Seneca | SDDS

Business Analytics

Introduction to Data Visualization

BAN140 - Section NBB /NCC

Mufleh Al-Shatnawi, Ph.D., P.Eng.,

Week 9

Week Topics

Previous Week

- Focus your audience's attention

Current Week

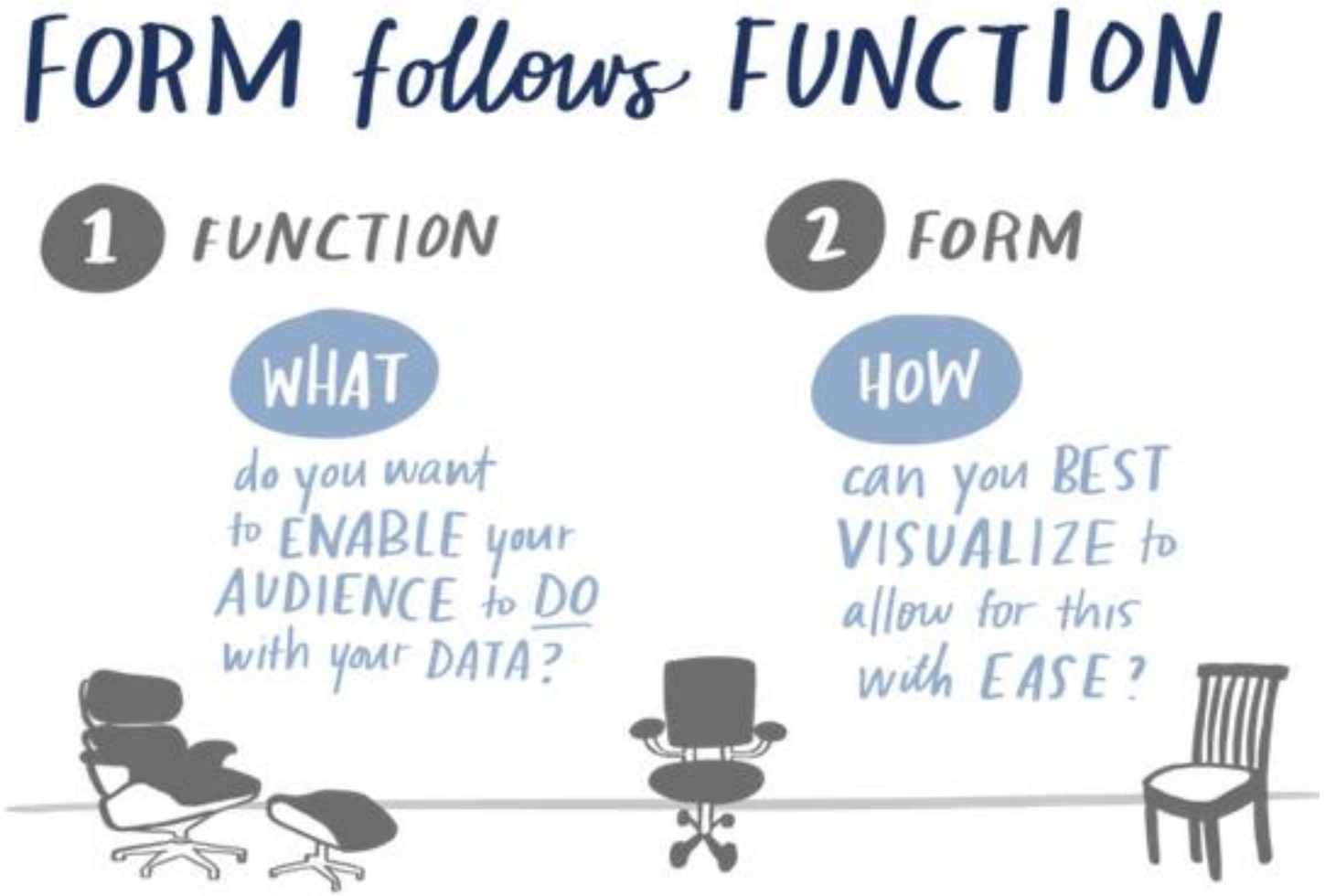
- Design Concepts
- Think like a designer

think like a designer

Chapter five: From Storytelling with Data: A Data Visualization Guide for Business Professionals, Wiley, 2017

Available online through Seneca Libraries: https://senecacollege-primo.hosted.exlibrisgroup.com/permalink/f/t3376v/01SENC_ALMA51463742800003226

Form and Function in Data Visualizations



http://www.storytellingwithdata.com/blog/2020/5/3/swdchallenge-think-like-a-designer

Introduction

- We will discuss how traditional **design concepts** can be applied to communicating with data.
- Affordances
- Accessibility
- Aesthetics
- Acceptance

[https://www.interaction-design.org/literature/article/affordances-and-design]

Affordances

"WHEN AFFORDANCES ARE TAKEN ADVANTAGE OF, THE USER KNOWS WHAT TO DO JUST BY LOOKING: NO PICTURE, LABEL, OR INSTRUCTION NEEDED." -DON NORMAN

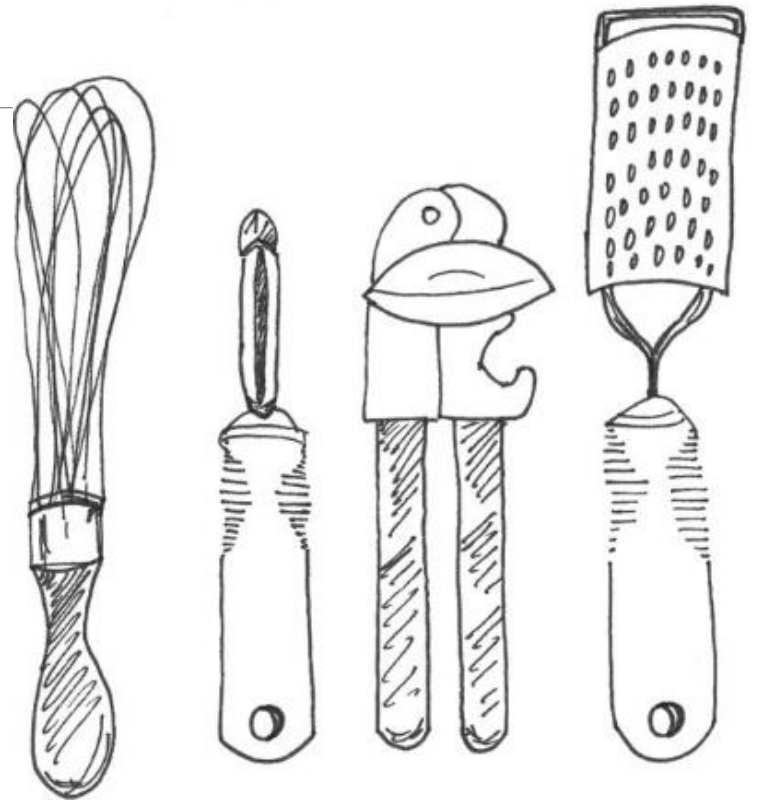
Affordances

- Definition: Aspects inherent to the design that make it obvious how the product is to be used
  - e.g. a button affords pushing
    - A toothbrush has a handle a little longer than the human palm. It affords gripping.
  - **Suggesting interaction and operation**
- *When sufficient affordances are present, good design fades into the background, and you don't even notice it.*

[Source: Robert F. Erlandson, Universal and Accessible Design for products, Services, and Processes, CRC Press, 2008]
[and https://www.interaction-design.org/literature/article/affordances-and-design]

Afford correct use only

- **OXO brand**
- There is really only one way to pick them up
- Afford correct use, without the user recognizing



Designers must create objects' affordances to conform to users' needs based on these users' physical capabilities, goals *and* past experiences. *Clear affordances are vital to usability*.

