Principles of Effective Dashboard Design

March 16, 2022

DATA 551 - Lecture 8

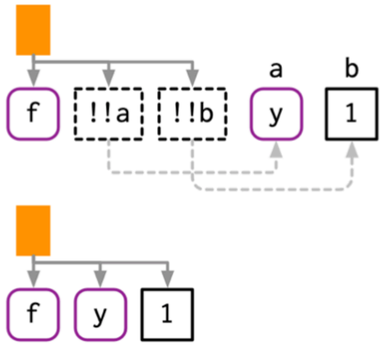
Part 0: Couple of R Tips I forgot to talk about…

```r
make_graph <- function(years = c(1952, 2007),
                       continents = all_continents,
                       yaxis = "gdpPercap"){

  # gets the label matching the column value
  y_label <- yaxisKey$label[yaxisKey$value==yaxis]

  #filter our data based on the year/continent selections
  data <- gapminder %>%
    filter(year >= years[1] & year <= years[2]) %>%
    filter(continent %in% continents)

  # make the plot!
  # on converting yaxis string to col reference (quosure) by `!!sym()`
  # see: https://github.com/r-lib/rlang/issues/116#issuecomment-298969559
  #
  # `sym()` turns strings (or list of strings) to symbols
  # (https://www.rdocumentation.org/packages/rlang/versions/0.2.2/topics/sym)
  #
  # `paste` concatenates vectors after converting to characters
  # (https://www.rdocumentation.org/packages/base/versions/3.6.1/topics/paste)

  p <- ggplot(data, aes(x = year, y = !!sym(yaxis), colour = continent,
                        text = paste('continent: ', continent,
                                     '</br></br></br> Year:', year,
                                     '</br></br></br> GDP:', gdpPercap))) +
    geom_point(alpha = 0.6) +
    scale_color_manual(name = 'Continent', values = continent_colors) +
    scale_x_continuous(breaks = unique(data$year))+
    xlab("Year") +
    ylab(y_label) +
    ggtitle(paste0("Change in ", y_label, " Over Time")) +
    theme_bw()

  # passing c("text") into tooltip only shows the contents of
  ggplotly(p, tooltip = c("text"))
}
```

!! - bang bang and sym

As well as call objects, `!!` also works with symbols and constants:

```r
a <- sym("y")
b <- 1
expr(f(!!a, !!b))
#> f(y, 1)
```



Source: Advanced R

```r
make_graph <- function(years = c(1952, 2007),
                       continents = all_continents,
                       yaxis = "gdpPercap"){

  # gets the label matching the column value
  y_label <- yaxisKey$label[yaxisKey$value==yaxis]

  #filter our data based on the year/continent selections
  data <- gapminder %>%
    filter(year >= years[1] & year <= years[2]) %>%
    filter(continent %in% continents)

  # make the plot!
  # on converting yaxis string to col reference (quosure) by `!!sym()`
  # see: https://github.com/r-lib/rlang/issues/116#issuecomment-298969559
  #
  # `sym()` turns strings (or list of strings) to symbols
  # (https://www.rdocumentation.org/packages/rlang/versions/0.2.2/topics/sym)
  #
  # `paste` concatenates vectors after converting to characters
  # (https://www.rdocumentation.org/packages/base/versions/3.6.1/topics/paste)

  p <- ggplot(data, aes(x = year, y = !!sym(yaxis), colour = continent,
                        text = paste('continent: ', continent,
                                     '</br></br></br> Year:', year,
                                     '</br></br></br> GDP:', gdpPercap))) +
    geom_point(alpha = 0.6) +
    scale_color_manual(name = 'Continent', values = continent_colors) +
    scale_x_continuous(breaks = unique(data$year))+
    xlab("Year") +
    ylab(y_label) +
    ggtitle(paste0("Change in ", y_label, " Over Time")) +
    theme_bw()

  # passing c("text") into tooltip only shows the contents of
  ggplotly(p, tooltip = c("text"))
}
```

```r
# First example

paste("file", "number", "32")

[1] "file number 32"

# Second example

paste("file", "number", "32", sep = "_")

[1] "file_number_32"
```

Paste and Paste0: R-bloggers

```r
make_graph <- function(years = c(1952, 2007),
                       continents = all_continents,
                       yaxis = "gdpPercap"){

  # gets the label matching the column value
  y_label <- yaxisKey$label[yaxisKey$value==yaxis]

  #filter our data based on the year/continent selections
  data <- gapminder %>%
    filter(year >= years[1] & year <= years[2]) %>%
    filter(continent %in% continents)

  # make the plot!
  # on converting yaxis string to col reference (quosure) by `!!sym()`
  # see: https://github.com/r-lib/rlang/issues/116#issuecomment-298969559
  #
  # `sym()` turns strings (or list of strings) to symbols
  # (https://www.rdocumentation.org/packages/rlang/versions/0.2.2/topics/sym)
  #
  # `paste` concatenates vectors after converting to characters
  # (https://www.rdocumentation.org/packages/base/versions/3.6.1/topics/paste)

  p <- ggplot(data, aes(x = year, y = !!sym(yaxis), colour = continent,
                        text = paste('continent: ', continent,
                                     '</br></br></br> Year:', year,
                                     '</br></br></br> GDP:', gdpPercap))) +
    geom_point(alpha = 0.6) +
    scale_color_manual(name = 'Continent', values = continent_colors) +
    scale_x_continuous(breaks = unique(data$year))+
    xlab("Year") +
    ylab(y_label) +
    ggtitle(paste0("Change in ", y_label, " Over Time")) +
    theme_bw()

  # passing c("text") into tooltip only shows the contents of
  ggplotly(p, tooltip = c("text"))
}
```

```r
# Value of sep: ""
name_village <- paste("Ma", "con", "do", sep = "")
name_village
[1] "Macondo"

# Default value of sep with paste function
name_village <- paste0("Ma", "con", "do")
name_village
[1] "Macondo"
```

Paste and Paste0: R-bloggers

40 minutes

Part 1: Dashboards & Principles of Effective Dashboard Design

The “laws” of crappy dashboards

Source: http://attackwithnumbers.com/the-laws-of-shitty-dashboard

Law 1	Most software dashboards are crappy
Law 2	If it’s called “Dashboard”, it’s probably crappy
Law 3	If you don’t know what to take away from your dashboard, your users will definitely not
Law 4	Not talking to users will result in a crappy dashboard
Law 5	Give users **full control** of your dashboard, and users will **fully break** it
Law 6	Just because it was useful in a Powerpoint doesn’t mean it’s useful on a dashboard
Law 7	Just because it moves, does not mean it’s not crappy

Purpose-Driven Dashboards

Before you build a dashbard, make sure it has a purpose!

Do not build one just for the sake of building one and contribute more noise!

