughout

"Flag" or "theme" presentation segments for recognition

DON'T FALL VICTIM TO CONWAY'S LAW

Organizations which design systems... are constrained to produce designs which are copies of the communication structures of these organizations.

Conway's Law

Implication:

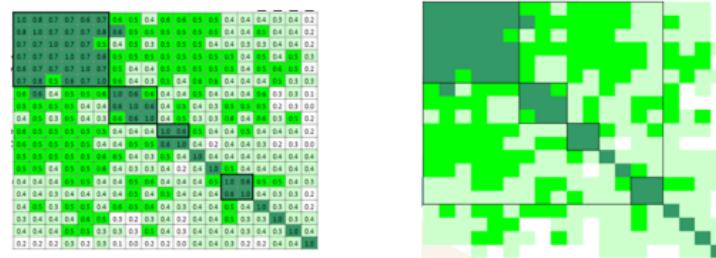
It is typical to display outputs in a format that mimics "the organization" (i.e., questionnaire flow, a specific methodology, or the org chart).

Application:

Be aware of the research objectives and the best manner in which to address the objectives. It may not be ideal to simply report following the questionnaire design or show "typical" outputs for a given methodology.

FOCUS ON TRENDS, NOT SPECIFIC NUMBERS

Individual data are never the key to a well-informed decision. Trends and comparisons provide context that helps drive decision-making. When individual data are shown, it often leads the presentation astray. Avoid the weeds by focusing on trends and comparisons, not specific numbers.



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APPLY MILLER'S LAW FOR CHUNKING AND ORGANIZATION



The maximum number of pieces of information a human brain can manage concurrently is about 7.

Miller's Law

Application:

1. Organize presentation (summary slides, objectives, analysis points, etc.) by structuring to aid "chunking" - between 3 and 7 items per component
2. When designing stimuli and surveys, apply the same structure theory (sections, attribute lists, etc.)

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Note: this applies to lists that require recall: 7 +/- 2 applies to *working memory*. Miller's Law does NOT need to apply to standard, written text if there is no recall requirement following

<http://psychclassics.yorku.ca/Miller/>

http://www.wikiwand.com/en/The_Magical_Number_Seven,_Plus_or_Minus_Two

<http://uxmyths.com/post/931925744/myth-23-choices-should-always-be-limited-to-seven>

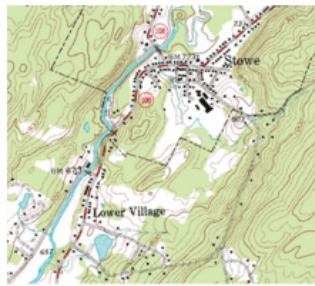
3

Be Aware of Data-Ink Ratio

- 1** Dense data is acceptable (and even encouraged).
- 2** Maximize data-ink ratio.
- 3** Use tables. Effectively.
- 4** Use PowerPoint's powers for good.

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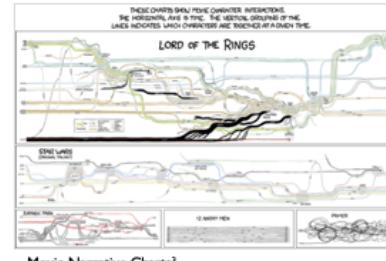
DO NOT FEAR DENSE DATA



Topographical Map²

"Visual displays rich with data are not only an appropriate and proper complement to human capabilities, but also such designs are frequently optimal. If the visual task is contrast, comparison, and choice – as so often it is – then the more relevant information within eyespan, the better."¹

Dense data is actually a desirable attribute in presentations IF density serves a purpose.



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1 Tufte, Edward R. *Envisioning Information*. Cheshire, CT: Graphics, 1995. 50. Print.

2 Demaj , Damien and Field , Kenneth. "Map Examples, Figure 38." *ICA Commission on Map Design*. Web. 7 Oct. 2014.

3 Munroe, Randall. "Movie Narrative Charts" XKCD, no. 657. Web. 7 Oct. 2014.

USE SMALL MULTIPLES

"Small multiples are an excellent architecture for showing large quantities of multivariate data."¹

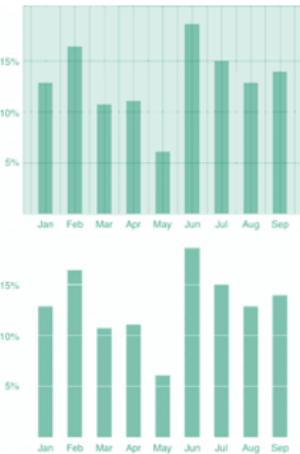
"Small multiples resemble frames of a movie: a series of graphics, showing the same combination of variables, indexed by changes in another variable."²



¹ Tufte, Edward R. *The Visual Display of Quantitative Information*, 2nd ed. Cheshire, CT: Graphics, 2011. 169. Print.

