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.

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

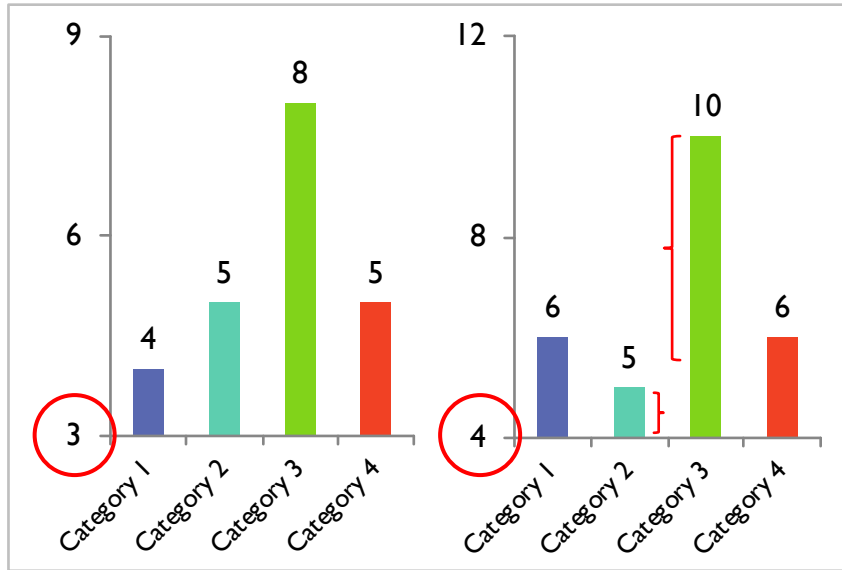| Context & Objectives	
Design Concepts	
1. Be True to the Data	
2. Tell a Story	
3. Consider Data-Ink Ratio	
4. Color Theory	
5. Font & Legibility	
Appendix	

1 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.

TELL
THE TRUTH

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

1. Use the same scale every time
2. Start charts at the origin if possible
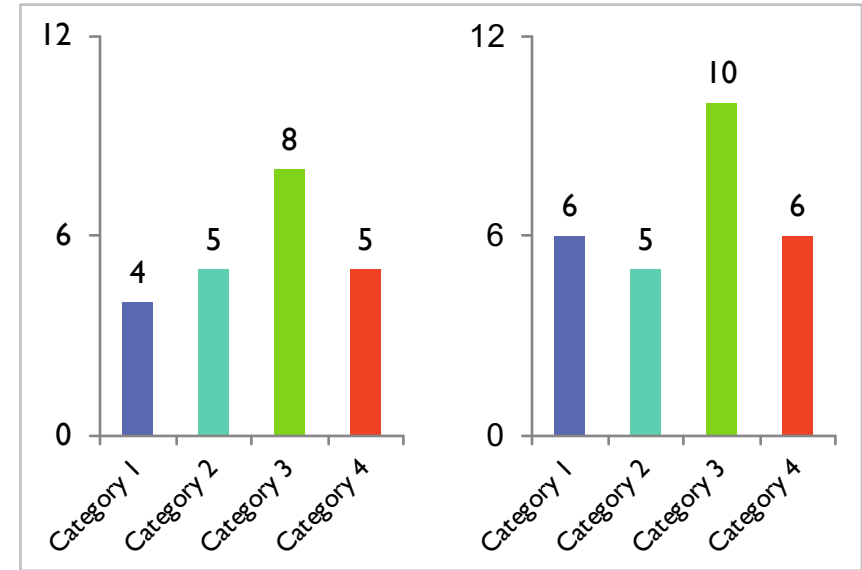
HELP THE EYE COMPARE THE DATA

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

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
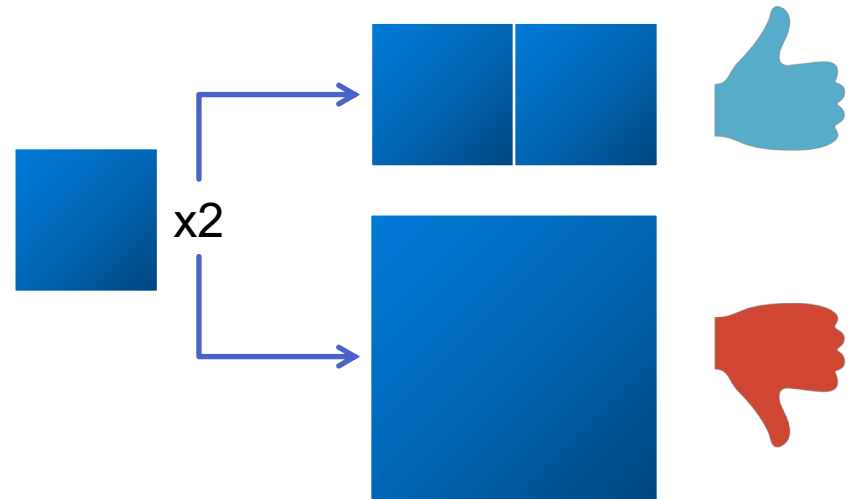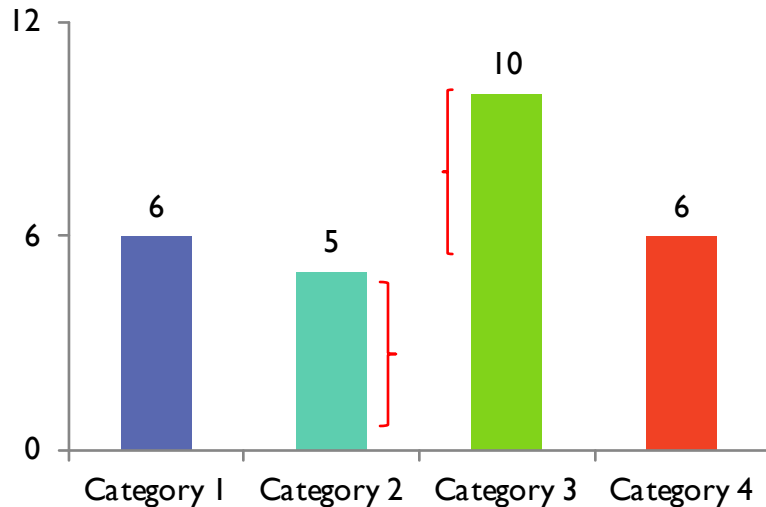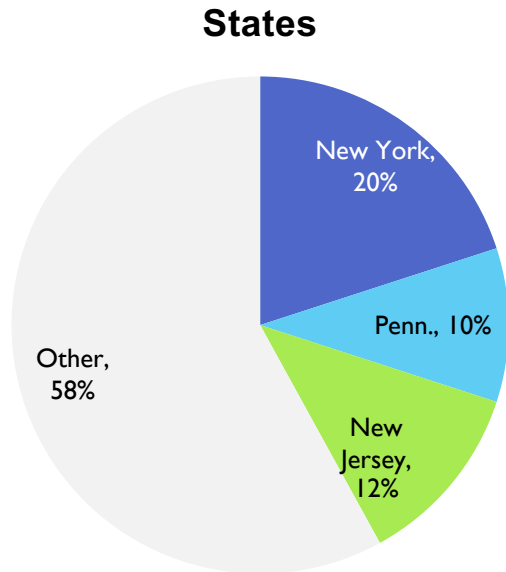
HELP THE EYE COMPARE THE DATA: PIE CHARTS