Questions to ask yourself:

- What is the research question?
- What is the business question?
- Who will use it (audience matters, a lot!)
- How long will they use it (one-time thing vs. continued use) ?
- Do you have time to build it, maintain it, and make it effective?

Rocketship

Search...

Feedback about this page?

- Home
- Payments
- Customers
- Products
- Reports
- Apps
- Developers
- Viewing test data

- Settings

Today

Net volume $456,581.14

Yesterday $253,702.97

USD Balance $5,383.52
Available to pay out
View detail

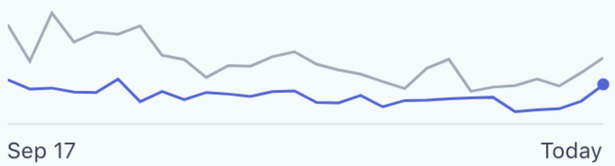
Payouts $229,069.82
Expected tomorrow
View detail

Analytics

4w | Sep 17, 2019 → Oct 14, 2019 vs. Aug 20, 2019 → Sep 16, 2019 | Daily | Customize

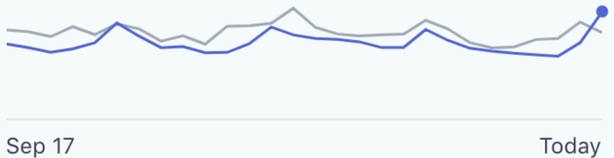
Gross volume −12.0%
$7.71M $8.76M

Connect gross volume −55.8%
$80,414.04 $182.0K



Net volume from sales −12.4%
$7.31M $8.34M

New customers −12.3%
128.4K 146.5K



New connected accounts −93.3%
1 15

Successful payments −10.4%
154.5K 172.6K

Source: Stripe docs

Rocketship

Search...

Feedback about this page?

- Home
- Payments
- Customers
- Products
- Reports
- Apps
- Developers
- Viewing test data

- Settings

✅

Today

Net volume $456,581.14

Yesterday $253,702.97

❗ y-axis ticks

USD Balance $5,383.52 View detail

Available to pay out

Payouts $229,069.82 View detail

Expected tomorrow

✅

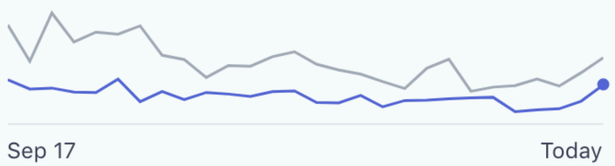
Analytics

4w | Sep 17, 2019 → Oct 14, 2019 | vs. | Aug 20, 2019 → Sep 16, 2019 | Daily ✅ ✅ Customize

✅

Gross volume −12.0% $7.71M $8.76M

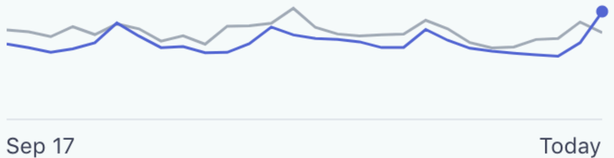
Connect gross volume −55.8% $80,414.04 $182.0K



Net volume from sales −12.4% $7.31M $8.34M

✅

New customers −12.3% 128.4K 146.5K



New connected accounts −93.3% 1 15

Successful payments −10.4% 154.5K 172.6K

Source: Stripe docs

Purpose-Driven Dashboards

Should Prison Sentences Be Based On Crimes That Haven't Been Committed Yet?

By Anna Maria Barry-Jester, Ben Casselman and Dana Goldstein

Graphics by Matthew Conlen, Reuben Fischer-Baum and Andy Rossback

Filed under Criminal Justice

Published Aug. 4, 2015

Principles of Effective Visualizations

Principle	Definition	Examples
• Proportional Ink	The amount of ink used to indicate a value should be proportional to the value itself.	Truncating the y-axis on a bar chart to exaggerate the difference between bars violates the principle of proportional ink.
• Data:ink ratio	Remove distracting visual elements to focus attention on the data	Lighten line weights, remove backgrounds, never use 3D or special effects, ~~remove~~ avoid unnecessary/redundant labels.
• Labels & legends	Use axes labels and titles to highlight/ communicate data	Never leave your data column names as axes labels! Generally good to add a title.
• Overplotting	With large datasets, points overlap, resulting in large clouds of data	To fix overplotting, could plot just a sample subset of the data, use alpha, and use smaller points. Or, jitter - but check if appropriate!
• Visualization choice	Must be informed by the **data** you have, the **research question** being asked and the **audience** that cares.	Pick the simplest plot that best shows most/all of the data needed to answer the research question. If you only have summary statistics, cannot show distributions. Tailor the visualization to your audience (within reason) but don't dumb it down.
• Colour & Accessibility	Colour can be used to encode information or for aesthetics/style/ design. However, colour can also be distracting if used inappropriately or poorly.	Choose a perceptually uniform colour palette; can be sequential or diverging for quantitative data. Opt for colour-blind friendly palettes. Categorical data can use qualitative colour schemes.