² Tufte, Edward R. *The Visual Display of Quantitative Information*, 2nd ed. Cheshire, CT: Graphics, 2011. 168. Print.

LIMIT INK THAT DOESN'T CONTRIBUTE TO DATA DISPLAY



"A large share of ink on a graphic should present data-information, ink changing as the data change. Data-ink is the non-erasable core of a graphic, the non-redundant ink arranged in response to variation in the numbers represented."¹

Goal: Maximize the data-ink ratio, within reason

- Erase non-data-ink, within reason
- Erase redundant data-ink, within reason

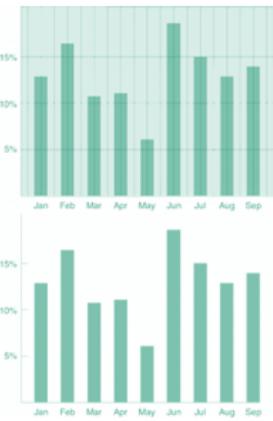
¹ Tufte, Edward R. *Envisioning Information*. Cheshire, CT: Graphics, 1995. Ch 5. Print.

Images borrowed with appreciation from Tim Bray's illustration of data-ink ratio:

<http://www.tbray.org/ongoing/When/200x/2003/03/13/Data-Ink>

Bray, Tim. "The Data-Ink Ratio Example" *ongoing*. Web. 7 Oct. 2014.

MAXIMIZING THE DATA-INK



Images borrowed with appreciation from Tim Bray's illustration of data-ink ratio:

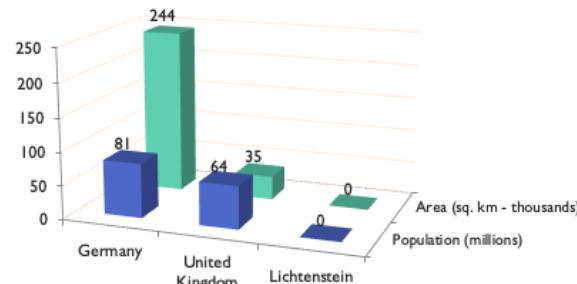
<http://www.tbray.org/ongoing/When/200x/2003/03/13/Data-Ink>

Bray, Tim. "The Data-Ink Ratio Example" *ongoing*. Web. 7 Oct. 2014.

APPROPRIATE USE: TABLES

It is preferable to use tables (instead of charts) when:

- 1) Audience needs to look up / compare individual values
- 2) Clients require precise values
- 3) Values involve multiple units of measure
- 4) Avoiding 3-D charts



Country	Population (millions)	Area Sq. km (thousands)
Germany	80.99	243.6
United Kingdom	63.74	35.0
Liechtenstein	0.04	0.2

HELP TABLES HELP YOU

Country	Germany	United Kingdom	Liechtenstein
Population	80,996,685	63,742,977	37,313

1 Put data to be compared in **columns**, not rows

2 Right-align data in columns

Country	Population	Population	Population	Population (millions)
Germany	80,994,685	80,994,685	80,994,685	80.99
United Kingdom	63,742,977	63,742,977	63,742,977	63.74
Liechtenstein	37,313	37,313	37,313	0.04

3 Remove excess digits / unnecessary precision

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TABLES HAVE CHART JUNK, TOO

Before

Team	1999	2000	2001	2002	2003	2004	2005	2006
Arizona Diamondbacks	\$13,184,462	\$12,498,412	\$14,051,862	\$17,702,002	\$18,361,332	\$18,488,012	\$19,361,342	\$19,361,342
Baltimore Orioles	\$17,213,752	\$17,213,752	\$17,213,752	\$17,213,752	\$17,213,752	\$17,213,752	\$17,213,752	\$17,213,752
Boston Red Sox	\$10,921,322	\$10,921,322	\$10,921,322	\$10,921,322	\$10,921,322	\$10,921,322	\$10,921,322	\$10,921,322
Cincinnati Reds	\$11,291,252	\$11,291,252	\$11,291,252	\$11,291,252	\$11,291,252	\$11,291,252	\$11,291,252	\$11,291,252
Chicago Cubs	\$1,051,202	\$1,051,202	\$1,051,202	\$1,051,202	\$1,051,202	\$1,051,202	\$1,051,202	\$1,051,202
Chicago White Sox	\$1,051,202	\$1,051,202	\$1,051,202	\$1,051,202	\$1,051,202	\$1,051,202	\$1,051,202	\$1,051,202
Colorado Rockies	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372
Detroit Tigers	\$1,051,202	\$1,051,202	\$1,051,202	\$1,051,202	\$1,051,202	\$1,051,202	\$1,051,202	\$1,051,202
Florida Marlins	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372
Houston Astros	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372
Kansas City Royals	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372
Los Angeles Dodgers	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372
Los Angeles Angels	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372
Montreal Expos	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372
New York Mets	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372
New York Yankees	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372
Philadelphia Phillies	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372
Pittsburgh Pirates	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372
San Diego Padres	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372
Seattle Mariners	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372
St. Louis Cardinals	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372
Tampa Bay Rays	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372
Toronto Blue Jays	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372
Washington Nationals	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372
Yankees	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372
Red Sox	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372
Angels	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372	\$1,793,372