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.
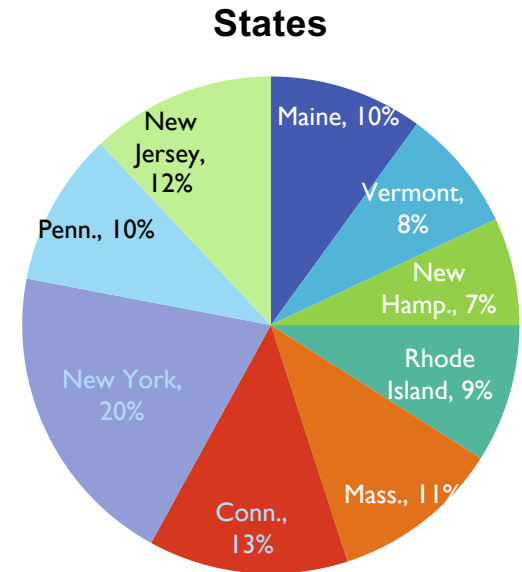
States
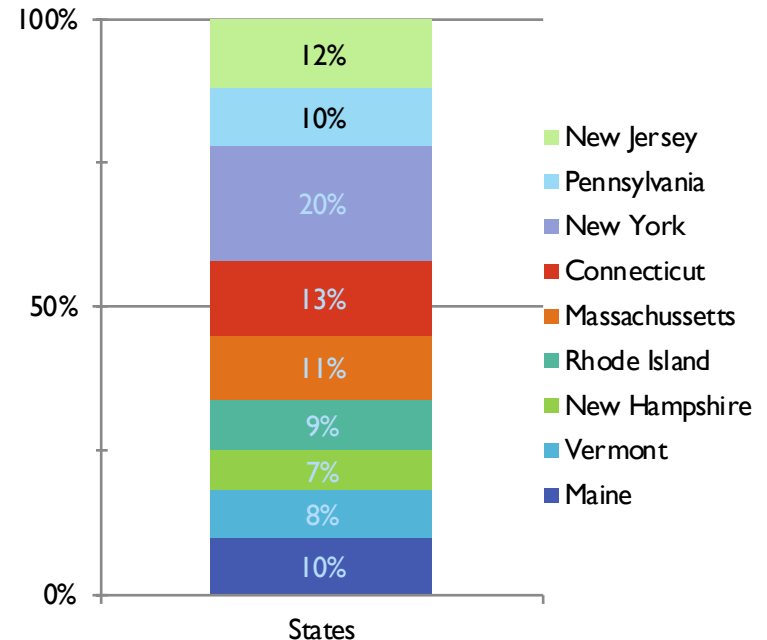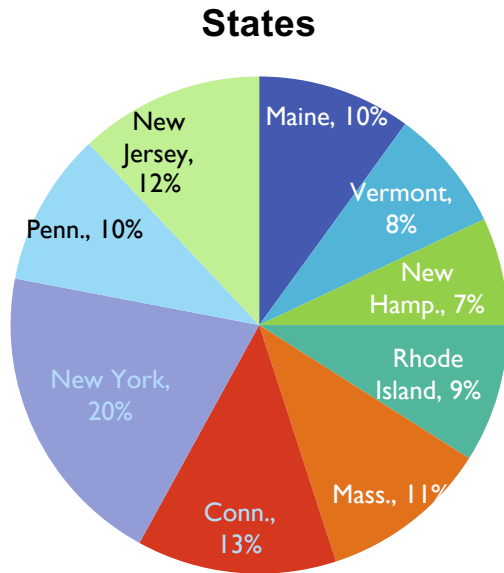
HELP THE EYE COMPARE THE DATA: PIES AND DONUTS

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)
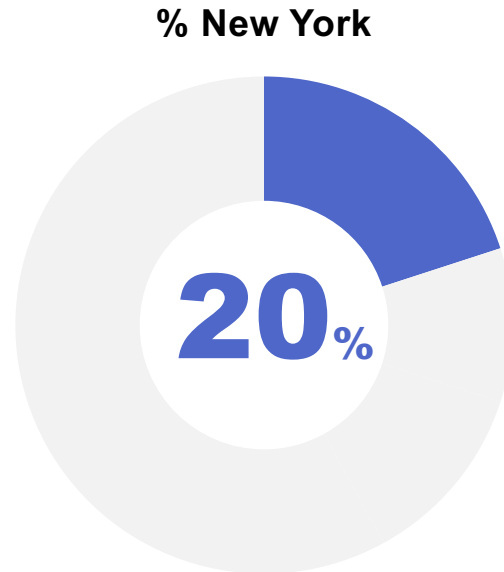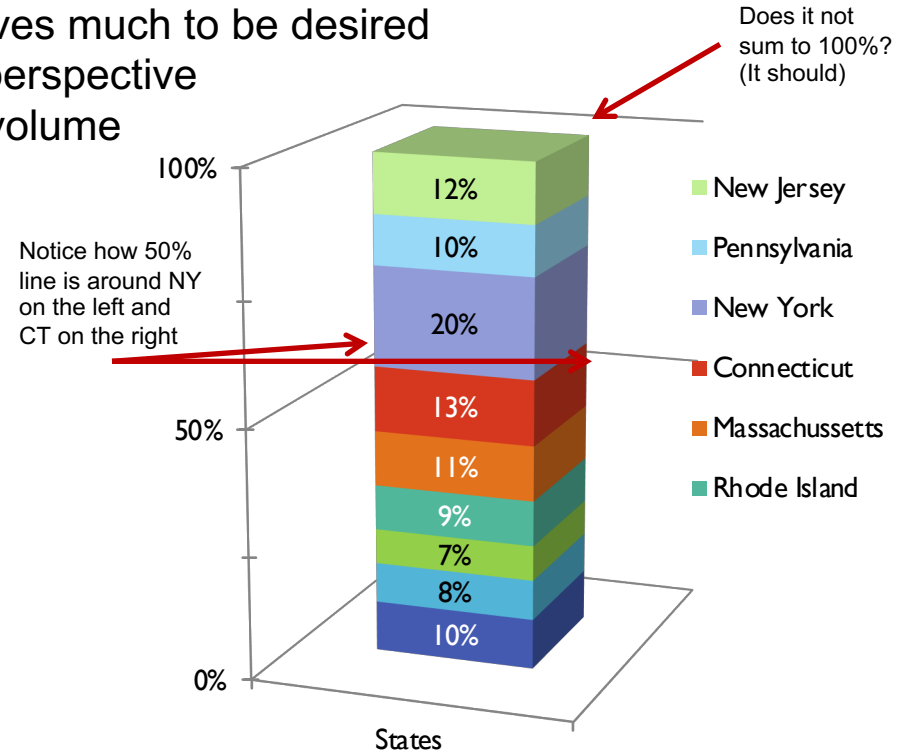
Avoid Pie Charts if comparing >5 distinct breaks