Affordances in Data Visualization

- There should be only one way to use and interact with the graph!
- "Through strategic use of things like color, **size of elements, special position**, and text, it is so clear to the audience how to interact with the data visualization that they don't even notice the design."
- We can leverage visual affordances to indicate to our audience how to use and interact with our visualizations.
  1) Highlight the important stuff
  2) *Eliminate distractions*
  3) Create a clear hierarchy of information

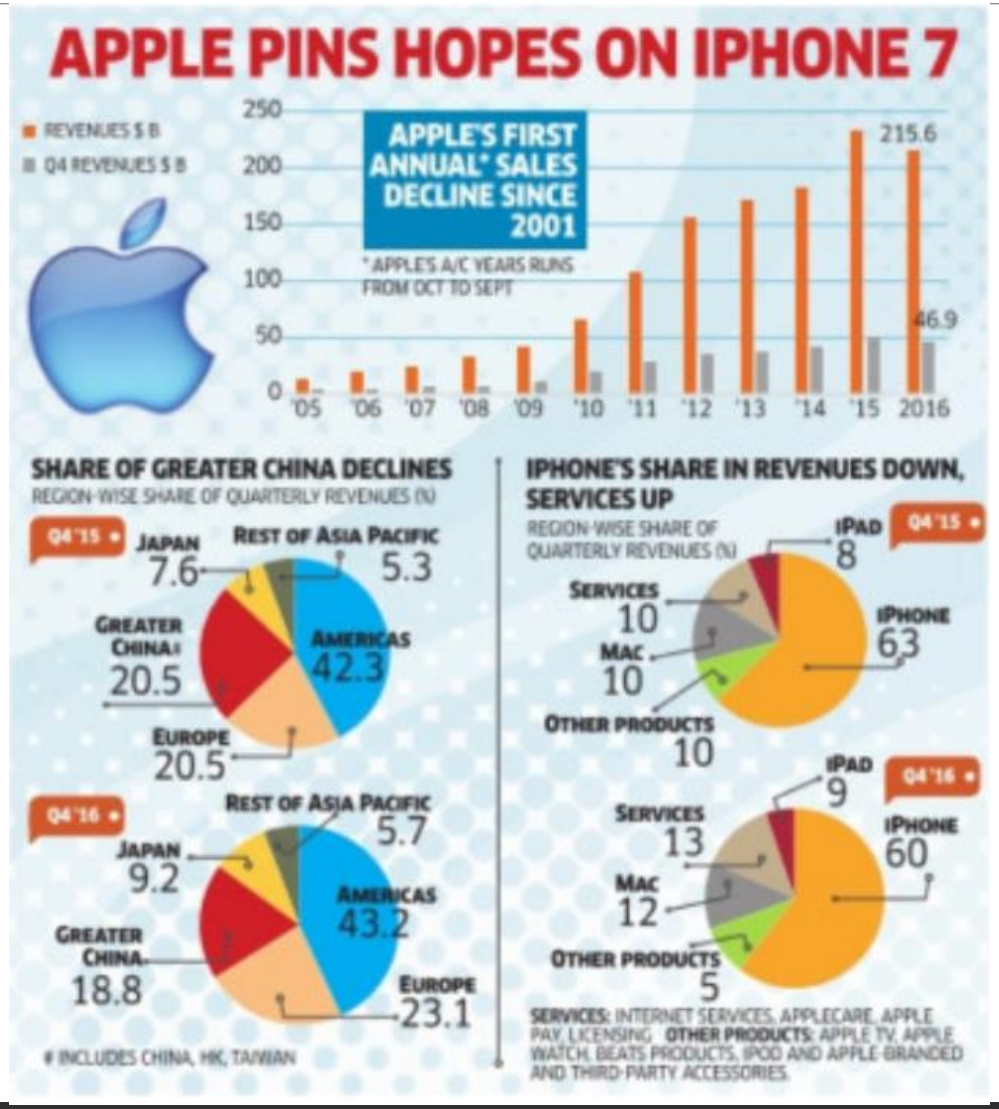
Highlight the important stuff

- At most **10%** of the visual design should be highlighted [Lidwell et al. , 2003].
- **Bold**, *italics*, and underlining: use for short word sequences
  - Bold: preferred, minimal noise
  - Italics: less legible
  - Underlining: adds noise, compromises legibility, use sparingly
- CASE and typeface
  - Uppercase: **suitable only for short word sequences**, easily scanned
  - Avoid using different fonts: not easily noticed, doesn't look good