After

Team	1999	2000	2001	2002	2003	2004	2005	2006
Average Salary (\$ millions)								
Arizona Diamondbacks	\$17.9	\$18.3	\$18.4	\$18.5	\$18.6	\$18.7	\$18.8	\$18.9
Atlanta Braves	\$68.1	\$70.4	\$74.1	\$75.4	\$96.9	\$79.0	\$85.1	\$79.7
Baltimore Orioles	\$73.1	\$70.2	\$62.4	\$47.3	\$59.9	\$40.7	\$66.6	\$64.8
Boston Red Sox	\$55.1	\$51.1	\$51.3	\$52.3	\$56.2	\$52.3	\$111.2	\$112.2
Chicago White Sox	\$22.7	\$26.8	\$57.7	\$52.8	\$43.0	\$69.7	\$69.9	\$76.2
Chicago Cubs	\$11.9	\$58.4	\$11.6	\$17.6	\$72.1	\$79.5	\$77.9	\$84.7
Cincinnati Reds	\$26.6	\$43.4	\$43.5	\$38.5	\$39.4	\$28.8	\$36.1	\$56.8
Cleveland Indians	\$60.8	\$73.0	\$76.6	\$65.8	\$39.4	\$28.8	\$36.1	\$56.8
Colorado Rockies	\$33.1	\$32.1	\$48.1	\$48.1	\$47.7	\$47.7	\$32.3	\$32.3
Detroit Tigers	\$30.5	\$33.9	\$44.6	\$49.2	\$47.3	\$41.4	\$61.6	\$74.2
Florida Marlins	\$17.5	\$17.3	\$29.6	\$37.5	\$43.2	\$39.0	\$55.9	\$14.4
Houston Astros	\$49.6	\$47.5	\$55.9	\$58.7	\$67.8	\$74.7	\$73.8	\$59.0
Kansas City Royals	\$22.8	\$20.9	\$30.7	\$40.7	\$39.9	\$39.7	\$34.1	\$40.8
Los Angeles Dodgers	\$70.8	\$18.6	\$31.2	\$101.8	\$86.2	\$67.8	\$91.8	\$91.8
Los Angeles Angels	\$39.0	\$42.8	\$37.6	\$5.7	\$24.5	\$24.5	\$102.6	\$102.6
Milwaukee Brewers	\$36.3	\$28.5	\$39.9	\$43.4	\$38.0	\$27.5	\$48.2	\$58.8
Minnesota Twins	\$18.5	\$15.9	\$22.5	\$38.7	\$53.5	\$51.5	\$52.4	\$51.4
Montreal/Washington Nationals	\$15.0	\$30.0	\$29.0	\$34.5	\$50.0	\$36.0	\$40.5	\$52.7
New York Mets	\$77.8	\$79.5	\$82.2	\$91.5	\$102.7	\$98.8	\$97.0	\$77.0
New York Yankees	\$75.9	\$79.4	\$84.2	\$100.9	\$124.4	\$108.0	\$177.4	\$177.4
Oakland Athletics	\$22.3	\$29.6	\$31.3	\$36.7	\$48.4	\$54.4	\$51.7	\$62.3
Philadelphia Phillies	\$26.1	\$28.8	\$40.1	\$51.7	\$41.0	\$66.3	\$91.7	\$51.7
Pittsburgh Pirates	\$18.5	\$27.8	\$42.6	\$36.5	\$48.7	\$29.8	\$34.0	\$41.8
San Diego Padres	\$42.7	\$45.7	\$36.8	\$36.7	\$27.9	\$54.6	\$66.2	\$62.3
Seattle Mariners	\$46.0	\$66.7	\$67.8	\$69.2	\$67.9	\$72.6	\$67.1	\$64.9
San Francisco Giants	\$44.9	\$11.7	\$17.8	\$72.1	\$72.2	\$68.1	\$66.0	\$90.9
St. Louis Cardinals	\$42.1	\$24.9	\$68.6	\$71.2	\$67.1	\$75.6	\$55.0	\$55.0
Tampa Bay Rays	\$29.3	\$56.6	\$59.9	\$30.7	\$19.6	\$27.3	\$26.7	\$31.6
Texas Rangers	\$72.0	\$68.1	\$71.4	\$96.8	\$87.1	\$47.3	\$48.1	\$52.8
Toronto Blue Jays	\$42.8	\$44.5	\$74.7	\$68.5	\$47.5	\$49.1	\$43.8	\$68.6
Average Salary	\$43.5	\$49.9	\$56.2	\$58.8	\$63.9	\$62.7	\$64.4	