Principles of Effective Visualizations

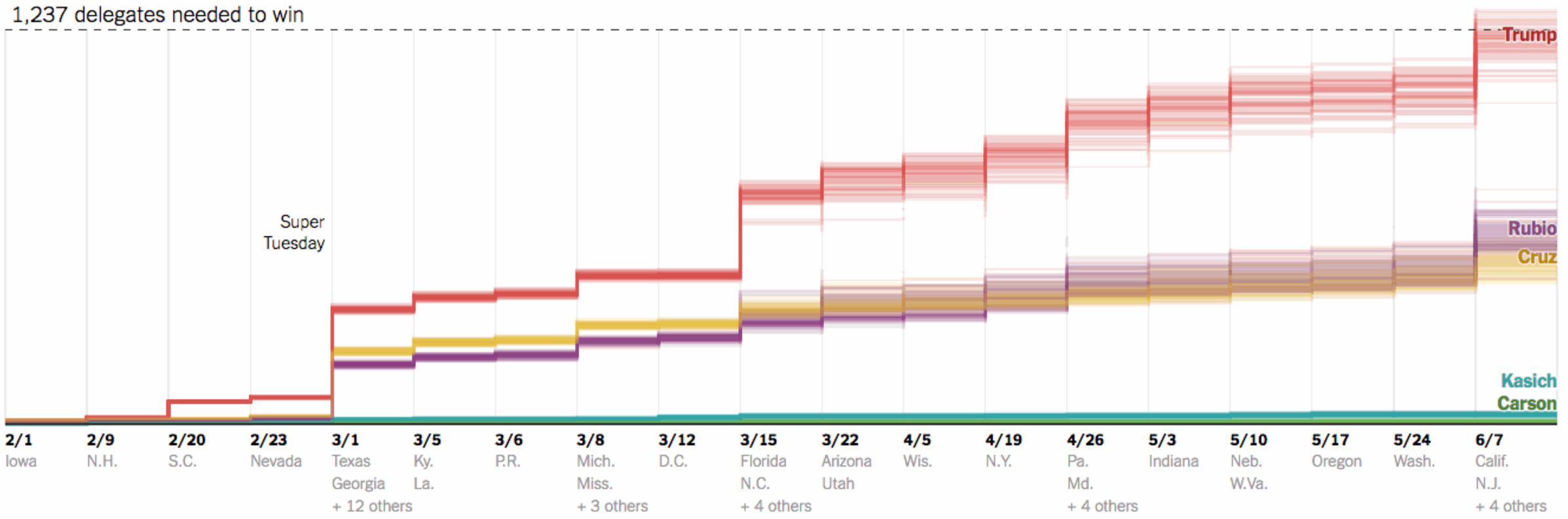
Principle	Definition	Examples
• Proportional Ink	The amount of ink used to indicate a value should be proportional to the value itself.	Truncating the y-axis on a bar chart to exaggerate the difference between bars violates the principle of proportional ink.
• Data:ink ratio	Remove distracting visual elements to focus attention on the data	Lighten line weights, remove backgrounds, never use 3D or special effects, ~~remove~~ avoid unnecessary/redundant labels.
• Labels & legend		ur data column names as axes erally good to add a title.
• Overplotting		ting, could plot just a sample ta, use alpha, and use smaller er - but check if appropriate!
• Visualization choice	Must be informed by the **data** you have, the **research question** being asked and the **audience** that cares.	plot that best shows most/all of the data needed to answer the research question. If you only have summary statistics, cannot show distributions. Tailor the visualization to your audience (within reason) but don't dumb it down.
• Colour & Accessibility	Colour can be used to encode information or for aesthetics/style/ design. However, colour can also be distracting if used inappropriately or poorly.	Choose a perceptually uniform colour palette; can be sequential or diverging for quantitative data. Opt for colour-blind friendly palettes. Categorical data can use qualitative colour schemes.

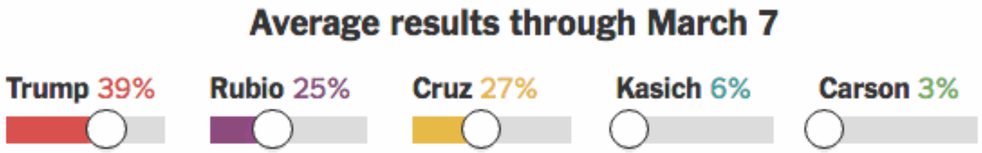
Follow these principles
and you will be 80% there
to making an effective dashboard !!

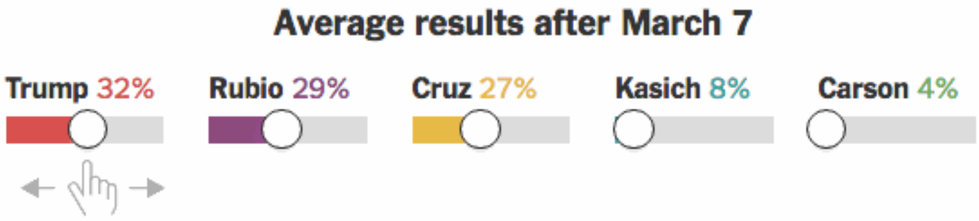
Principles of Effective Dashboards

Principle	Explanation
Audience Matters (a lot!)	You may need to build dashboards with different views: - one for a manager/executive - one for yourself to explore and understand the data - one for the public
Purpose-driven Dashboards	Every dashboard should have a purpose! Resist the idea to bake in the “purpose” as a dropdown or menu option. What are the usage scenarios? List your intent/purpose in your dashboard!
Choose defaults wisely	Interactivity with your dashboard should **NOT** be mandatory! When your audience first arrive at your app, self-sufficient.
Less is more	Resist the urge to “plot everything in every way for every category/option/filter. Go back to the “purpose” of the dashboard, make sure you stay true to that. Put cool charts you want people to look at in an appendix, or build a second app.
Add a narrative and signposts	Have a conversation with your reader, add sign-posts, consider adding a “reset/home/defaults” button so they can always get back to the main point if they mess around too much.
Aesthetics matter!	Styling, branding, colour schemes (including colour-blind friendly), typography, layout, user interface (UI) and experience (UX) matter! Think hard about them and make good choices. Find the right balance between aesthetics and functionality.