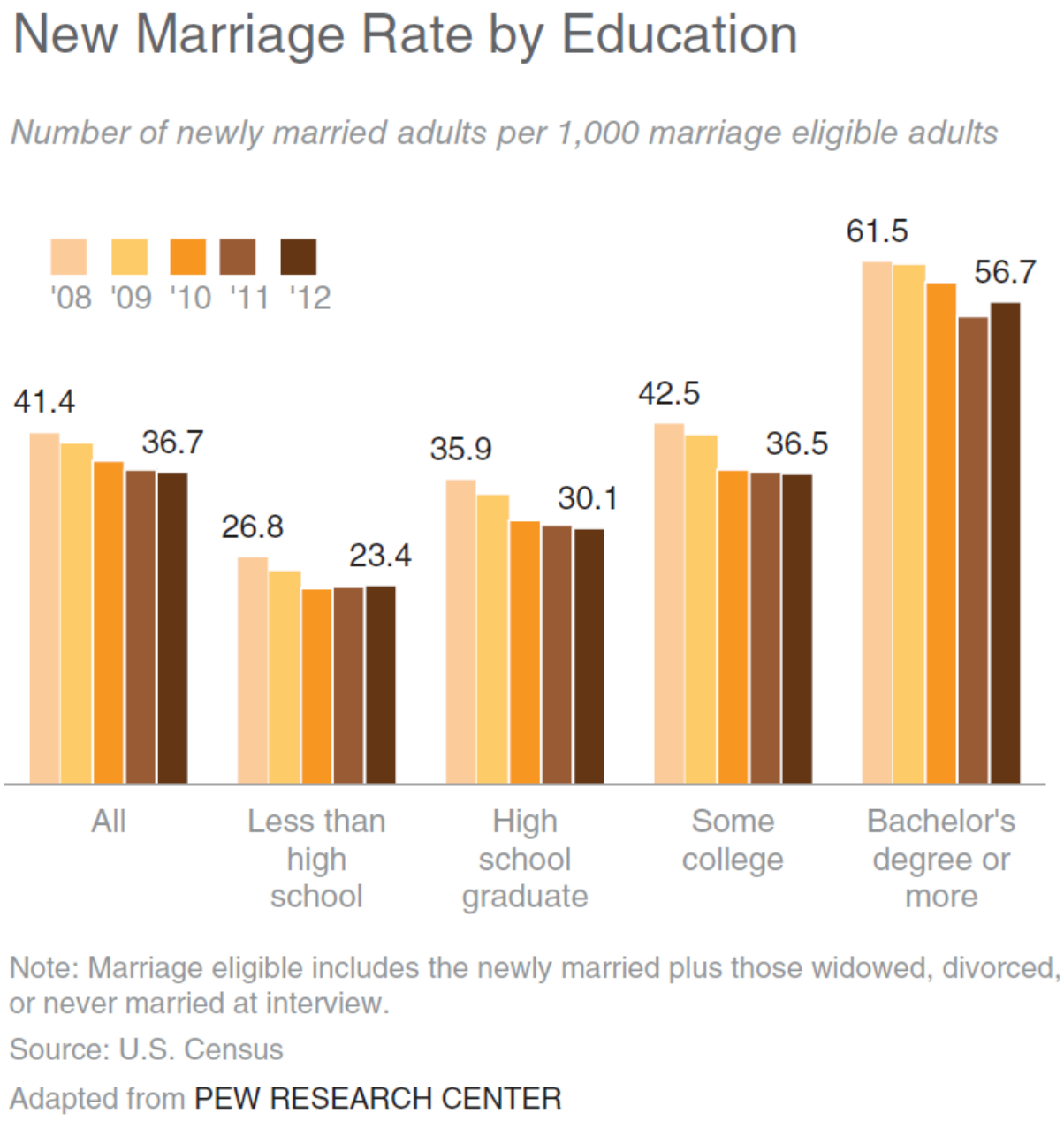
Highlight the important stuff (cont.)

- Color: use sparingly
  - The color is one of the most powerful preattentive attributes and when used wisely, it can drive our reader's attention to where we want them to focus on.
- Inversing elements
  - Effective for attracting attention, but adds considerable noise; use sparingly
- Size: Effective for attracting attention
- Blinking and flashing: annoying?

In Class Example



Highlight the important stuff in action



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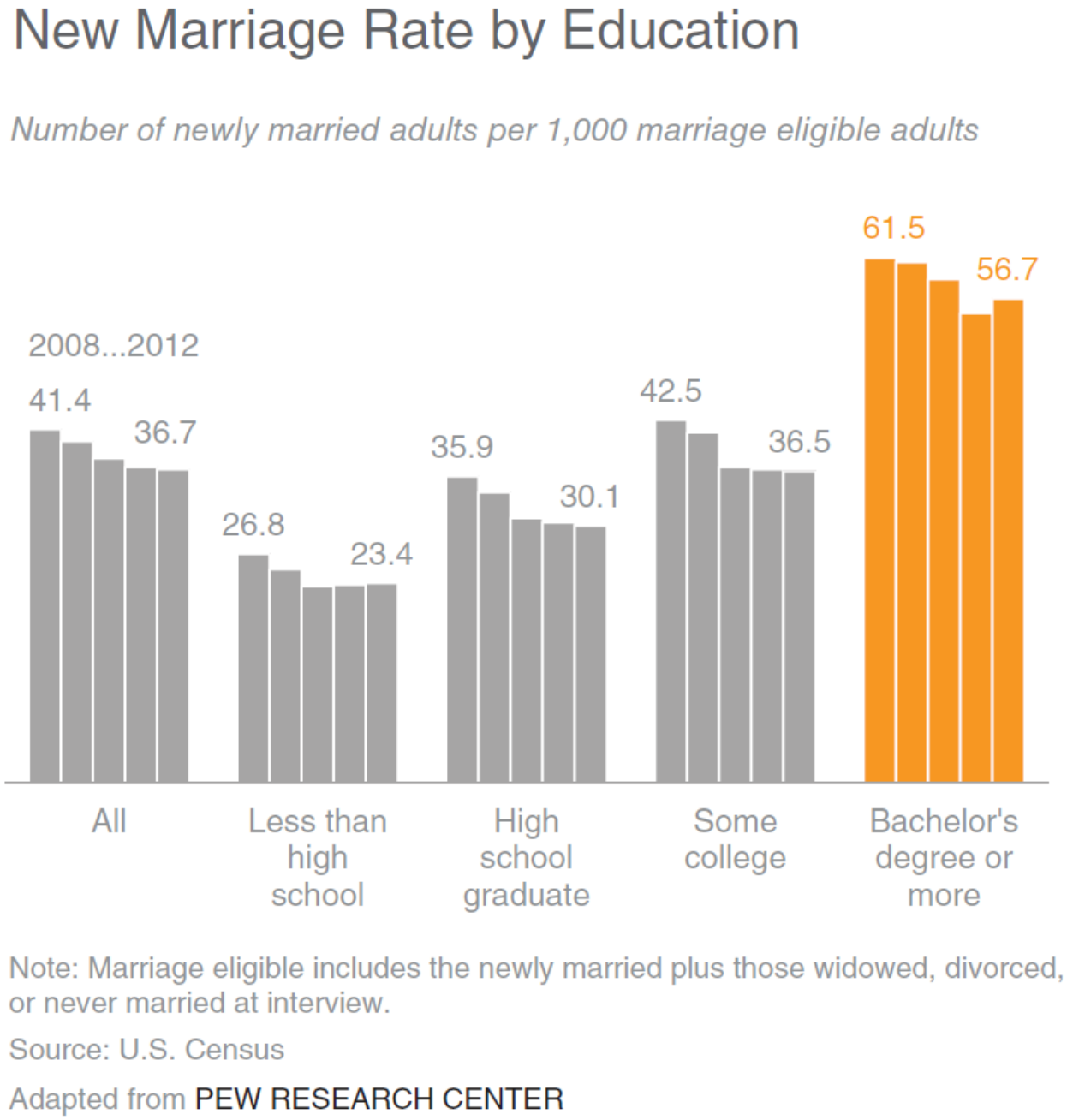
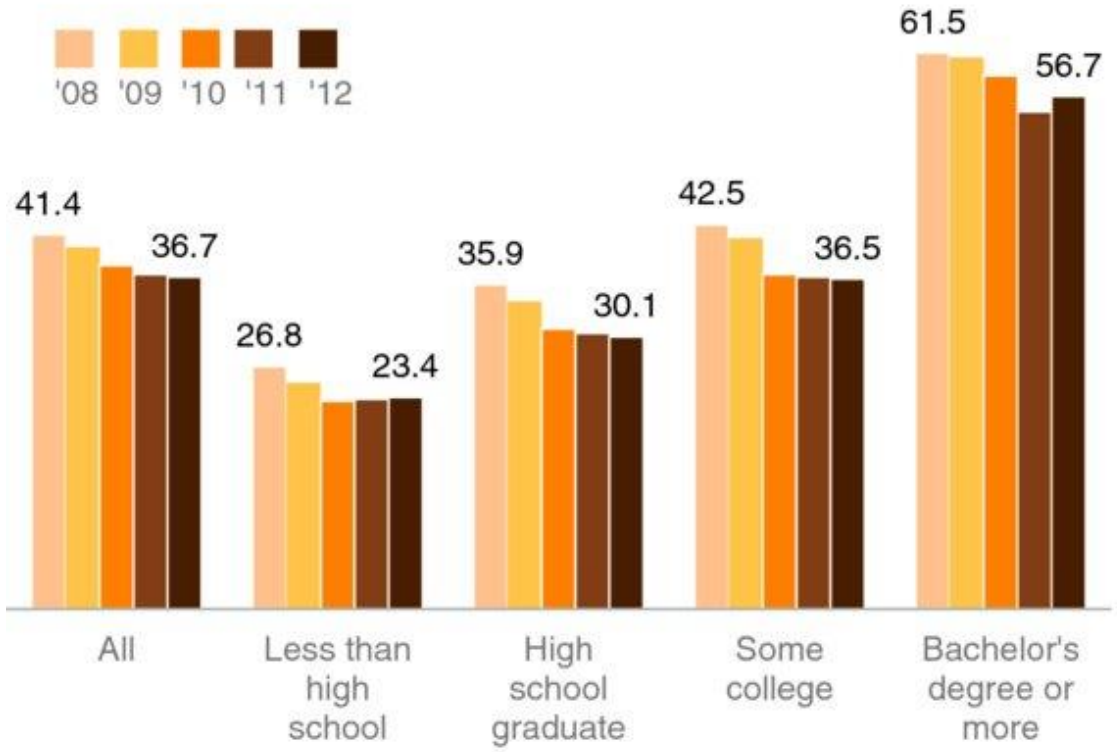