States

New York, 20%

Penn., 10%
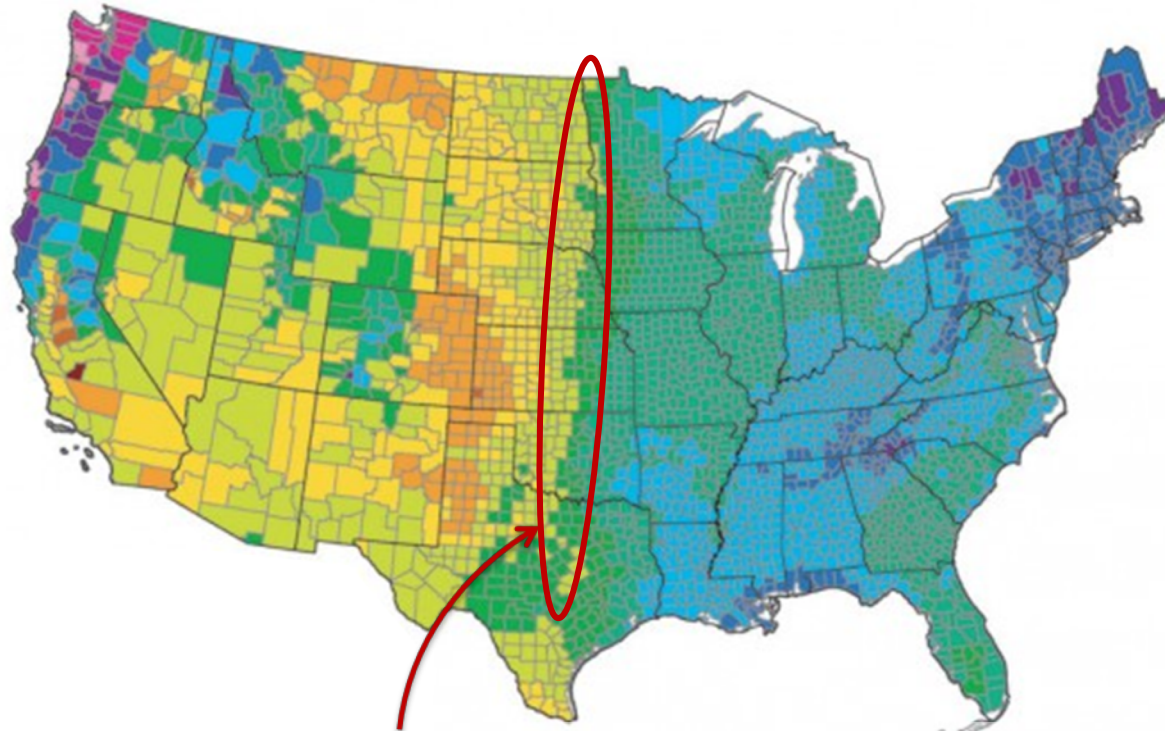
New Jersey, 12%

Other, 58%

% New York

20%

States

Maine, 10%

Vermont, 8%

New Hamp., 7%

Rhode Island, 9%

Mass., 11%

Conn., 13%

New York, 20%

Penn., 10%

New Jersey, 12%

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
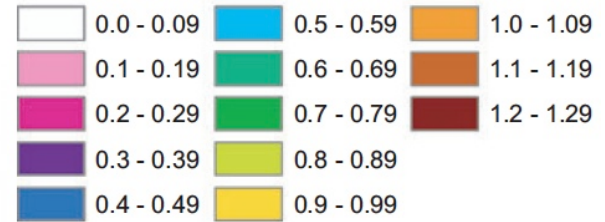   - Confusion between length, area, and volume

Relativity[1]

Does it not sum to 100%? (It should)

Notice how 50% line is around NY on the left and CT on the right

12%	New Jersey
10%	Pennsylvania
20%	New York
13%	Connecticut
11%	Massachussetts
9%	Rhode Island
7%	
8%	
10%	

100%

50%

0%

States
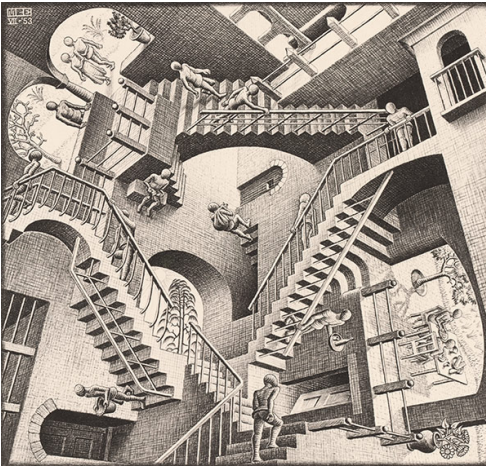
AVOID MISLEADING BY
CHOOSING COLOR CAREFULLY

Estimated fraction of precipitation lost to evapotranspiration 1971-2000

Current Scale

0.0 - 0.09	0.5 - 0.59	1.0 - 1.09
0.1 - 0.19	0.6 - 0.69	1.1 - 1.19
0.2 - 0.29	0.7 - 0.79	1.2 - 1.29
0.3 - 0.39	0.8 - 0.89	
0.4 - 0.49	0.9 - 0.99	

Current Scale - Luminance

0.0 - 0.09	0.5 - 0.59	1.0 - 1.09
0.1 - 0.19	0.6 - 0.69	1.1 - 1.19
0.2 - 0.29	0.7 - 0.79	1.2 - 1.29
0.3 - 0.39	0.8 - 0.89	
0.4 - 0.49	0.9 - 0.99	
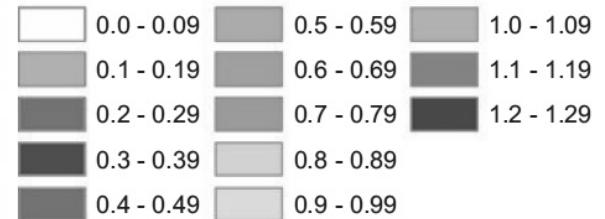
At first glance, this looks like a significant shift because of the very visual change in color intensity. Additional time is needed to review the key and identify it represents only a small change.

CHOOSE COLOR CAREFULLY

Single Hue
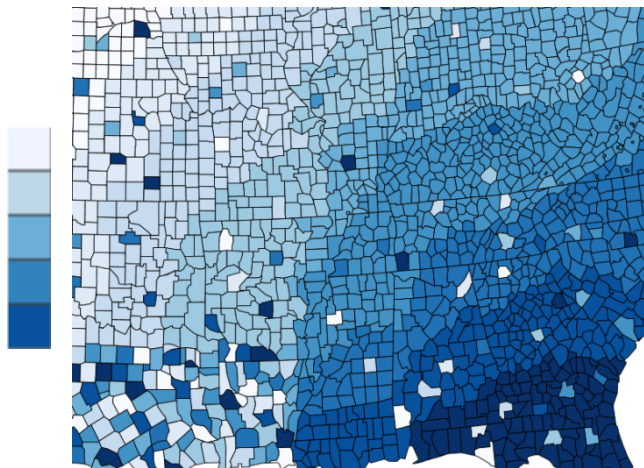
Dual Hue

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.
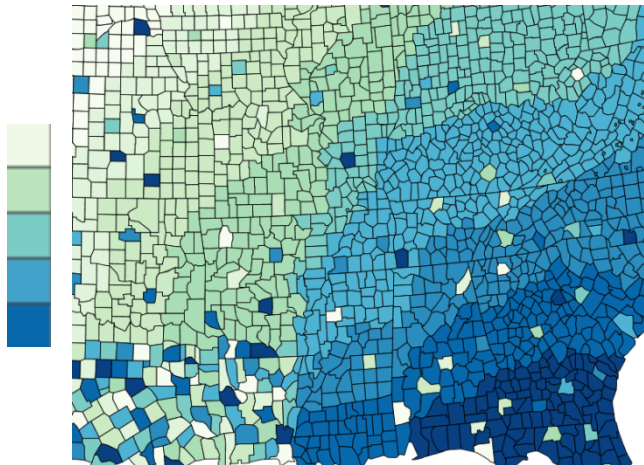
Dual Hue Color Scheme

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.

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)
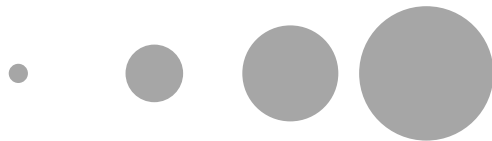
2 Tell A Story

1 Let the Story lead the Visual.

2 Create a structure

3 Show Trends, not Specifics (unless required)

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***.