Purpose of Interactivity & Dashboards

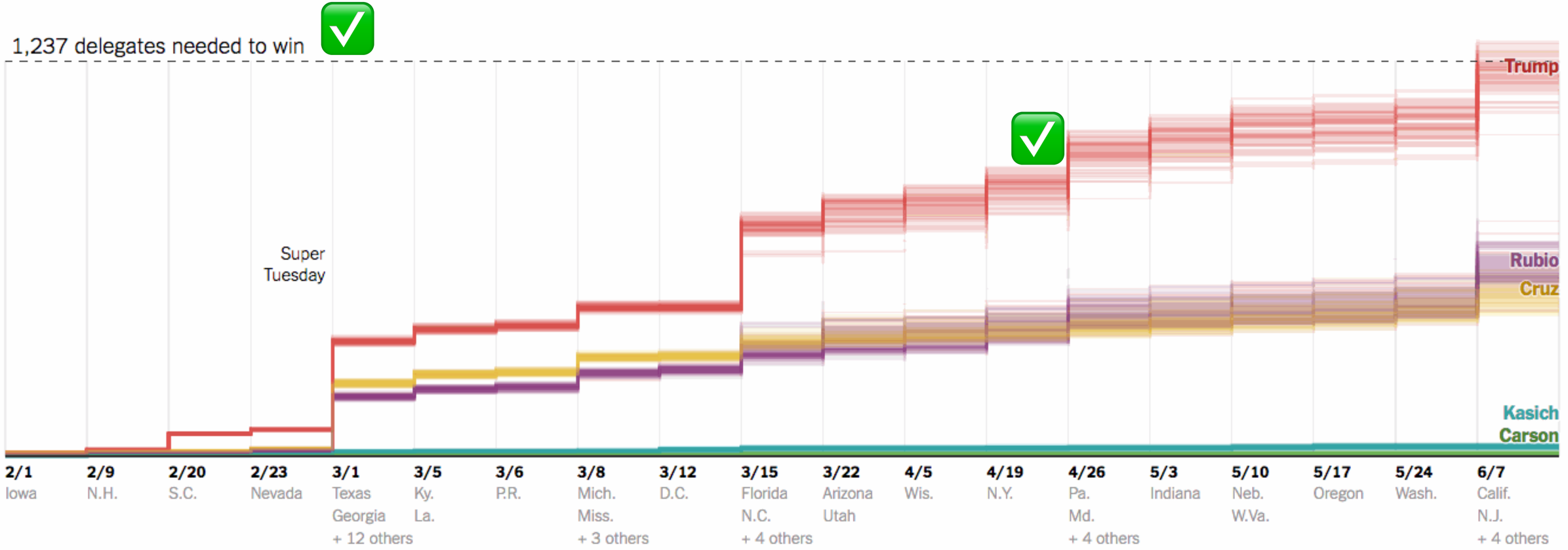


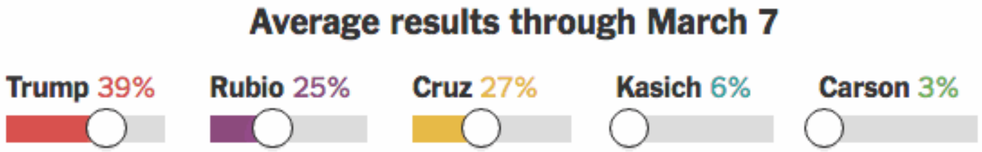


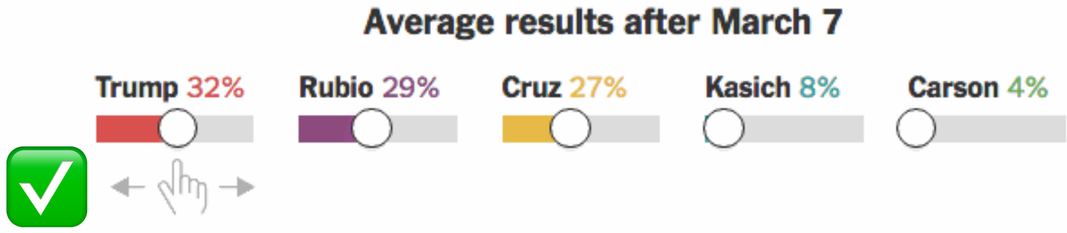


Source: Delegate Calculator and Blog post

Purpose of Interactivity & Dashboards







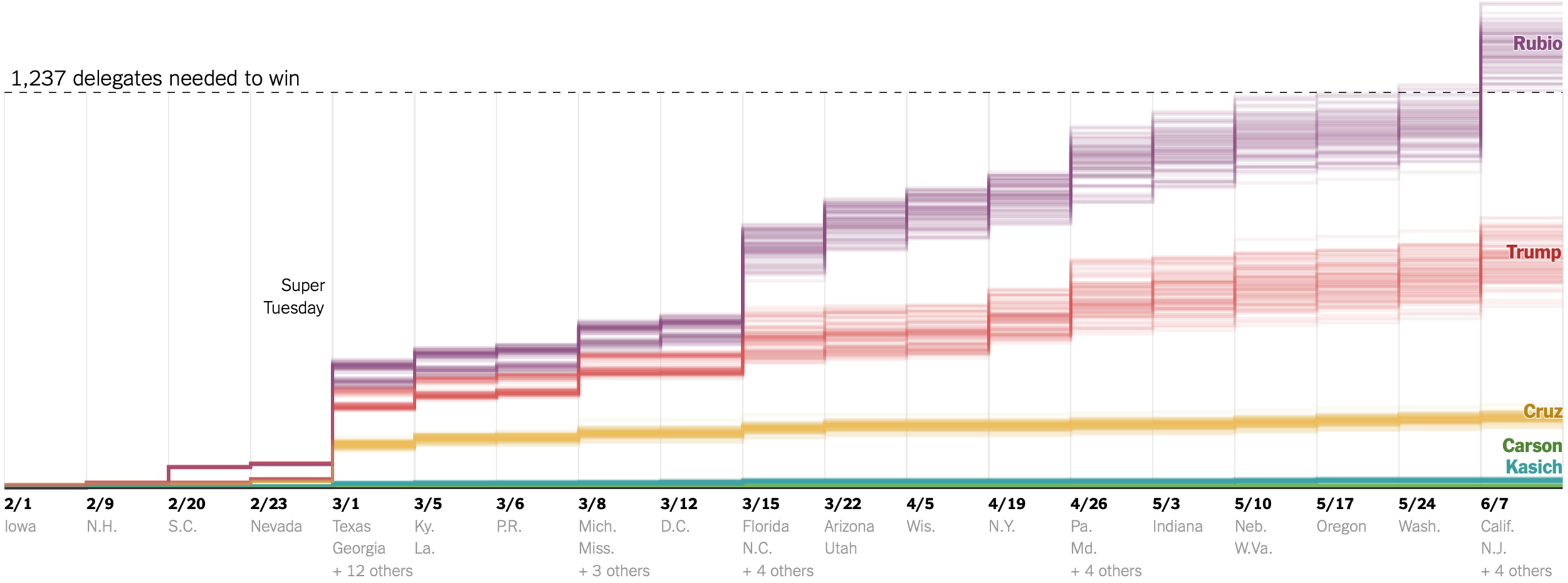
Source: Delegate Calculator and Blog post

Republican nomination. Here are some presets to get you started:

Rubio with small margins | Rubio and Trump head-to-head

Trump wins with huge margins | Cruz makes a comeback

Three-way tie | Trump hits a ceiling



Average results through February 28

Trump 31% | Rubio 34% | Cruz 26% | Kasich 6% | Carson 3%

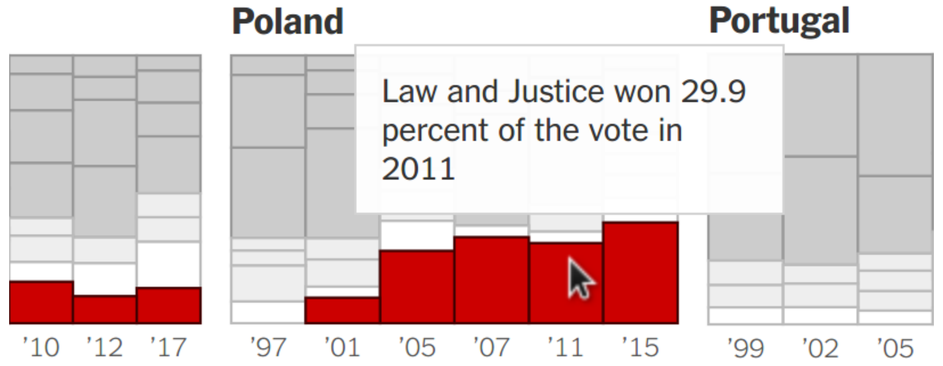
Average results after February 28

Trump 33% | Rubio 40% | Cruz 18% | Kasich 6% | Carson 3%

Purpose of Interactivity & Dashboards

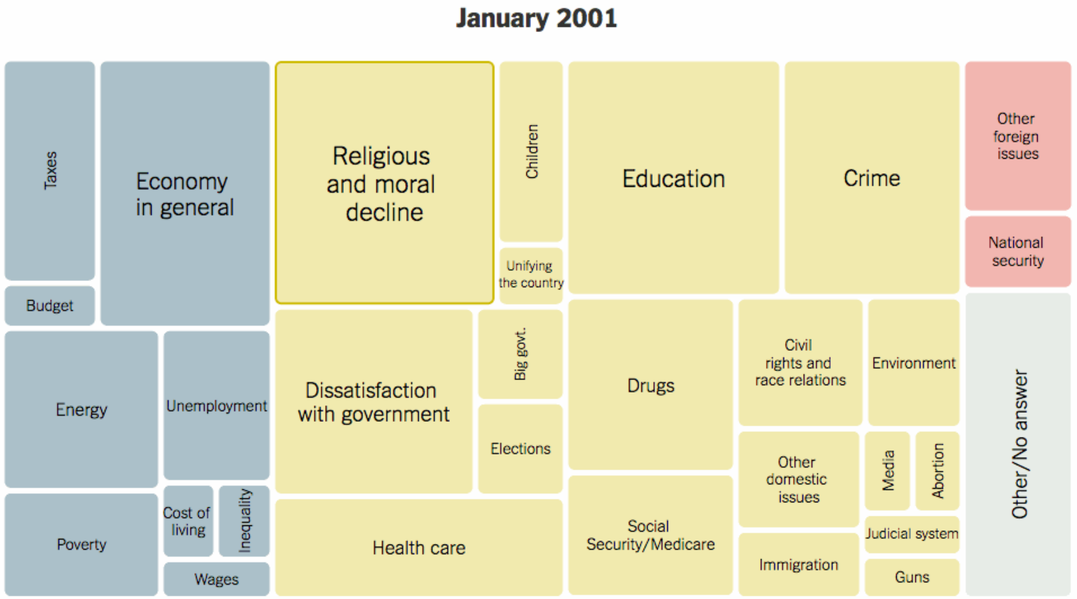
1. Tooltips allow your most interested users to dig deep

Take a look at the following graphic which summarized election results across 20 European countries. Everything you need to see is shown right away. You see the country names, the years and the red bars representing results of right-wing and far-right parties.



2. Interaction allow readers to discover the full dataset

There are cases when you have far more data than fit on a page, which means you have to select which charts to show and which to hide. To avoid cherry-picking we usually try to come up with a selection rule that we apply consistently throughout the piece. For instance, in a recent graphic we decided to show the first poll after the start of the term for each president. Deciding on such a rule is definitely better than just picking charts, but it can still feel arbitrary sometimes. Fortunately we had already set up the graphic in a way that the charts are rendered dynamically. So it didn't cost us much to add in a little bonus feature that allows browsing through the entire dataset.



Source: Election results in 20 EU countries and Blog post

Principles of Effective Dashboards

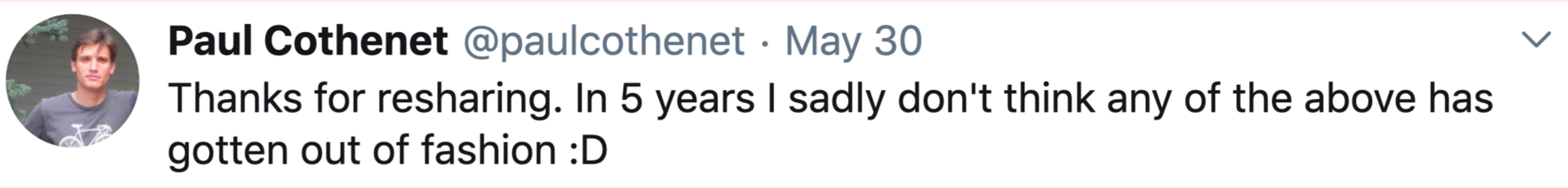
Principle	Explanation
Build trust in your analysis	Think about ways you can increase transparency of your data sources and analysis methods. Be upfront about missing data and accuracy of your data. Add tooltips so users can check data.
Think about the “onboarding” experience	What happens when users first visit your site? Related to “set good defaults” but more than that: how do they use it? Where are the controls? What do they do?
Use a consistent layout	Do not burden your users by making them think about the layout of your app and how it’s structured ; should be natural!
Use animations sparingly	Animations can be distracting, use them if you think it will help drive your point home (e.g., prison parole example)
Allow users to filter data (if applicable)	If you start with a giant dataset - say, the gapminder dataset - allow users the ability to filter the data and show data for the country they are interested in; have a good default comp
User testing is critical!	Get someone to look at your dashboard during development. Ideally someone who will be using it

Resources

- “The end of interactive visualizations”
- “In defence of interactive visualizations”
- “The laws of crappy dashboards”

Resources

- “The end of interactive visualizations”
- “In defence of interactive visualizations”
- “The laws of crappy dashboards”



Summary

- Building good dashboards is HARD, you are fighting an uphill battle in the industry because of all the bad dashboards with terrible defaults

- But it is WORTH IT, dashboards are excellent for **exploring data**, **showcasing important results**, and creating a more **data-aware society**

- Audience matters! Context matters! Research questions matter!