New Marriage Rate by Education

Number of newly married adults per 1,000 marriage eligible adults



Note: Marriage eligible includes the newly married plus those widowed, divorced, or never married at interview.

Source: U.S. Census

Adapted from **PEW RESEARCH CENTER**

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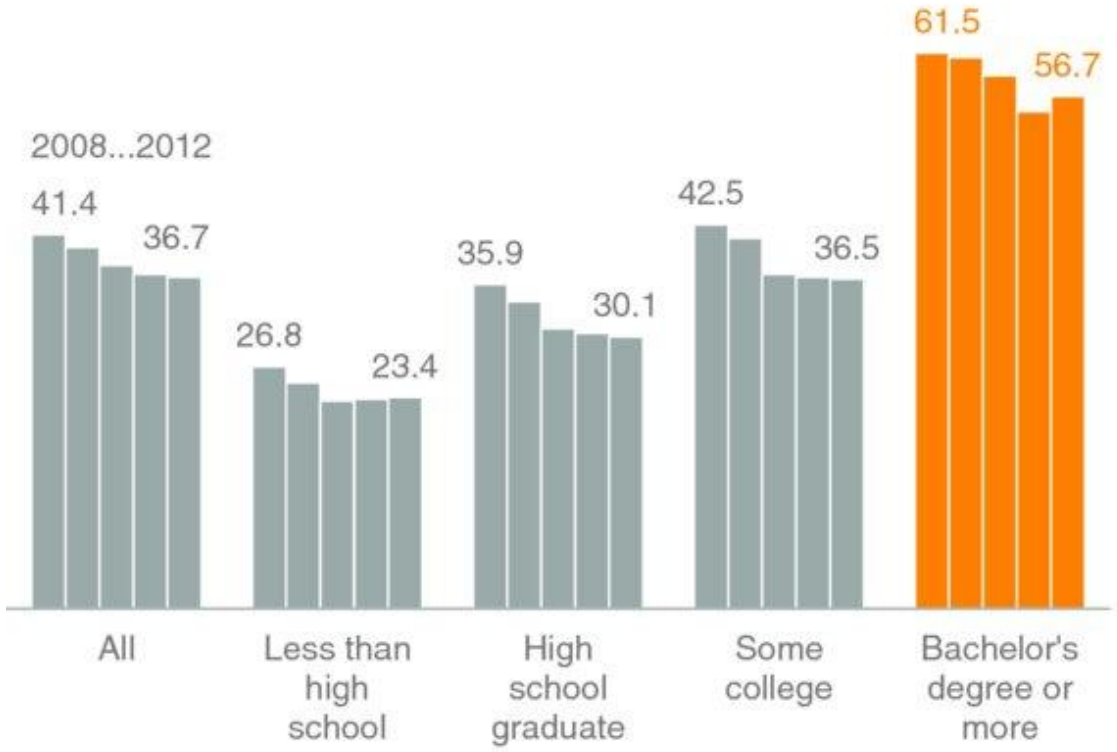

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Adapted from **PEW RESEARCH CENTER**

Eliminate distractions

- "You know you've achieved perfection, not when you have nothing more to add, but when you have nothing to take away"
  - Airman's Odyssey, Antoine de Saint-Exupery (Saint-Exupery, 1943)

- Clutter vs. Context
  - Context :
    - What needs to be present for your audience to make sense of the visual
  - Clutter:
    - What takes up space but doesn't add information to the visual
    - Are elements present that distract from the main message?

Eliminate distractions (In Specific)

- Not all data are equally important.
- When detail isn’t needed, summarize.
- Ask yourself: would eliminating this change anything?
- Push necessary, but non-message-impacting items to the background.