Note: white space breaks for grouping,
removal of background color, removal
of extra digits/precision

34

<http://www.juiceanalytics.com/writing/10-ways-to-reduce-to-improve-your-data-visualizations>

REMOVE POWERPOINT'S UNNECESSARY EFFECTS

Outlines, drop shadows,
and 3D effects

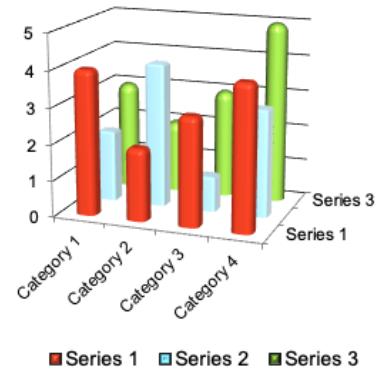
Will

In

The

Way

Get



35

INCONSISTENCY DISTRACTS

- 1) Here we see that rounded rectangles radius the corners differently depending on rectangle area.
 - 2) Manually adjusting the corners takes time, but leads to a more consistent visual style
 - 3) Squared rectangles do not have the additional step of adjusting corner radius to show consistency
 - 4) Squared rectangles provide greater text area as corners can be fully utilized
 - 5) Maintain consistent white space – especially for spaces on the same 90° plane – unless it presents problems relating to other objects on the slide
 - 6) Item alignment is also important
 - 7) Ensure items are aligned left/right/center and/or top/middle/bottom
- Consistent white space

4

Color Theory

- 1** Review your color theory.
- 2** Color relationships add meaning.
- 3** Consider Kelly's 22 colors of maximum contrast.

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COLOR THEORY: COLOR WHEEL



Primary Colors: Colors at their basic essence; those colors that cannot be created by mixing others.

Secondary Colors: Those colors achieved by a mixture of two primaries.

Tertiary Colors: Those colors achieved by a mixture of primary and secondary hues.

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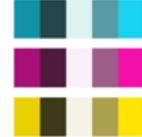
<http://www.tigercolor.com/color-lab/color-theory/color-theory-intro.htm>

http://worqx.com/color/color_wheel.htm

COLOR THEORY: SIMILAR RELATIONSHIPS



Monochromatic Relationship Colors that are shade or tint variations of the same hue.



Analogous Colors: Those colors located close together on a color wheel.



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<http://worqx.com/color/combinations.htm>

<http://www.tigercolor.com/color-lab/color-theory/color-theory-intro.htm>

<http://www.smashingmagazine.com/2010/02/08/color-theory-for-designer-part-3-creating-your-own-color-palettes/>

COLOR THEORY: COMPLEMENTARY RELATIONSHIPS



Complementary Colors: Those colors located opposite each other on a color wheel.



Split-Complementary Relationship: One hue plus two others equally spaced from its complement.



Double-Complementary Relationship (aka Tetradic): Two complementary color sets; the distance between selected complementary pairs will effect the overall contrast of the final composition.



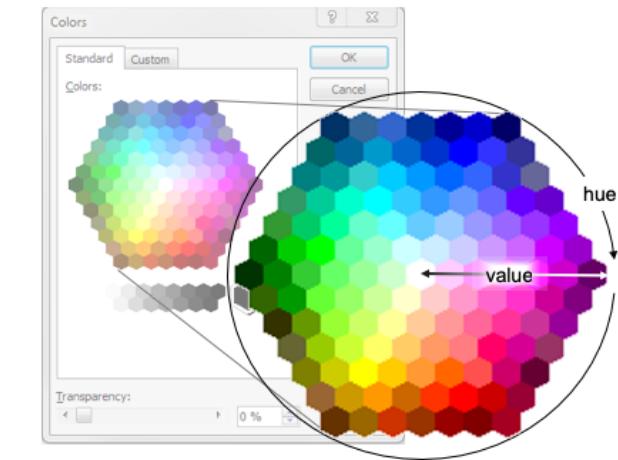
<https://color.adobe.com/create/color-wheel/?base=2&rule=Custom&selected=0&name=My%20Color%20Theme&mode=rgb&rgbvalues=0.6901960784313725,0.7333333333333333,0,1,0.47843137254901963,0.0392156862745098,0,0.5137254901960784,0.5019607843137255,0.5058823529411764,0.19607843137254902,0.45098039215686275,0,0.43529411764705883,0.5882352941176471&swatchOrder=0,1,2,3,4>
<http://paletton.com/#uid=75b0W0ky1vgkTISqkBpy7nfDAg4>

<http://worqx.com/color/combinations.htm>

<http://www.tigercolor.com/color-lab/color-theory/color-theory-intro.htm>

<http://www.smashingmagazine.com/2010/02/08/color-theory-for-designer-part-3-creating-your-own-color-palettes/>

COLOR THEORY: HUE AND VALUE



Hue:

Use for: Categories (i.e., product classes, brands)

Value:

Shade: A hue produced by the addition of black.