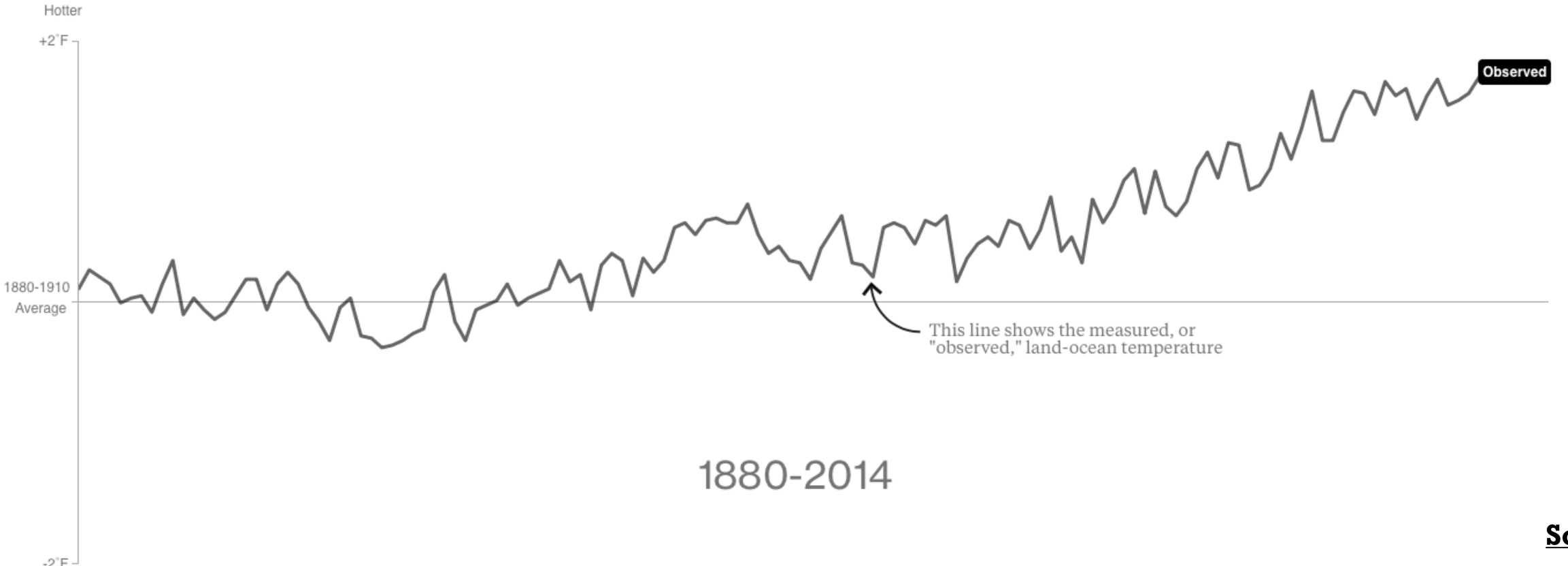
20 minutes

Part 2: Dashboards case study

What's Really Warming the World?

By Eric Roston and Blacki Migliozzi | June 24, 2015

Skeptics of manmade climate change offer various natural causes to explain why the Earth has warmed 1.4 degrees Fahrenheit since 1880. But can these account for the planet's rising temperature? Scroll down to see how much different factors, both natural and industrial, contribute to global warming, based on findings from NASA's Goddard Institute for Space Studies.



Source

PARABLE OF THE POLYGONS

A PLAYABLE POST ON THE SHAPE OF SOCIETY

by vi hart + nicky case

español | deutsch | français | português | 日本語 | 中文 | polski
italiano | magyar | nederlands | हिन्दी | čeština | Русский | العربيّة | Українська

This is a story of how harmless choices can make a harmful world.

These little cuties are 50% Triangles, 50% Squares, and 100% slightly shapist.
But only slightly! In fact, every polygon *prefers* being in a diverse crowd:

Source

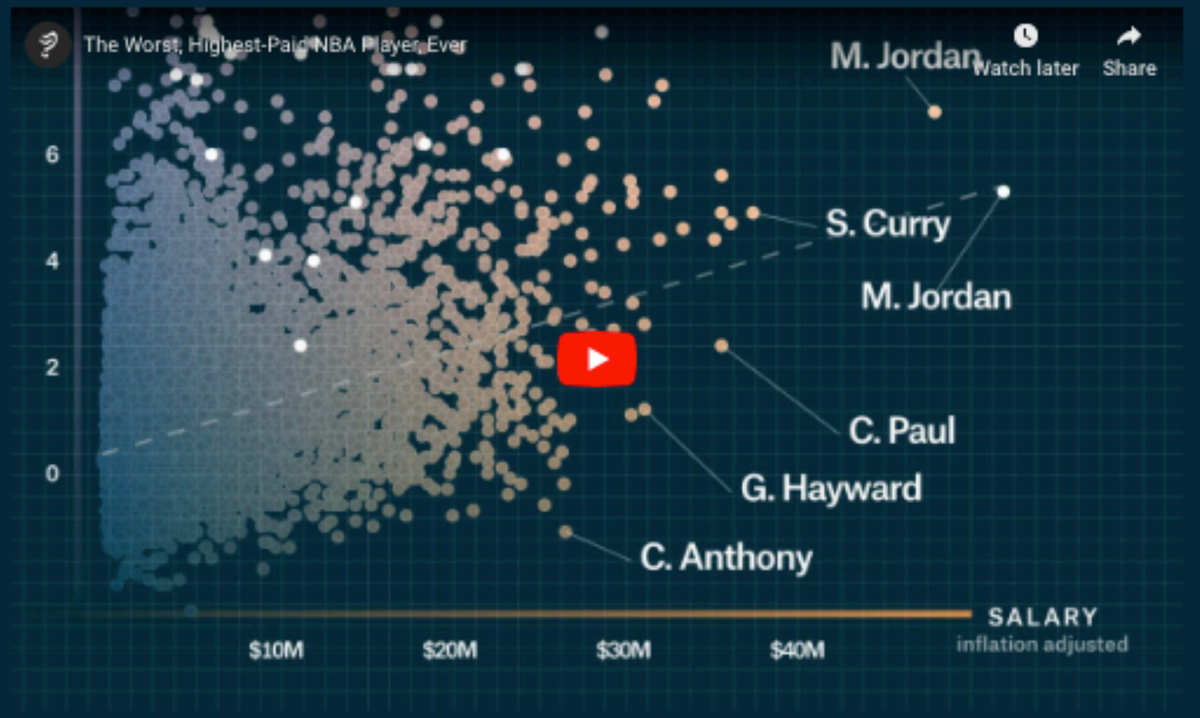
The Pudding

Finding the Worst, Highest-Paid NBA Player, Ever

Using advanced NBA stats to rank player performance against pay.