Eliminate distractions

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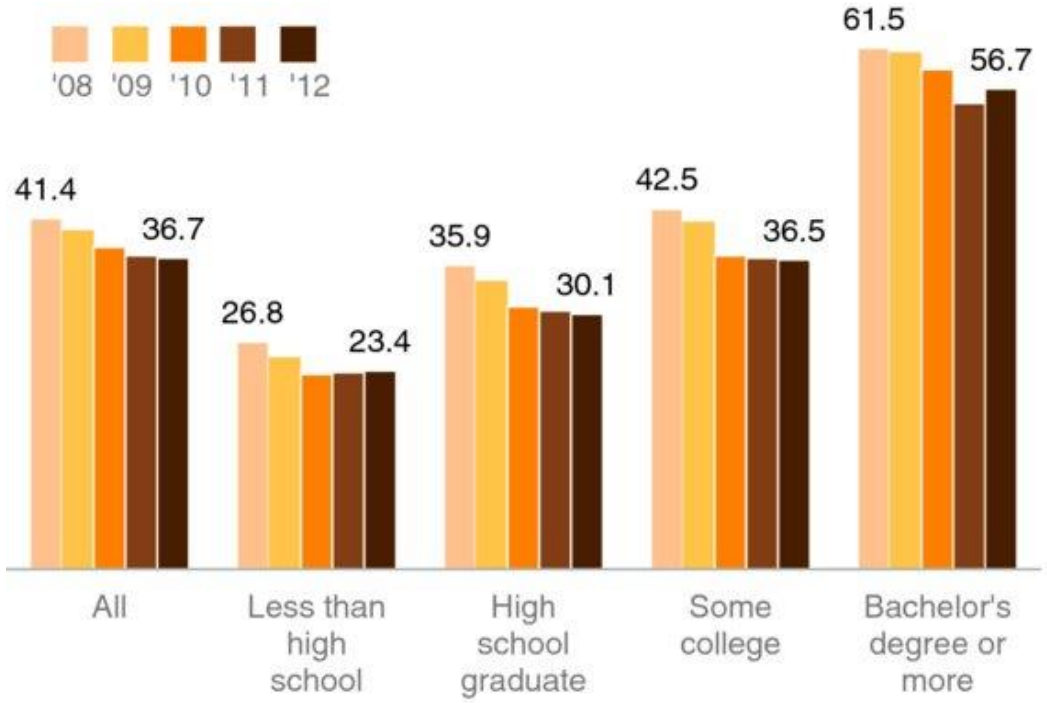

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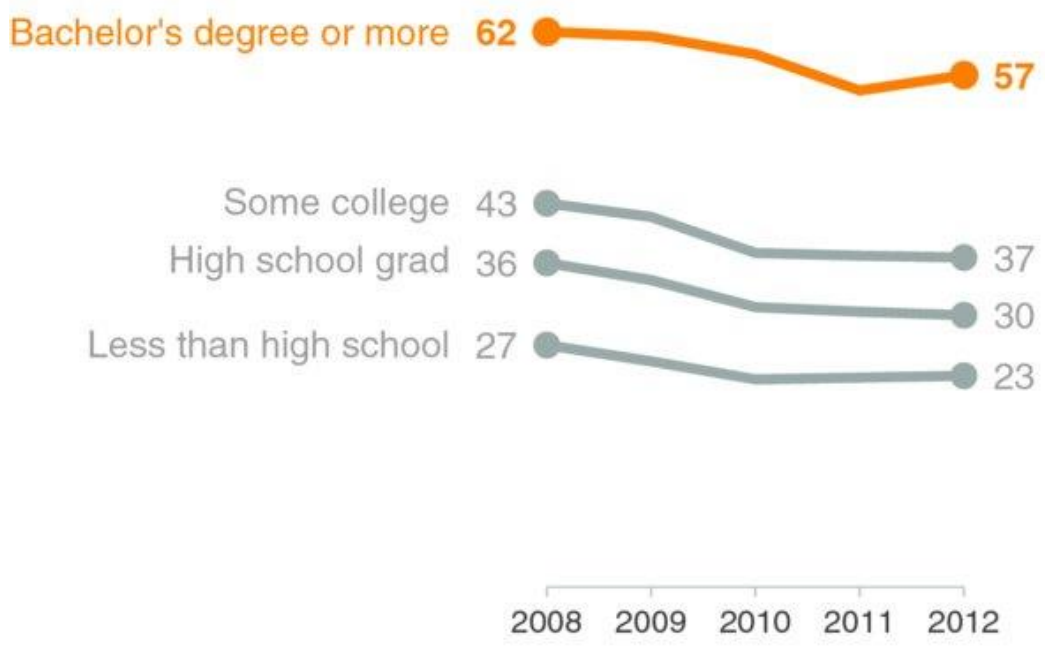

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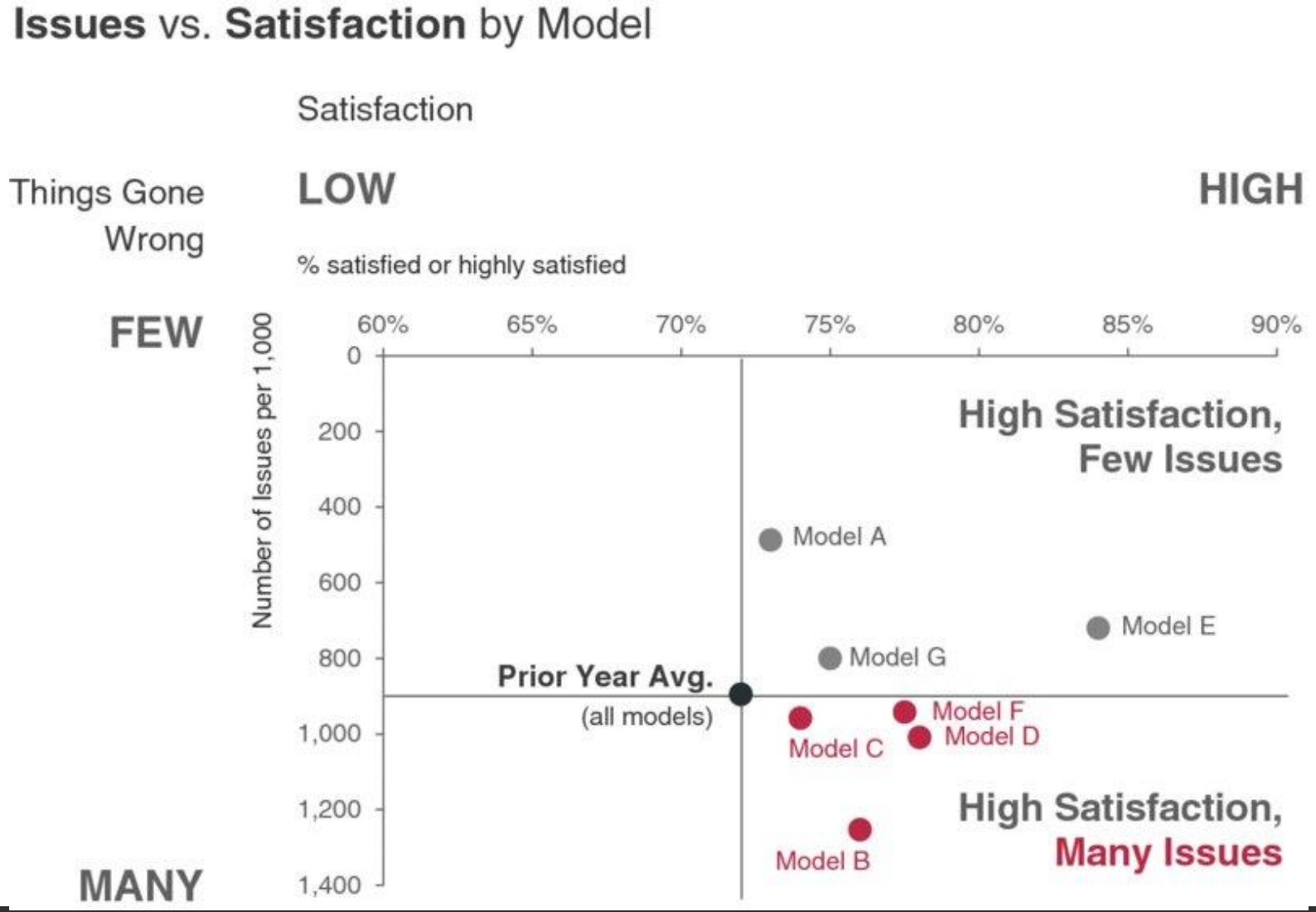
Source: U.S. Census