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.
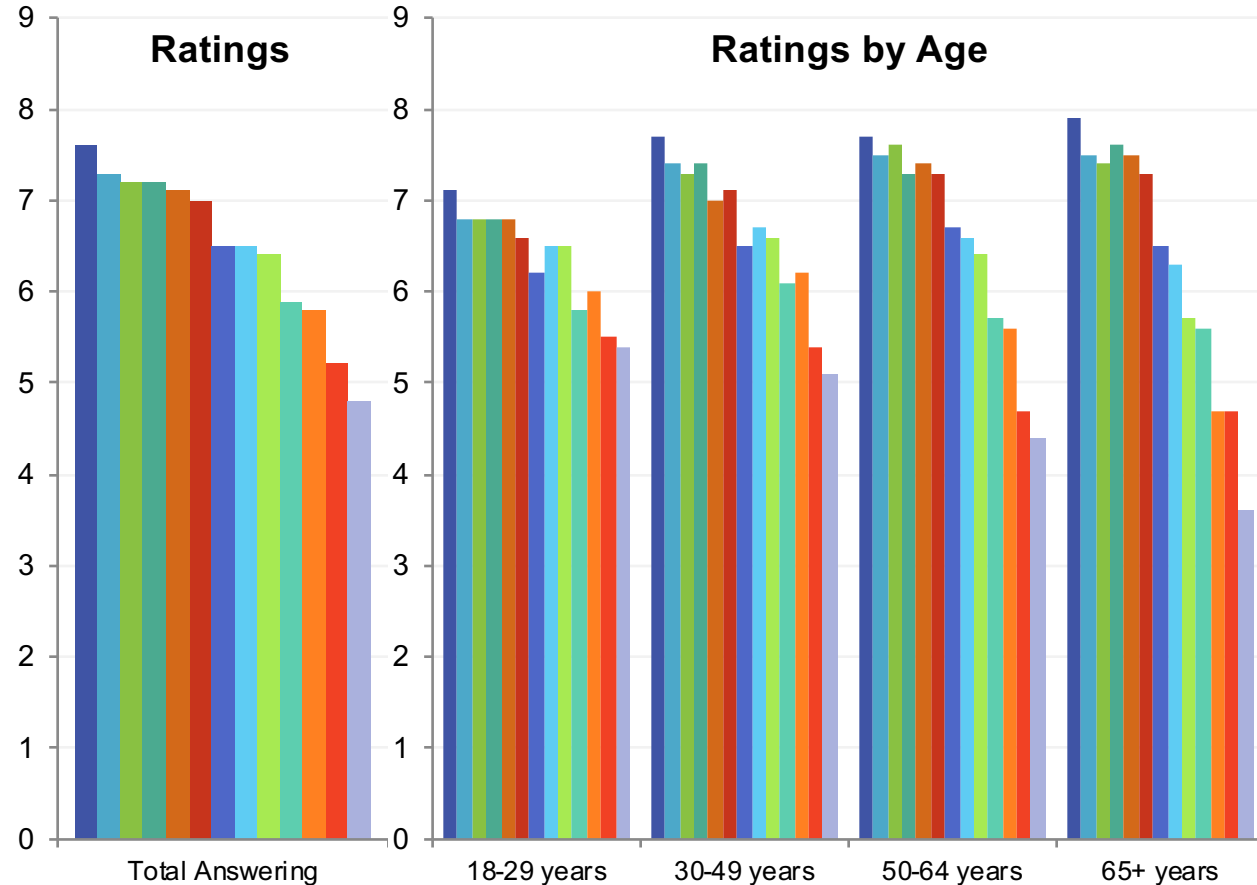
CREATE STRUCTURE TO AID STORYTELLING

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
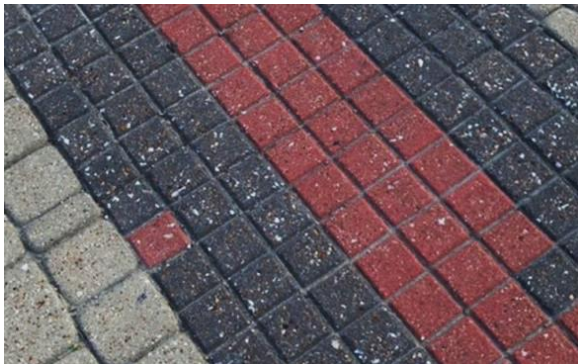
Represent recurring products/brands with same color throughout

"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.

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.)

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.

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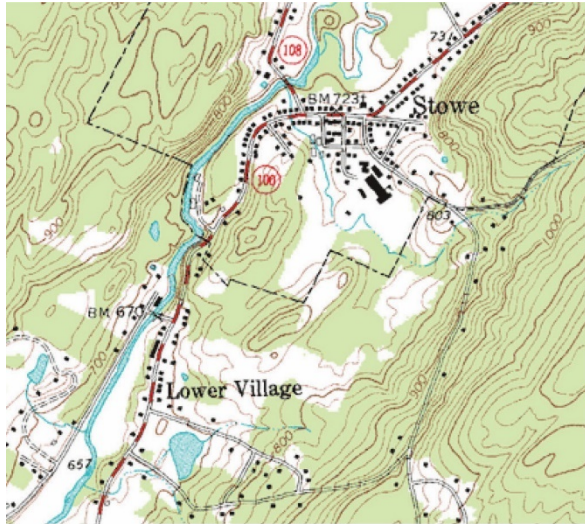
"*Visual displays rich with data are not only an appropriate and proper complement to human capabilities, but also such designs are frequently optimal.* **If the visual task is contrast, comparison, and choice – as so often it is – then the more relevant information within eyespan, the better**." [1]

Topographical Map[2]

Dense data is actually a desirable attribute in presentations IF density serves a purpose.
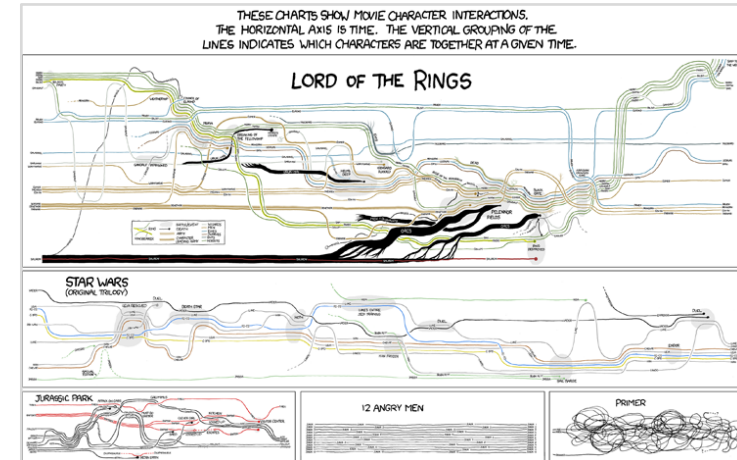
Movie Narrative Charts[3]

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]

LIMIT INK THAT DOESN'T CONTRIBUTE TO DATA DISPLAY
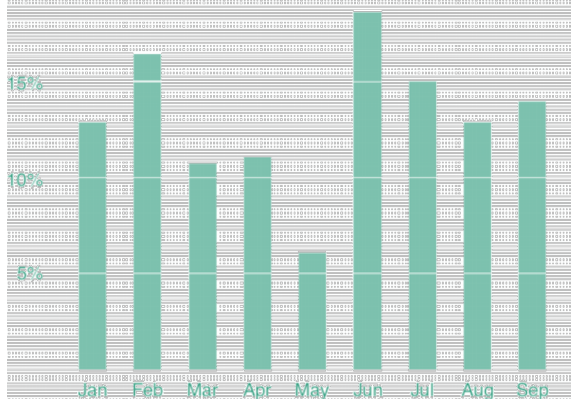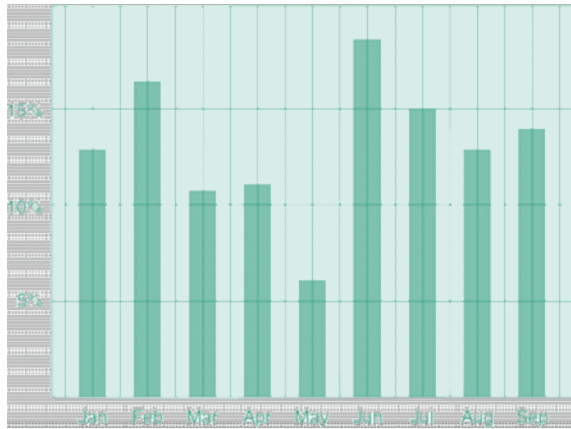
"A large share of ink on a graphic should present data-information, ink changing as the data change. Data-ink is the non-erasable core of a graphic, the non-redundant ink arranged in response to variation in the numbers represented."[1]