by Matt Daniels

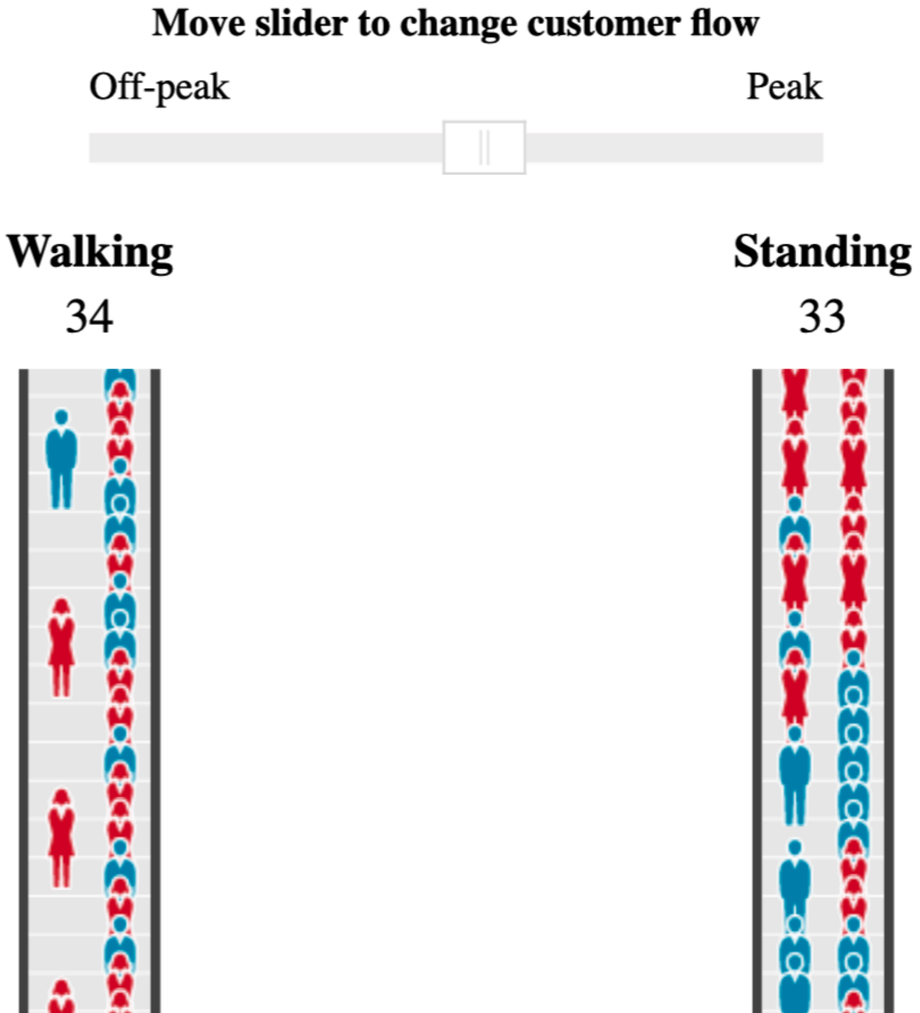
Watch the Video



Source

Does standing on both sides of the escalator work? Test it with our interactive simulator

The interactive below shows how the trial helped ease congestion - showing the number of people reaching the top of each escalator, and based on figures provided by TfL.



Source

You Draw It: How Family Income Predicts Children's College Chances

By **GREGOR AISCH, AMANDA COX and KEVIN QUEALY** MAY 28, 2015

How likely is it that children who grow up in very poor families go to college? How about children who grow up in very rich families?

We'd like you to **draw your guess** for every income level on the chart below.

If you think the chances of enrolling in college (or vocational school) are about the same for everyone, you should draw something like this: —— . If you think the odds are especially harsh for children from the poorest families, but higher for middle- and higher-income children, your drawing would instead look like this: ⁄ . Or here is one for a situation in which chances level off after a certain income threshold: ⁀ . Or for one that spikes ⁀ or dips ⁀ for the very richest.

Source

Can you form a stable government?

Combine parties as best you can to form a workable government. You need 323 votes, probably, to survive a confidence vote, but you may find that some parties get along together better than others

Choose your parties

Start by dragging either Labour or Conservatives

Ukip 3

SNP 52

PC 3

SDLP 3

Green 1

You have

582 seats

Reset

DUP 9

It's a bad match because ...

Source

Great list of fantastic interactive dashboards!