Tint: A hue produced by the addition of white.

Use for: Differences within one category (i.e., products w/in a class, progression over time)

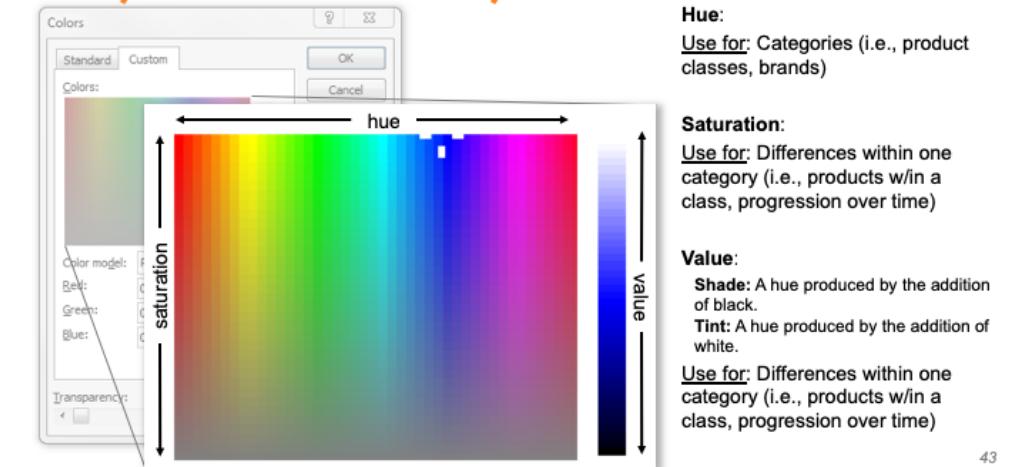
42

“strong” colors (high saturation, middle value) activate negative space (whitespace)

Consider color contrasts.

- 1) B&W is actually harder on the eyes/harder to read than white & dk grey.
- 2) Strong colors will overwhelm weaker ones, which can be imputed to align with importance or add'l interpretation (which may be unintentional / incorrect)
- 3) Super-strong colors (fire engine red, neon orange) are to be avoided unless there is a specific STRONG reason for using such a strong color

COLOR THEORY: HUE, SATURATION, AND VALUE



Hue:

Use for: Categories (i.e., product classes, brands)

Saturation:

Use for: Differences within one category (i.e., products w/in a class, progression over time)

Value:

Shade: A hue produced by the addition of black.

Tint: A hue produced by the addition of white.

Use for: Differences within one category (i.e., products w/in a class, progression over time)

43

“strong” colors (high saturation, middle value) activate negative space (whitespace)

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- 3) Super-strong colors (fire engine red, neon orange) are to be avoided unless there is a specific STRONG reason for using such a strong color



<http://www.incredibleart.org/lessons/middle/color2.htm>

<http://mwpdigitalmedia.com/blog/psychology-colour-video-post-production/>

<http://www.colormatters.com/color-symbolism>

<http://www.zevendesign.com/color-association/>

KELLY'S 22 COLORS OF MAXIMUM CONTRAST

#	Color	Name	R	G	B	#	Color	Name	R	G	B	#	Color	Name	R	G	B
1		White	242	243	244	8		Tan	194	178	128	15		Tangerine	246	166	0
2		Black	34	34	34	9		Grey	132	132	130	16		Berry	179	68	108
3		Yellow	243	195	0	10		Green	0	136	86	17		Greenish Yellow	220	211	0
4		Purple	135	86	146	11		Pink	230	143	172	18		Reddish Brown	136	45	23
5		Orange	243	132	0	12		Blue	0	103	165	19		Grass Green	141	182	0
6		Light Blue	161	202	241	13		Salmon	249	147	121	20		Brown	101	69	34
7		Red	190	0	50	14		Violet	96	78	151	21		Red Orange	226	88	34
												22		Olive Green	43	61	38

In the event that highly contrasting colors are needed, Kelly's 22 Colors of Maximum Contrast might offer a good selection.

Recommended use places colors next to each other in the order indicated by number.

http://hackerspace.lifehacker.com/some-os-x-calendar-tips-1658107833/1665644975/+whitsongordon?utm_campaign=socialflow_lifehacker_twitter&utm_source=lifehacker_twitter&utm_medium=socialflow

5

Font & Readability

- 1 Consider readability.
- 2 Apply a standard font framework.
- 3 Avoid comic sans (and some other font advice).