Adapted from PEW RESEARCH CENTER

Create a clear visual hierarchy of information

- **What is the Hierarchy:**
  - The sequence that we expect the audience to go through in our visual graph is the hierarchy that we have designed in the graph.
  - This is a key element of visualization because people can know what to do without any further instructions.
  - ***"Visual hierarchy controls the delivery of the experience. If you have a hard time figuring out where to look on a page, it's more than likely that its layout is missing a clear visual hierarchy."*** - *Nielsen Norman*
- **Tools for Hierarchy:**
  - To set up a hierarchy, we can firstly use different **sizes and colors** and they would tell the audience where to start reading and what is the order.
  - We can also highlight the most important part, and this helps the audience quickly process the information.

Create a clear visual hierarchy



- Use pre-attentive attributes
- Use groups or super-categories (hierarchical organization)

Accessibility

Accessibility

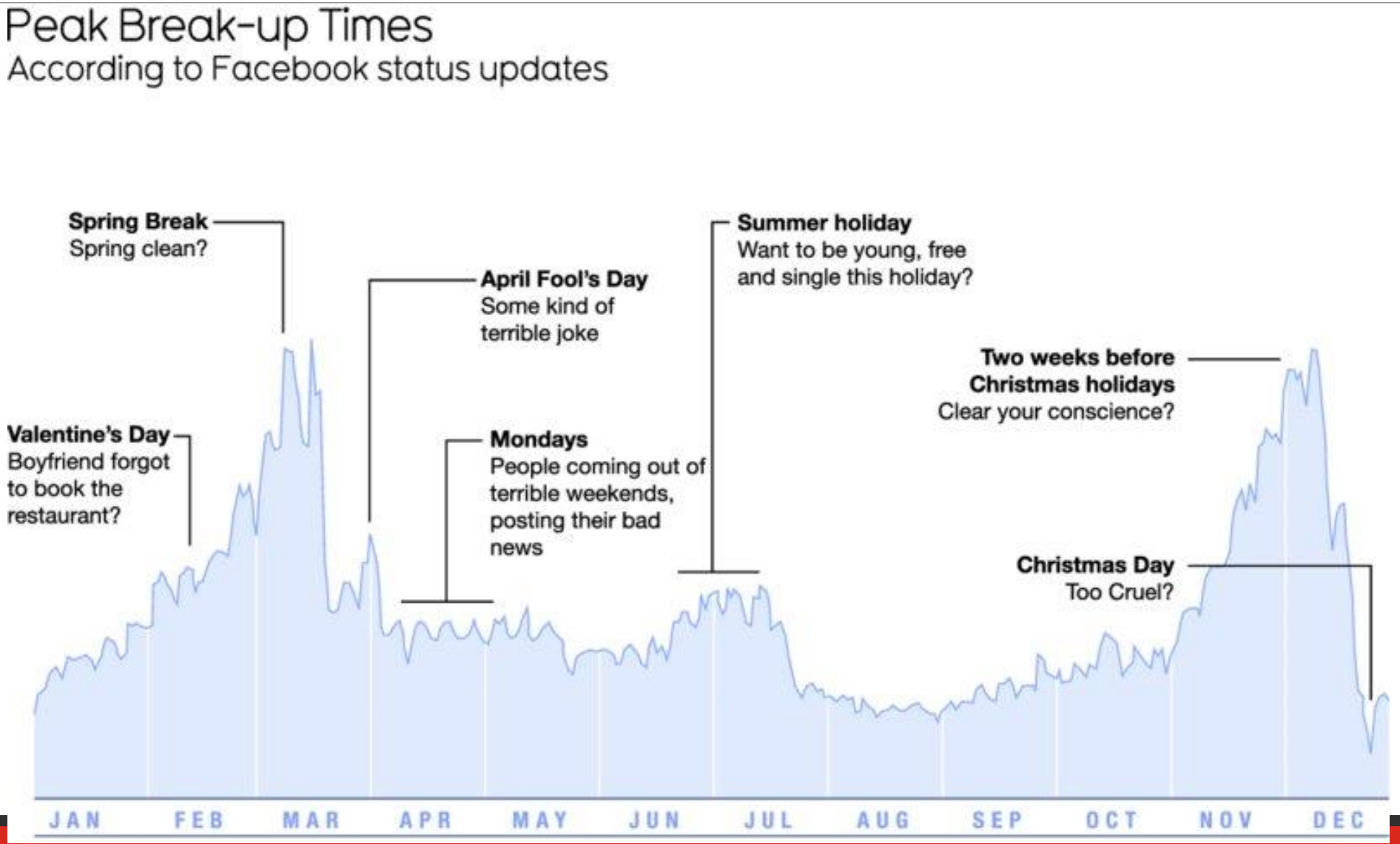
- Definition: Designs should be usable by people of diverse abilities
- In Data Visualization: The design should be usable (understandable) by people of widely varying technical skills.

Accessibility

- Don’t overcomplicate! : More complicated visual ➔longer it takes to understand ➔ less likely to spend time to understand the visual
- Make it legible and clean: Use an easy-to-read font (Arial, Calibri work great)
- Use straightforward language: Use simple language over complex wording
- Remove unnecessary complexity: when making a choice between simple and complicated, favor simple.
- Text is your friend: Label, introduce, explain, reinforce, highlight, recommend, and tell a story