Goal: Maximize the data-ink ratio, within reason

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

MAXIMIZING THE
DATA-INK
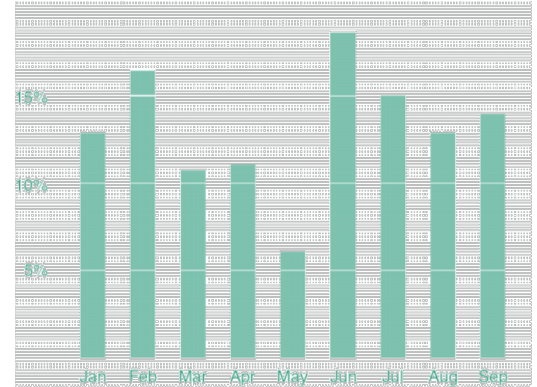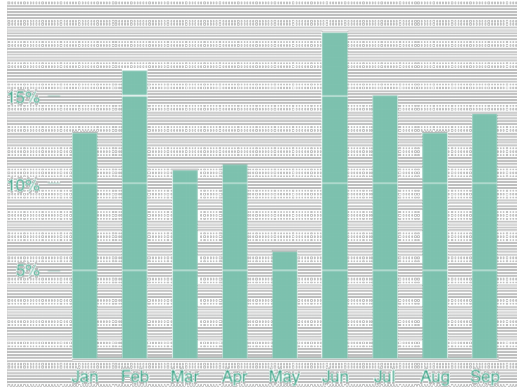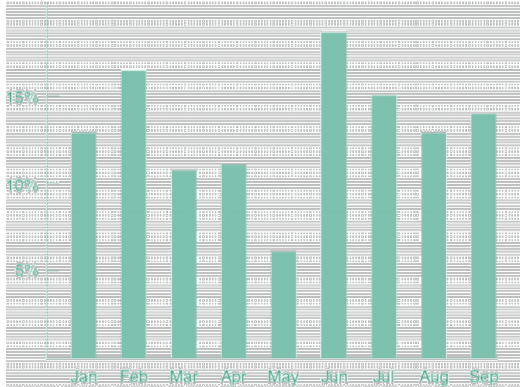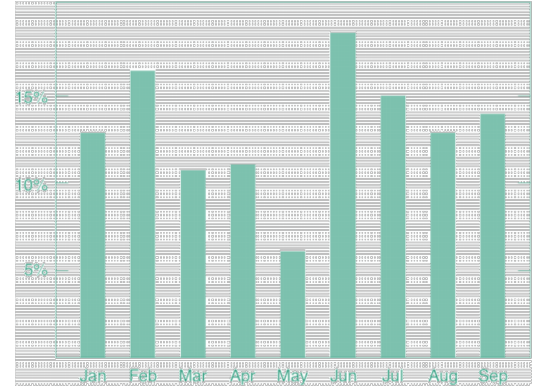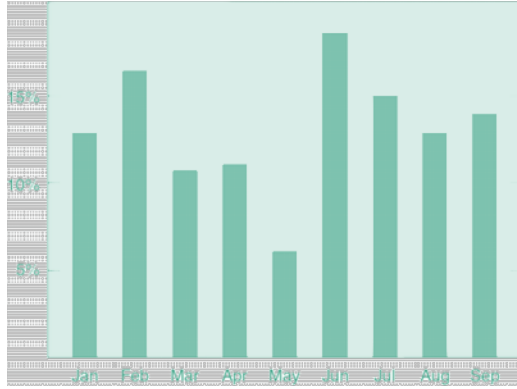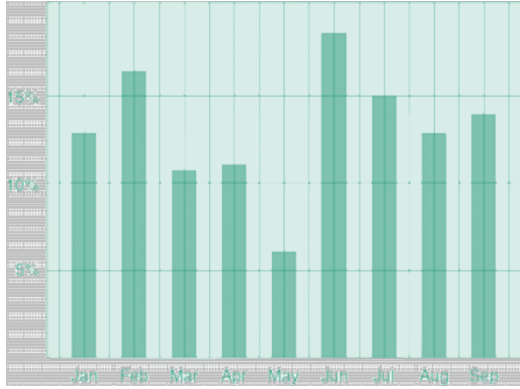
APPROPRIATE USE: TABLES

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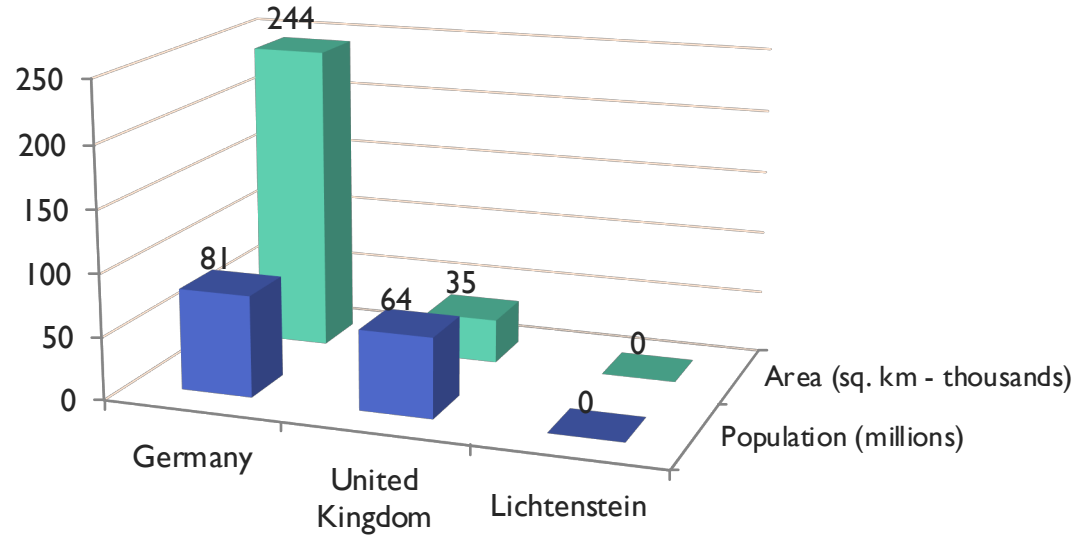
Country	Population (millions)	Area Sq. km (thousands)
Germany	80.99	243.6
United Kingdom	63.74	35.0
Liechtenstein	0.04	0.2

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

TABLES HAVE CHART JUNK, TOO

After

Before

Team	Average Salary ($ millions)							
	1999	2000	2001	2002	2003	2004	2005	2006
Arizona Diamondbacks	61.2	72.3	72.5	77.9	80.7	60.5	58.3	56.9
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	45.7	66.6	64.8
Boston Red Sox	55.1	65.0	85.6	90.3	89.5	104.3	108.3	111.2
Chicago White Sox	22.7	26.8	57.7	52.8	49.0	62.7	69.7	98.9
Chicago Cubs	51.9	50.4	61.6	67.6	72.1	78.5	77.9	84.7
Cincinnati Reds	28.6	43.4	43.5	37.5	50.9	38.5	49.7	53.1
Cleveland Indians	60.8	73.0	76.6	65.8	39.4	28.8	36.1	56.8
Colorado Rockies	53.7	54.6	65.8	52.6	55.8	57.7	41.2	34.3
Detroit Tigers	30.5	53.9	44.5	49.2	47.3	41.4	61.6	76.2
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	89.0
Kansas City Royals	22.8	20.9	30.7	40.7	39.0	39.7	34.1	40.8
Los Angeles Dodgers	70.8	81.6	93.9	91.2	101.8	86.2	67.5	91.8
Anaheim/Los Angeles Angels	39.3	42.9	37.6	55.1	73.2	93.6	81.9	103.6
Milwaukee Brewers	38.3	28.5	39.9	43.4	35.0	27.5	40.2	56.8
Minnesota Twins	18.5	15.9	22.5	38.7	53.5	51.5	52.4	61.4
Montreal/Washington Nationals	15.0	30.0	29.0	34.5	50.0	36.0	40.5	52.7
New York Mets	57.8	79.5	83.2	91.0	100.7	96.8	97.0	97.0
New York Yankees	75.9	79.8	88.5	108.6	133.7	157.6	198.0	177.4
Oakland Athletics	22.3	29.6	31.3	36.7	48.4	55.4	53.7	62.3
Philadelphia Phillies	26.1	40.8	40.1	51.7	61.0	86.3	91.7	81.7
Pittsburgh Pirates	18.5	27.8	42.5	36.5	48.7	29.8	34.0	41.8
San Diego Padres	42.7	45.7	35.5	36.7	37.9	54.6	56.2	62.3
Seattle Mariners	48.0	56.6	67.5	80.3	80.7	72.8	67.1	84.9
San Francisco Giants	44.9	51.7	68.6	72.5	79.2	66.1	86.0	90.9
St. Louis Cardinals	42.3	56.9	66.6	71.2	67.1	75.6	89.7	85.0
Tampa Bay Rays	29.3	50.6	50.9	30.7	19.6	27.3	26.7	31.6
Texas Rangers	72.0	68.1	71.4	90.8	87.1	47.3	46.1	52.8
Toronto Blue Jays	42.8	44.5	67.7	66.3	47.5	48.1	43.6	66.6
Average Salary	43.3	49.9	56.2	59.6	63.9	62.1	66.4	72.1