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CONSIDER READABILITY FOR MAXIMUM COMPREHENSION

- If your audience cannot read text instantly, they won't try.
- Improve comprehension with easy-to-read text and easy-to-decipher charts, graphs, and graphics.

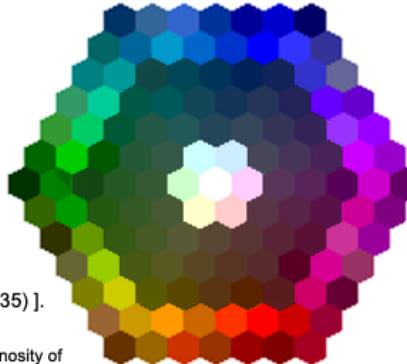
Legibility is the ease with which a reader can recognize individual characters in text. "The legibility of a typeface is related ... to the ability to distinguish one letter from the other."

Readability is the ease with which a reader can recognize words, sentences, and paragraphs. Legibility is a component of readability.

FONT AND BACKGROUND COLORS: HIGH CONTRAST = GOOD RESULTS

To obtain the best readability, choose either a very light font on a very dark background or vice versa.

"On that color wheel my definition of Very Light is 'Snow White' in the center and the Six Dwarfs touching Snow White. All the Very Dark colors are on the last two rows furthest from Snow White, although NOT every color swatch on those last two rows is dark."¹



This means that 470 high-contrast color combinations exist: [$2(7^35)$].

- Note: Not ALL of these 470 high-contrast (light/dark // dark/light) color combinations are readable! You must also consider the brightness /luminosity of the colors and their placement on the color wheel (i.e., red and blue/green are difficult to make readable).

1. Finkelstein, Ellen. "Choose fonts and colors for legibility" *EllenFinkelstein.com*, July 10th, 2002. Web. 7 Oct. 2014.

<http://www.webreference.com/dlab/9704/backgr.html>

http://www.colortools.net/color_text_on_background.html

http://sapdesignguild.org/goodies/diagram_guidelines/textcolor_bk.html#Anchor1

A SIMPLE FONT FRAMEWORK

DEFINITIONS

Header Text

The majority of text falls into four categories:

- **Body** text is clean, readable content
- **Headers** separate and name major sections of your work
- **Notes** describe additional things the reader should be aware of. These should fade into the background unless we call attention to them.
- **Emphasis** text is what we want our reader to pay particular attention to.

Emphasis

Notes

Body Text

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A SIMPLE FONT FRAMEWORK SUGGESTED FORMATTING

	Purpose	Size	Font	Color	Style
Body	• Clean, readable text • 50-80% of your text will look like this	10-18 pts	Sans-serif: Arial, Calibri Serif: Georgia, Cambria	Neutral	• Normal • No bold, no italic • 1.2 line spacing
Header	Separate and name major sections	150%-200% of body	Same as body or flip serif/sans-serif	Neutral	• Normal, bold, or italic • Whitespace above
Notes	• Additional things audience should be aware of: data sources, metric calculations • "Fade into the background"	85% of body	Same as body	De-emphasized, lower contrast	Normal, thin
Emphasis	Draw the eye to key points you need to make	Same as body	Same as body	Choose one or both High impact color Bold or italic	

<http://www.juiceanalytics.com/writing/make-your-text-readable-with-4-easy-tips>

A SIMPLE FONT FRAMEWORK

OTHER FORMATTING

	Purpose	Size	Font	Color	Style
Body	• Clean, readable text • 50-80% of your text will look like this	10-18 pts	Sans-serif: Arial, Calibri Serif: Georgia, Cambria	Neutral	<ul style="list-style-type: none">NormalNo bold, no italic1.2 line spacing
Header	Separate and name major sections	150%-200% of body	Same as body or flip serif/sans-serif	Neutral	<ul style="list-style-type: none">Normal, bold, or italicWhitespace above
Table Header	Titles and separates table segments	100%-150% of table text size	Body with a dash of header style	Neutral	<ul style="list-style-type: none">Normal, bold, or italicWhitespace above
Graph Title	Titles graphs and charts	100%-150% of graph text; Body size	Header style	Neutral	<ul style="list-style-type: none">Normal, bold, or italicWhitespace above

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FONT FORMATTING ADDITIONAL SUGGESTIONS

- Suggestion: Use a **serif font** for **body** text.
 - Studies indicate that an audience may trust a serif typeface more than a sans-serif typeface because newspapers and textbooks have typically be written in serif fonts.
- Suggestion: Use a **sans-serif font** for **heading** and **title** text
 - If we follow our Font Framework and use a serif font for body text, then we should use a sans-serif font for the headline and title text
- Suggestion: Consider font qualities for maximum legibility in small text size for charts and graphs
 - Gill Sans, Tahoma, & Segoe UI are all highly legible in small font size
- **AVOID COMIC SANS** or any other *font* based on *handwriting-mimicry*