The power of annotation

Accessibility in Data Visualization

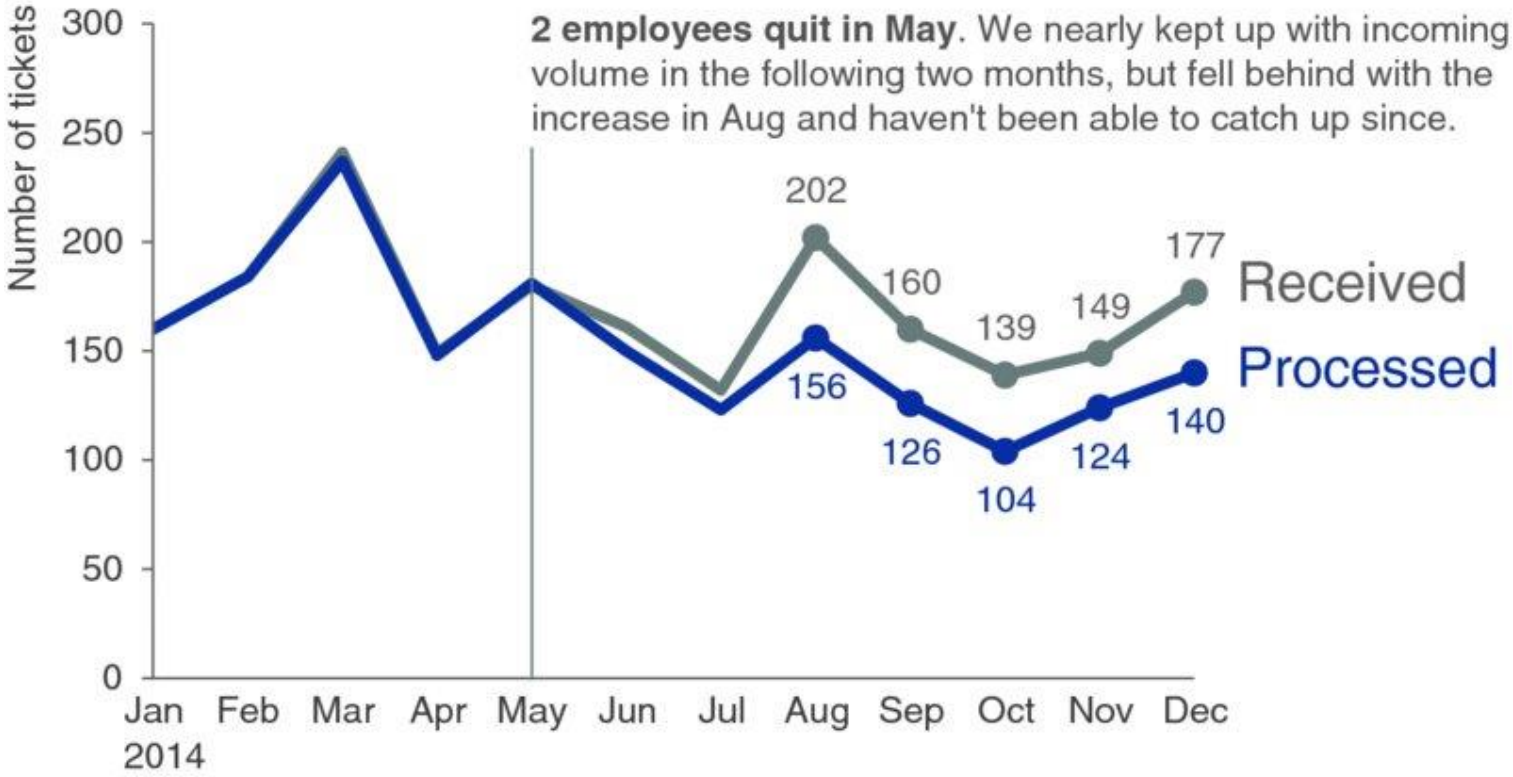


Accessibility

Please approve the hire of 2 FTEs

to backfill those who quit in the past year

Ticket volume over time



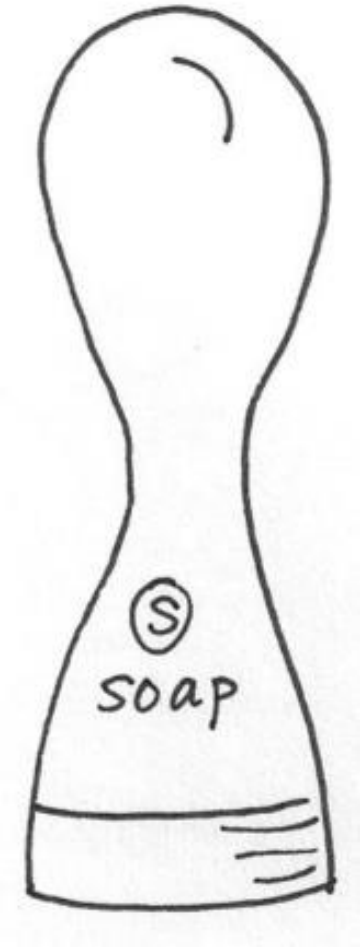
Data source: XYZ Dashboard, as of 12/31/2014 I A detailed analysis on tickets processed per person and time to resolve issues was undertaken to inform this request and can be provided if needed.

Aesthetics

Aesthetics

- Make it pretty!

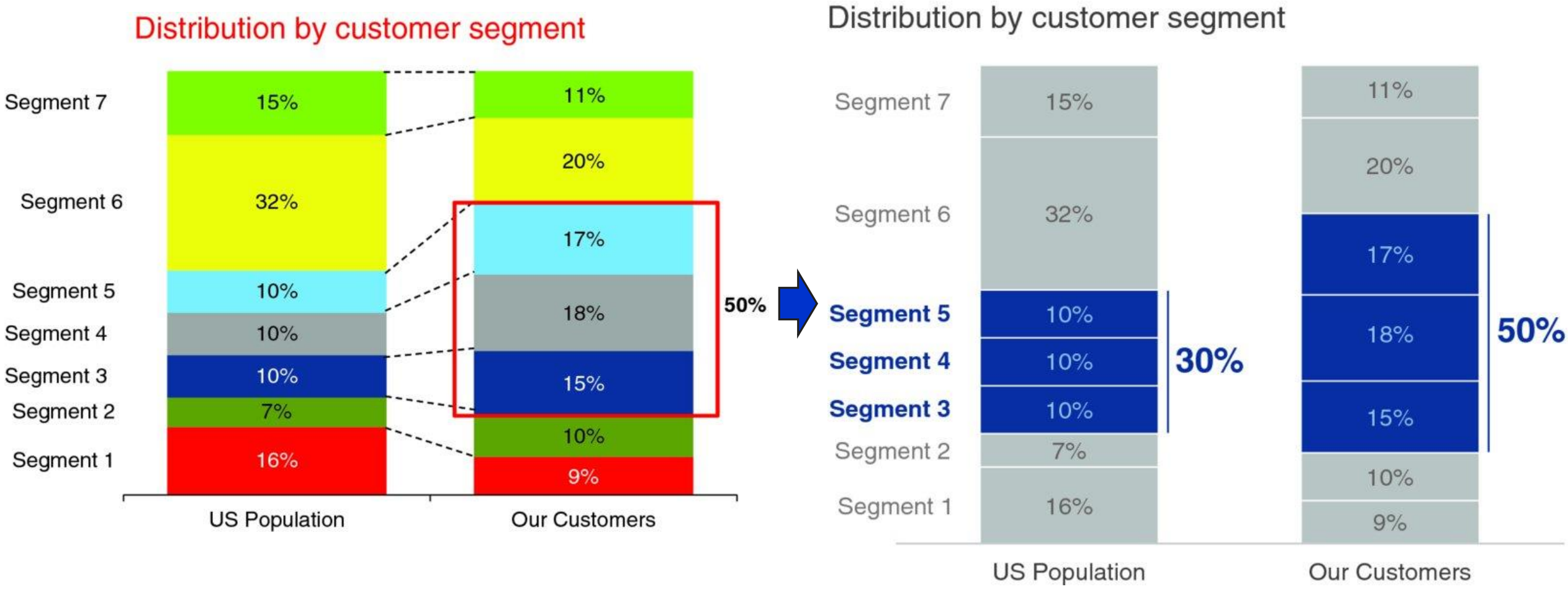
- Aesthetic designs
  - Perceived as easier to use,
  - More readily accepted and used over time,
  - Promote creative thinking and problem solving,
  - Foster positive relationships, making people more tolerant of problems with designs