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

34

REMOVE POWERPOINT'S UNNECESSARY EFFECTS

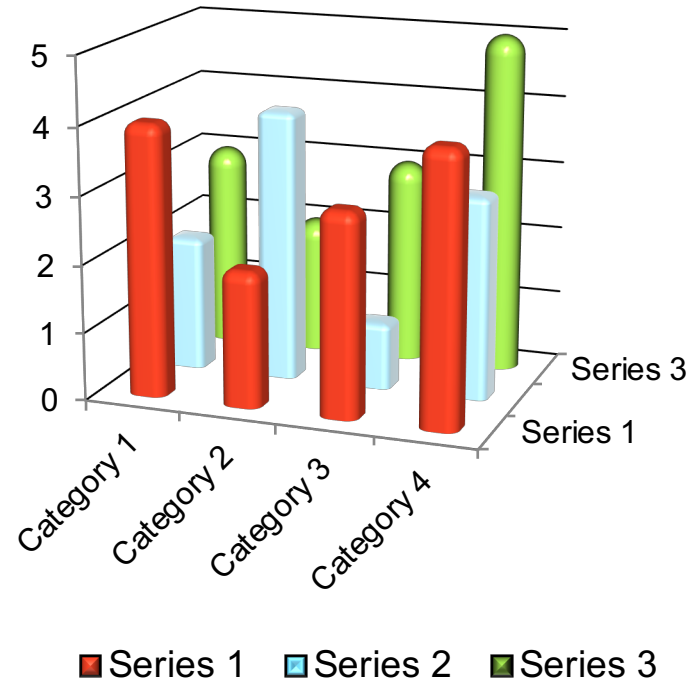Outlines, drop shadows, and 3D effects

Will

Get

In

The

Way

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

Consistent white space

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

4 Color Theory

1   Review your color theory.

2   Color relationships add meaning.

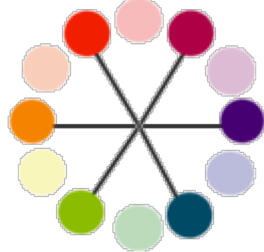**3**   Consider Kelly's 22 colors of maximum contrast.

COLOR THEORY:
COLOR WHEEL
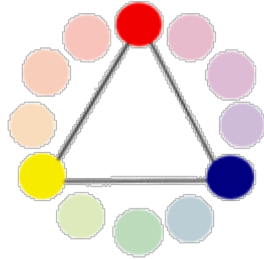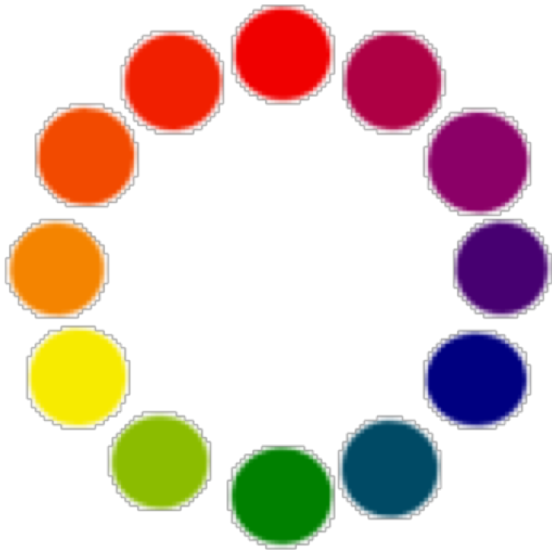
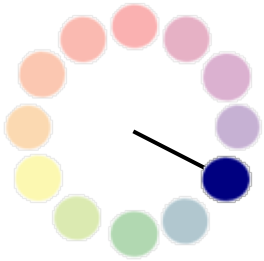**Primary Colors:** Colors at their basic essence; those colors that cannot be created by mixing others.
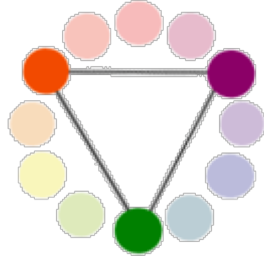
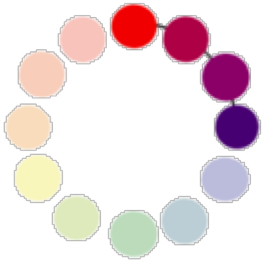**Secondary Colors:** Those colors achieved by a mixture of two primaries.

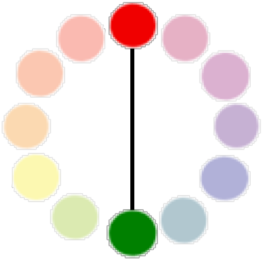**Tertiary Colors:** Those colors achieved by a mixture of primary and secondary hues.

COLOR THEORY:
SIMILAR RELATIONSHIPS

Monochromatic Relationship Colors that are shade or tint variations of the same hue.
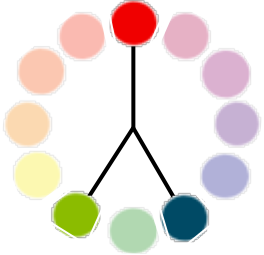
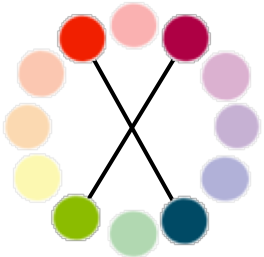**Analogous Colors:** Those colors located close together on a color wheel.

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.
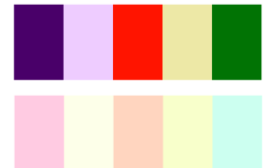
COLOR THEORY:
HUE AND VALUE