<http://usabilitynews.org/a-comparison-of-popular-online-fonts-which-is-best-and-when/>

<http://alexpooke.info/blog/which-are-more-legible-serif-or-sans-serif-typefaces/>

<http://www.smashingmagazine.com/2010/05/06/50-helpful-typography-tools-and-resources/>

<http://www.smashingmagazine.com/2009/08/20/typographic-design-survey-best-practices-from-the-best-blogs/>

<http://net.tutsplus.com/tutorials/html-css-techniques/typography-on-the-web/>

OPTIMIZE LINE LENGTH AND SPACING WHEN POSSIBLE

Optimal line width (60-70 characters, 10 words)

Lore ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

Studies show that shorter lines (45-80 characters) and wider line spacing (1.2x font size) ease the transition from the end of one line to the beginning of the next, enhancing readability.

Wider lines require more vertical spacing.

Lore ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

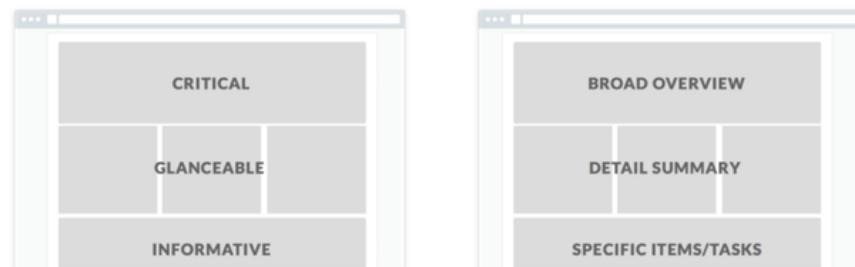
54

<http://www.smashingmagazine.com/2014/09/29/balancing-line-length-font-size-responsive-web-design/>
<http://www.screencast.com/t/MTAzNDhl>

6

ADDITIONAL MATERIALS

Show the user what they **need** to see first, then structure the remainder of the page based on the user story or hierarchy of information.



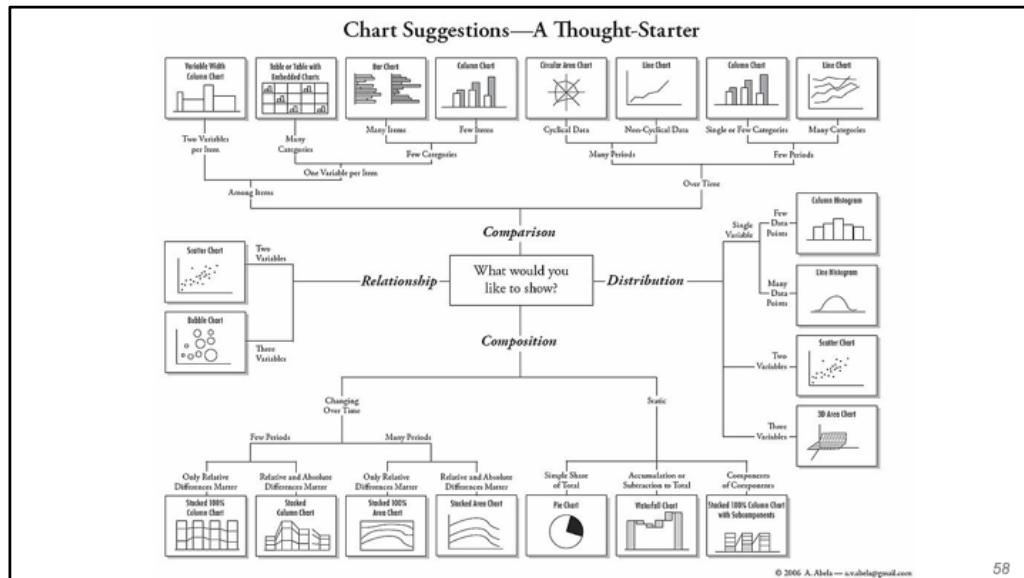
56

<https://medium.com/truth-labs/designing-data-driven-interfaces-a75d62997631?ref=webdesignernews.com>

	Nominal (Business unit)	Ordinal (Tenure, Grade, Age)	Time Series	Quantitative additive (Income, market share, costs)	Quantitative non-additive (temp.)
Quantitative Additive	Bars Must start from zero Sort in descending order	Bars or Lines Must start from zero Must maintain order	Points or lines	Points	Points
Quantitative Non-additive	Bars or points Sort in descending order	Points or lines Must maintain order	Points or lines	Points	Points