Aesthetics in Data Visualization

- **Be smart with color:** The use of color should always be an intentional decision
- **Pay attention to alignment:** Organize elements on the page to create clean vertical and horizontal lines to establish a sense of unity and cohesion.
- **Leverage white space:** Preserve margins; don't stretch your graphics to fill the space or add things simply because you have extra space.

Aesthetics in Action



Acceptance

Acceptance

- A design must be accepted by its intended audience.
- Human nature to experience discomfort with change.

Strategies to gain acceptance

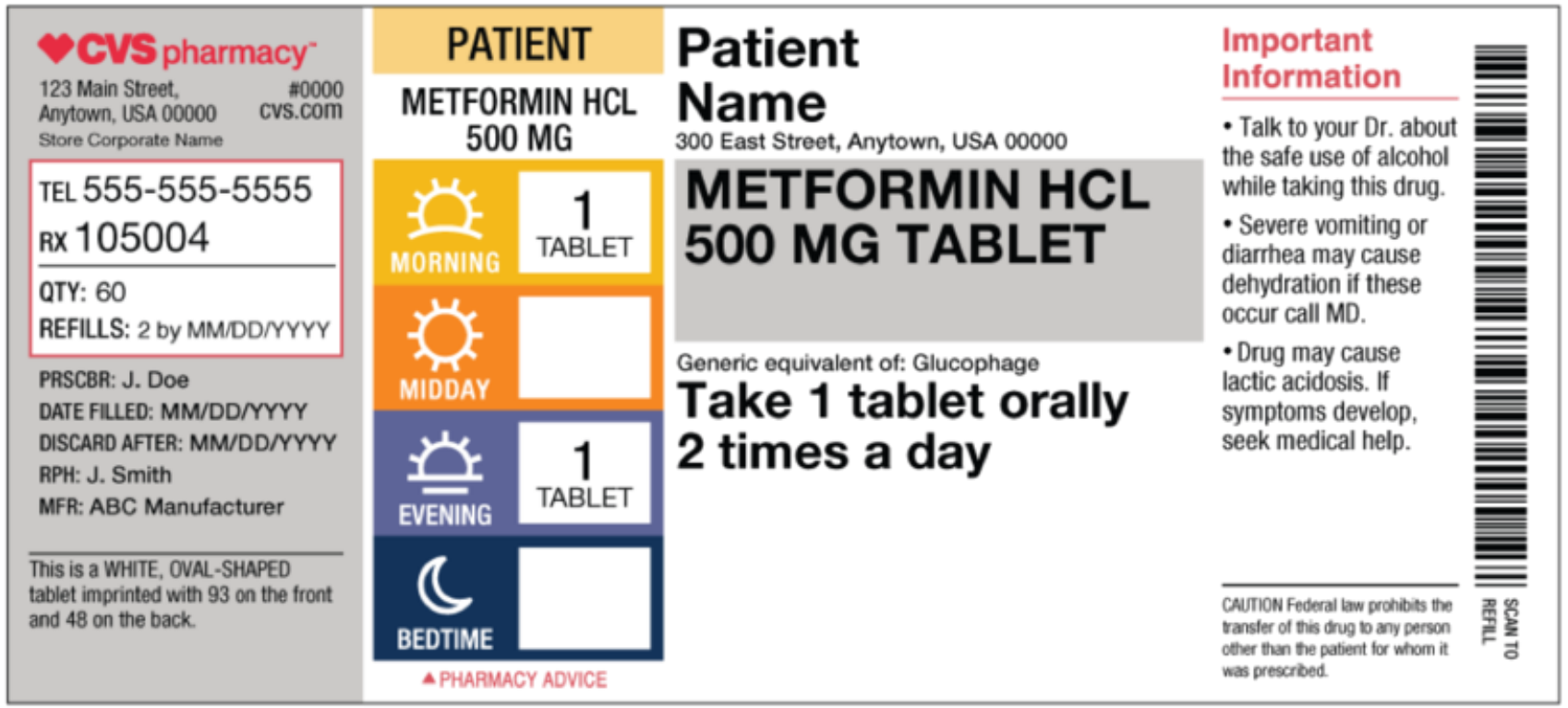
- **Articulate the benefits of the new or different approach:** Sometimes simply giving people transparency into *why* things will look different going forward can help them feel more comfortable
- **Show the side-by-side:** If the new approach is clearly superior to the old, showing them side-by-side will demonstrate this.
- **Provide multiple options and seek input:** Rather than prescribing the design, consider creating several options and getting feedback from colleagues or your audience
- **Get a vocal member of your audience on board:** Identify influential members of your audience and talk to them one-on-one to gain acceptance of your design.

Example

http://www.storytellingwithdata.com/blog/2020/5/3/swdchallenge-think-like-a-designer

Clear refill details make re-ordering a snap

Simplified dosage schedule for clearer directions



Easy-to-find prescription information

Color-coded icons for times of day

Larger text for increased readability

References and Resources

- [Knaflic] Cole Nussbaumer Knaflic, **Storytelling with Data: A Data Visualization Guide for Business Professionals**, Wiley, 2017
  - Available online through Seneca Libraries: https://senecacollege-primo.hosted.exlibrisgroup.com/permalink/f/t3376v/01SENC_ALMA5146374280003226
- [Ryan] Lindy Ryan, **Visual Data Storytelling with Tableau**, Pearson Addison-Wesley, 2018
  - Available online through Seneca Libraries: https://senecacollege-primo.hosted.exlibrisgroup.com/permalink/f/t3376v/01SENC_ALMA5167006190003226
- [Healy] Kieran Healy, **Data Visualization: A Practical Introduction**, Princeton University Press, 2018.
  - Available (hardcopy) at Seneca Libraries: https://senecacollege-primo.hosted.exlibrisgroup.com/permalink/f/t3376v/01SENC_ALMA2172469250003226
- **A Reader on Data Visualization:** https://mschermann.github.io/data_viz_reader/
- **Data visualization:** https://en.wikipedia.org/wiki/Data_visualization
- **Section 5: Data concepts** https://www.statcan.gc.ca/eng/dli/guide/section5