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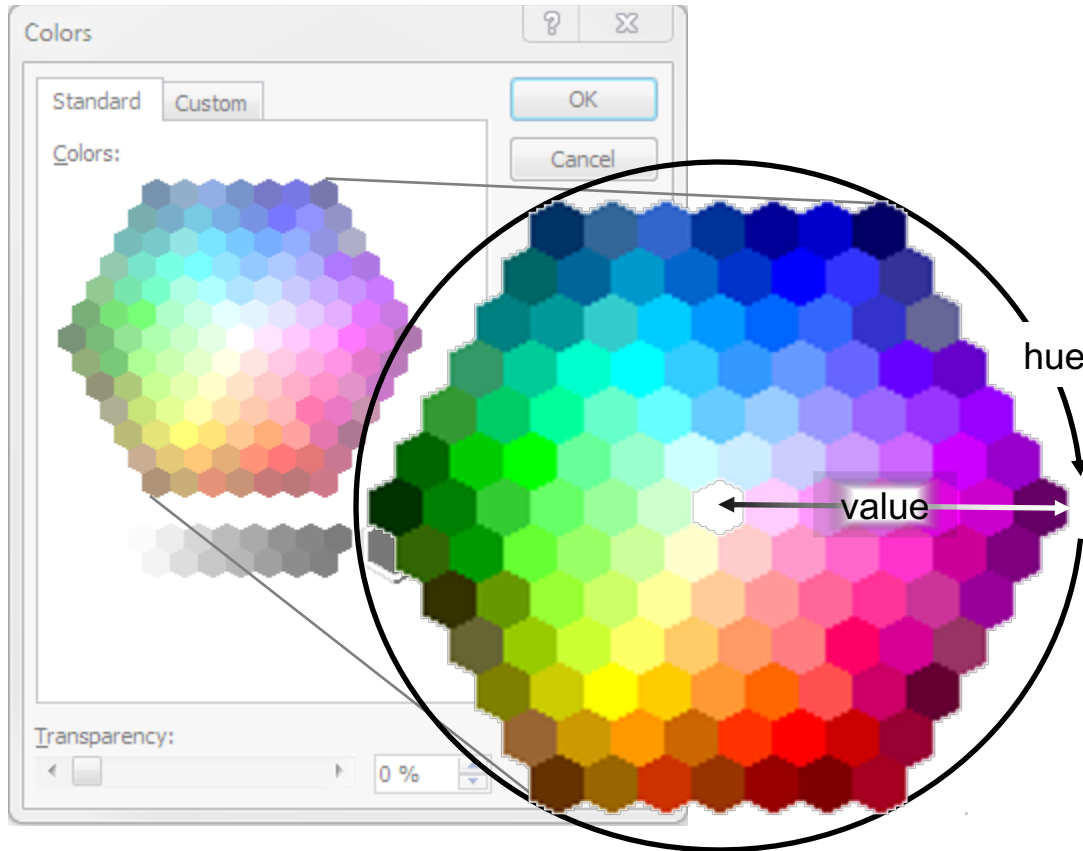
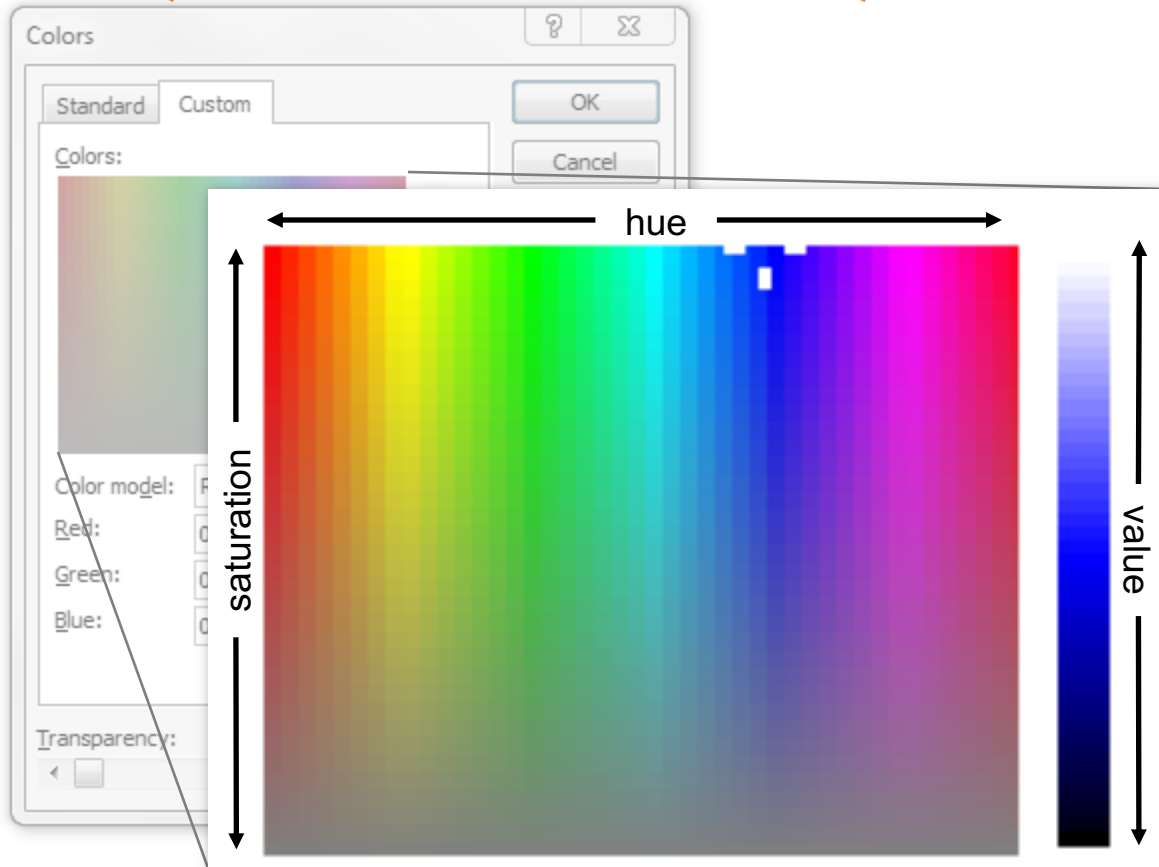Use for: Categories (i.e., product classes, brands)

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)

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)

CONSIDER ASSOCIATIONS WHEN SELECTING COLOR

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.

5 Font & Readability

1 Consider readability.

2 Apply a standard font framework.

3 Avoid comic sans (and some other font advice).

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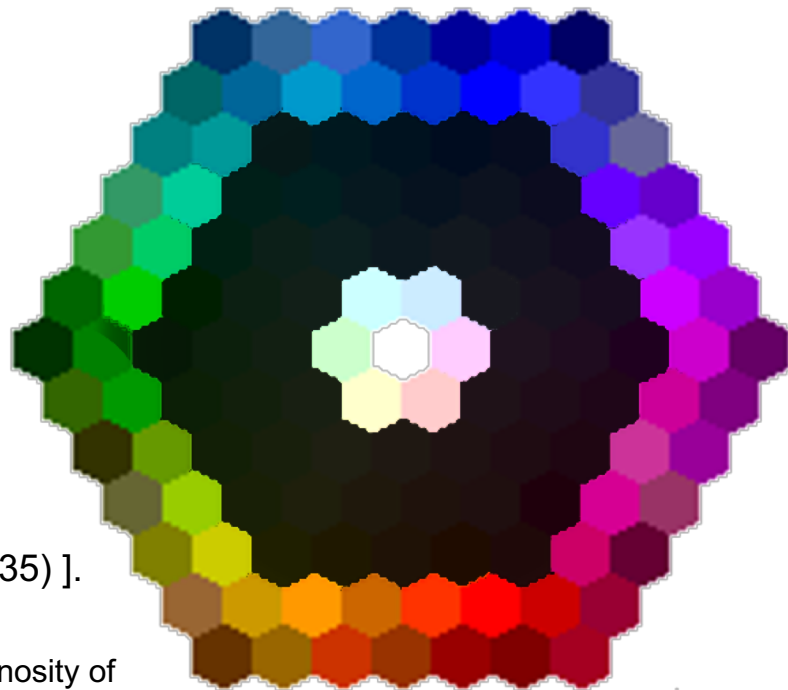
This means that 470 high-contrast color combinations exist: [2(7*35)].

- 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).

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.

Notes

Body Text

Emphasis

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

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	• 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
Table Header	Titles and separates table segments	100%-150% of table text size	**Body** with a dash of **header** style	Neutral	• Normal, bold, or italic • Whitespace above
Graph Title	Titles graphs and charts	100%-150% of graph text; **Body** size	**Header** style	Neutral	• Normal, bold, or italic • Whitespace above

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

OPTIMIZE LINE LENGTH AND SPACING WHEN POSSIBLE

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

Lorem 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.

Lorem 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.
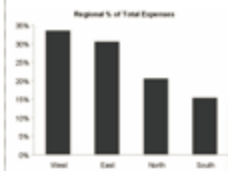
6 ADDITIONAL MATERIALS

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.