Juice Analytics Guide to Dashboard Design

<http://labs.juiceanalytics.com/chartchooser/index.html>



58

Image from: <http://www.labnol.org/software/find-right-chart-type-for-your-data/6523/> or
http://extremepresentation.typepad.com/blog/2006/09/choosing_a_good.html

Also, see:

- <http://labs.juiceanalytics.com/chartchooser/index.html>
- <http://www.dummies.com/how-to/content/how-to-choose-the-right-chart-type-in-excel-2010.html>
- http://pic.dhe.ibm.com/infocenter/cx/v10r1m0/index.jsp?topic=%2Fcom.ibm.swg.ba.cognos.dsk_ug.10.1.0.doc%2Fc_dsk_charts_types.html
- <http://www.tutorial9.net/tutorials/web-tutorials/selecting-the-right-chart-type-for-your-data/>

KELLY'S 22 COLOURS OF MAXIMUM CONTRAST										
Color number and hex code	Color sample and name of the contrasting color	General color name	ICC-988 contrasting color number	ICC-988 color name [abbreviation]	Hex code of the contrasting color	ICC-988 color number	Hex	R	G	B
1	white	263	white	2.3PF 9.5/0.2	263	F2F3F4	242	243	244	
2	black	267	black	N 0.8	267	222222	34	34	34	
3	yellow	82	v.Y	3.3Y 8.0/14.3	82	F3C300	243	195	0	
4	purple	218	x.P	6.5P 4.3/9.2	218	875602	135	86	146	
5	orange	48	v.O	4.7YR 6.5/15.0	48	F38400	243	132	0	
6	light blue	180	v.IB	2.7PB 7.8/6.0	180	A1GAF1	161	202	241	
7	red	11	v.R	5.0R 3.8/15.4	11	BE0032	190	0	50	
8	buff	90	gy.Y	4.4Y 7.2/3.8	90	C2B200	194	178	128	
9	grey	265	med.Gy	3.3GY 5.4/0.1	265	848482	132	132	130	
10	green	139	v.G	3.2G 4.8/18.1	139	008856	0	136	86	
11	purplish pink	247	x.pPk	5.8RP 6.8/8.0	247	E68FAC	230	143	172	
12	blue	178	x.B	2.0PB 4.1/10.4	178	0067A5	0	103	165	
13	yellowish pink	26	x.yPk	8.4R 7.0/9.5	26	F99379	249	147	121	
14	violet	207	x.V	0.3P 3.7/10.1	207	604E97	96	78	151	
15	orange yellow	66	v.OY	8.4YB 7.3/15.2	66	F6A600	246	166	0	
16	purplish red	255	x.pR	7.38P 4.4/11.4	255	B3446C	179	68	108	
17	greenish yellow	97	v.gY	9.1Y 9.2/12.0	97	DGD300	220	211	0	
18	reddish brown	40	x.BR	0.31B 3.1/9.9	40	882017	136	45	23	
19	yellow green	115	v.YG	5.4GY 6.8/11.2	115	888600	141	182	0	
20	yellowish brown	75	deep.ybr	8.8YB 3.1/5.0	75	654522	101	69	34	
21	reddish orange	34	v.O	9.8E 5.4/14.5	34	E28822	226	88	34	
22	olive green	126	d.005	8.00Y 2.2/3.6	126	2B3D26	43	61	38	

59

<https://eagereyes.org/basics/rainbow-color-map>

http://hackerspace.lifehacker.com/some-os-x-calendar-tips-1658107833/1665644975/+whitsongordon?utm_campaign=socialflow_lifehacker_twitter&utm_source=lifehacker_twitter&utm_medium=socialflow

FONT AND BACKGROUND COLORS FOR THE MATHEMATICALLY MINDED

Goal: Ensure that foreground and background color combinations provide sufficient contrast when viewed by someone having color deficits (*1/10 males may be blue/green colorblind*) or when viewed on a black and white screen.

The W3C (World Wide Web Consortium) suggest the following definition and formulas to make this quantifiable:

Two colors provide good color visibility if the brightness difference and the color difference between the two colors are greater than a given range.

- *Color brightness is determined by the following formula:*
$$((Red * 299) + (Green * 587) + (Blue * 114)) / 1000$$
- *Color difference is determined by the following formula: Sum the difference of each color pair*
$$(max (Red 1, Red 2) - min (Red 1, Red 2)) + (max (Green 1, Green 2) - min (Green 1, Green 2)) + (max (Blue 1, Blue 2) - min (Blue 1, Blue 2))$$
- The minimum range for color *brightness* difference is 125. The minimum value for color *difference* is 500.

<http://www.particletree.com/notebook/calculating-color-contrast-for-legible-text/>

http://colorusage.arc.nasa.gov/legib_1.php