CRITICAL

GLANCEABLE
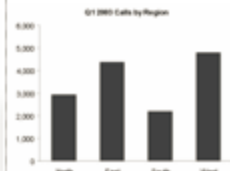
INFORMATIVE

BROAD OVERVIEW

DETAIL SUMMARY

SPECIFIC ITEMS/TASKS
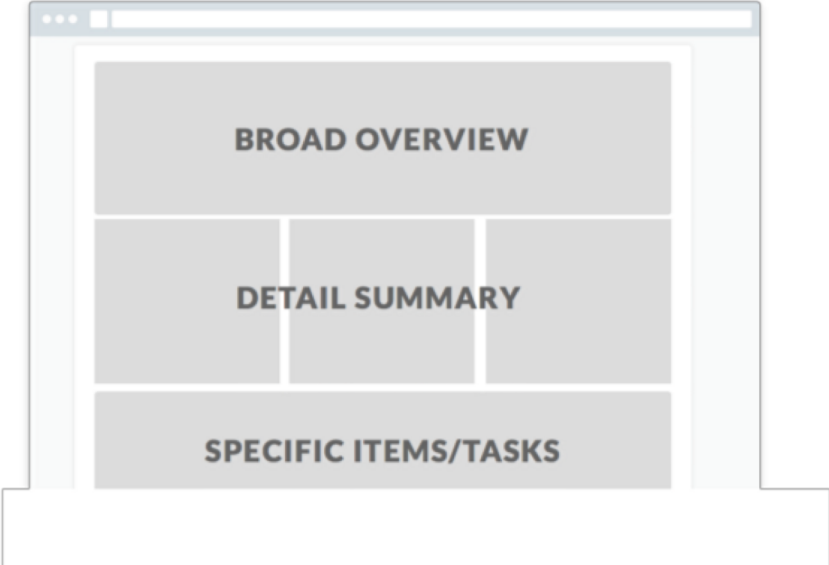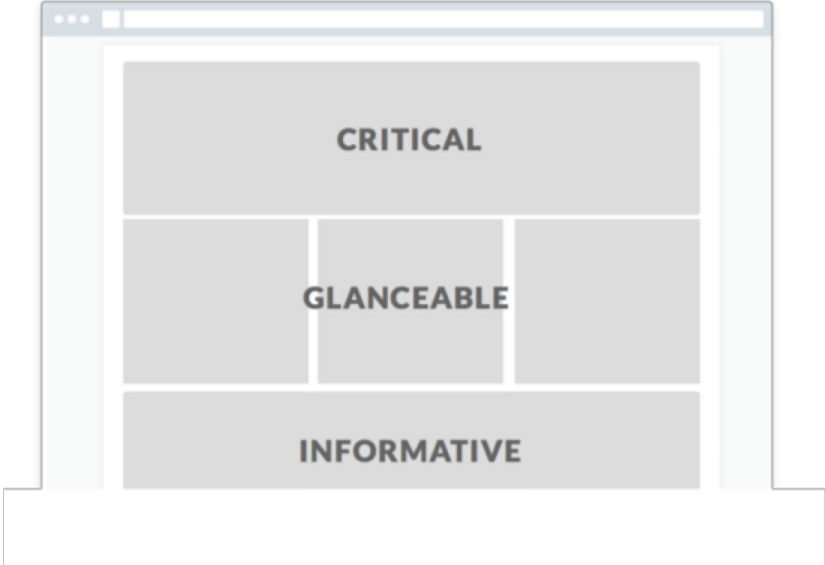
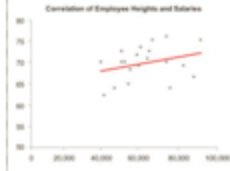|	Nominal (Business unit)	Ordinal (Tenure, Grade, Age)	Time Series	Quantitative additive (Income, market share, costs)	Quantitative non-additive (temp.)
Quantitative Additive	**Bars** Must start from zero Sort in descending order	**Bars** or **Lines** Must start from zero Must maintain order	**Points** 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**
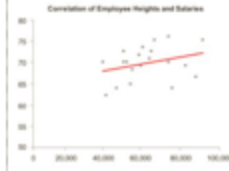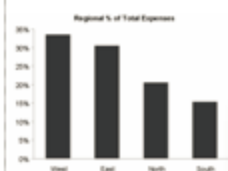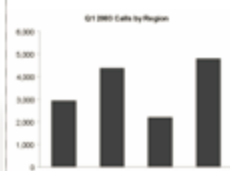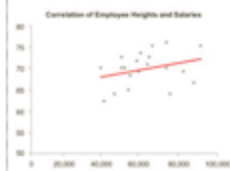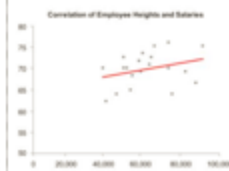
Chart Suggestions—A Thought-Starter

Variable Width Column Chart

Table or Table with Embedded Charts

Bar Chart

Column Chart

Circular Area Chart

Line Chart

Column Chart

Line Chart

Two Variables per Item

Many Categories

Many Items — Few Items

Cyclical Data — Non-Cyclical Data

Single or Few Categories — Many Categories

Few Categories

One Variable per Item

Many Periods — Few Periods

Among Items

Over Time

Comparison

Scatter Chart

Two Variables

Relationship

What would you like to show?

Distribution

Single Variable

Few Data Points

Column Histogram

Many Data Points

Line Histogram

Bubble Chart

Three Variables

Composition

Two Variables

Scatter Chart

Three Variables

3D Area Chart

Changing Over Time

Static

Few Periods

Many Periods

Only Relative Differences Matter

Relative and Absolute Differences Matter

Only Relative Differences Matter

Relative and Absolute Differences Matter

Simple Share of Total

Accumulation or Subtraction to Total

Components of Components

Stacked 100% Column Chart

Stacked Column Chart

Stacked 100% Area Chart

Stacked Area Chart

Pie Chart

Waterfall Chart

Stacked 100% Column Chart with Subcomponents

KELLY'S 22 COLOURS OF MAXIMUM CONTRAST

Colour serial or selection number	Colour sample matched visual to ISCC-NBS centroid colour	General colour name	ISCC-NBS centroid number	ISCC-NBS colour name [abbreviation]	Munsell renotation of ISCC-NBS centroid colour	iscc-nbs number	Hex	R	G	B
1		white	263	white	2.5PB 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	s.P	6.5P 4.3/9.2	218	875692	135	86	146
5		orange	48	v.O	4.1YR 6.5/15.0	48	F38400	243	132	0
6		light blue	180	v.l.B	2.7PB 7.9/6.0	180	A1CAF1	161	202	241
7		red	11	v.R	5.0R 3.9/15.4	11	BE0032	190	0	50
8		buff	90	gy.Y	4.4Y 7.2/3.8	90	C2B280	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 4.9/11.1	139	008856	0	136	86
11		purplish pink	247	s.pPk	5.6RP 6.8/9.0	247	E68FAC	230	143	172
12		blue	178	s.B	2.9PB 4.1/10.4	178	0067A5	0	103	165
13		yellowish pink	26	s.yPk	8.4R 7.0/9.5	26	F99379	249	147	121
14		violet	207	s.V	0.2P 3.7/10.1	207	604E97	96	78	151
15		orange yellow	66	v.OY	8.6YR 7.3/15.2	66	F6A600	246	166	0
16		purplish red	255	s.pR	7.3RP 4.4/11.4	255	B3446C	179	68	108
17		greenish yellow	97	v.gY	9.1Y 8.2/12.0	97	DCD300	220	211	0
18		reddish brown	40	s.rBr	0.3YR 3.1/9.9	40	882D17	136	45	23
19		yellow green	115	v.YG	5.4GY 6.8/11.2	115	8DB600	141	182	0
20		yellowish brown	75	deep yBr	8.8YR 3.1/5.0	75	654522	101	69	34
21		reddish orange	34	v.rO	9.8R 5.4/14.5	34	E25822	226	88	34
22		olive green	126	d.OlG	8.0GY 2.2/3.6	126	2B3D26	43	61	38

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.