Rock 'n Poll

The power of Explorable Explanations

Maarten Lambrechts
@maartenzam

Mediafin

DataHarvest 2016

1

Dataharvest I: Rock 'n Poll

4 years ago 1 5,583

maartenzam PRO ★

maartenzam

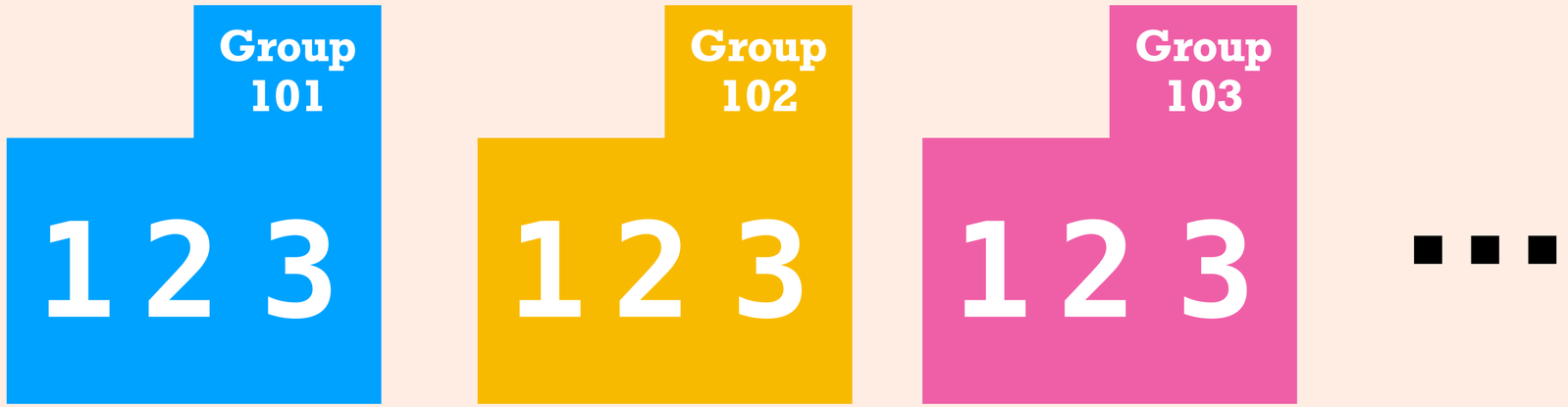
Source

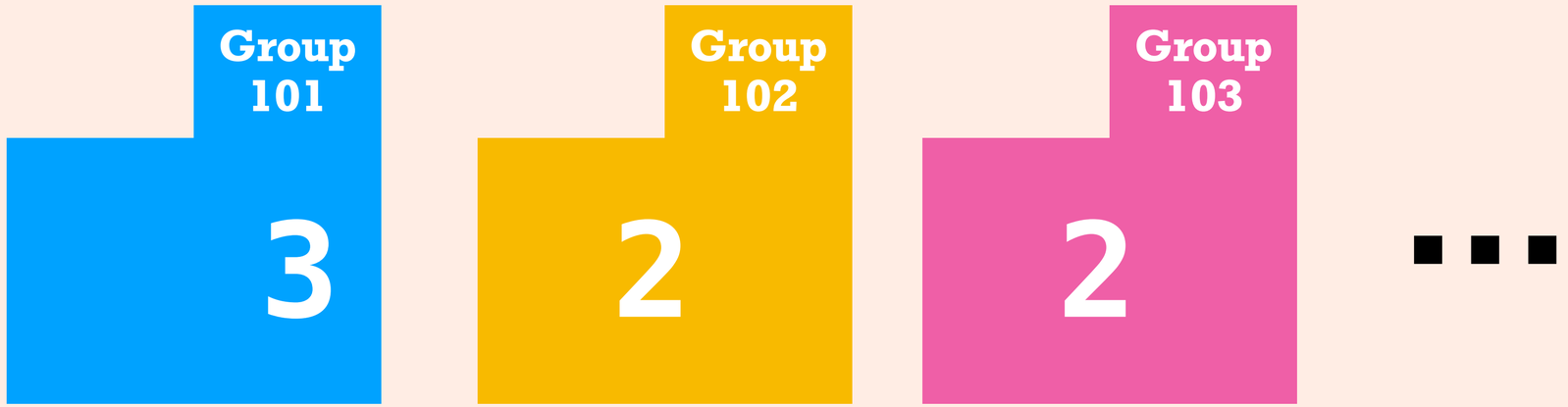
Part 3: Feedback Session

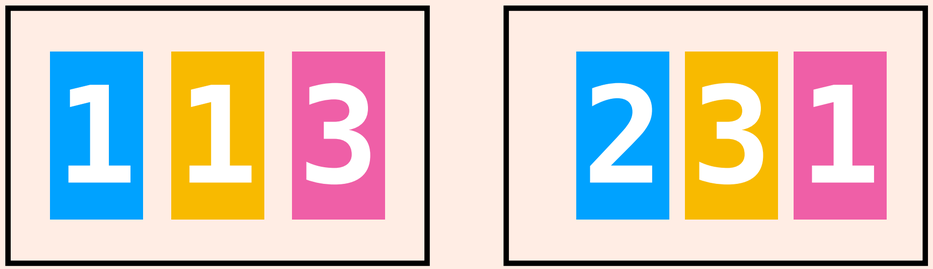
Feedback Activity

Very important that you follow my lead/cues for times!

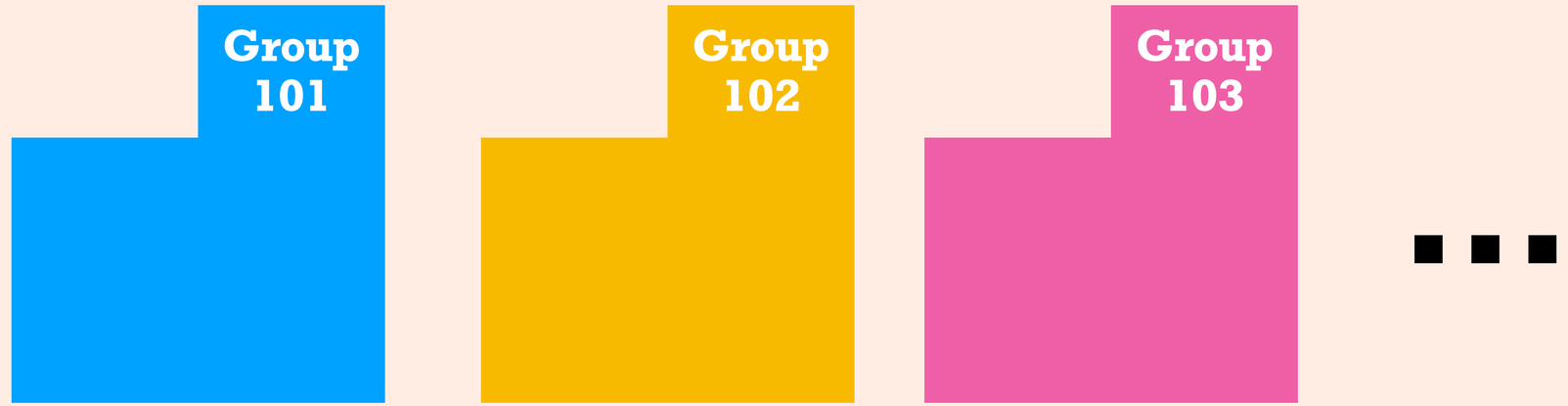
Do **not** start early and do not move on to the next steps!

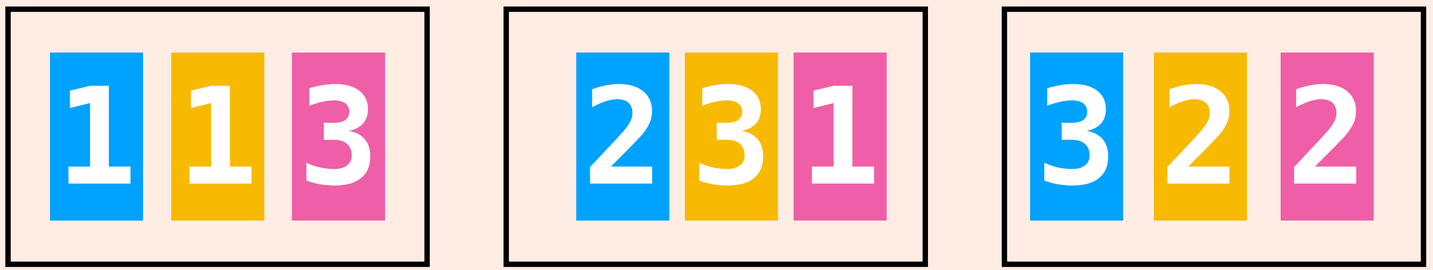

Group
101
1 2 3
Group
102
1 2 3
Group
103
1 2 3

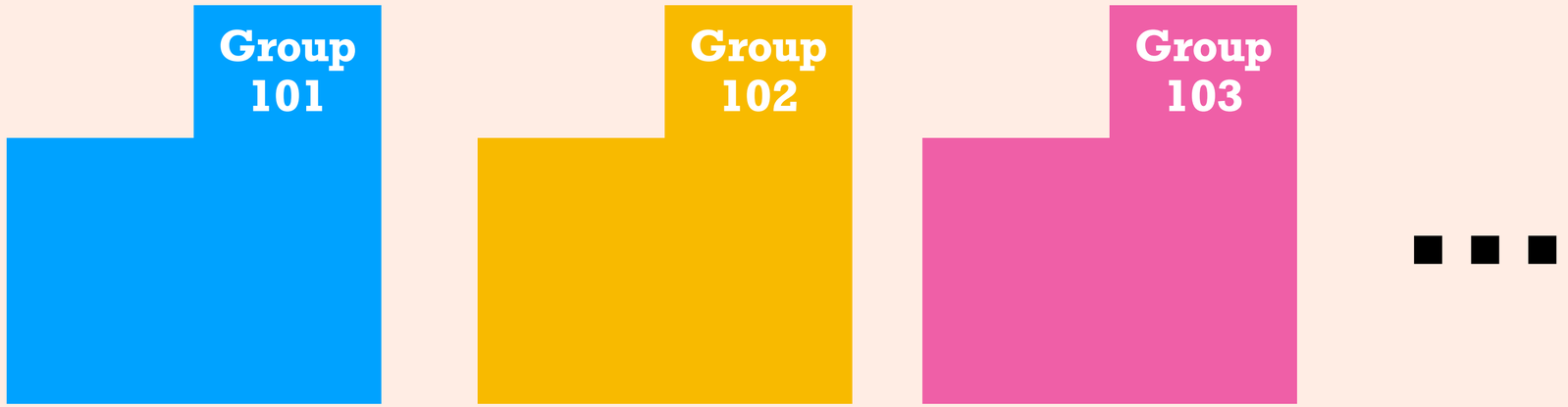

Group
101
3
Group
102
2
Group
103
2

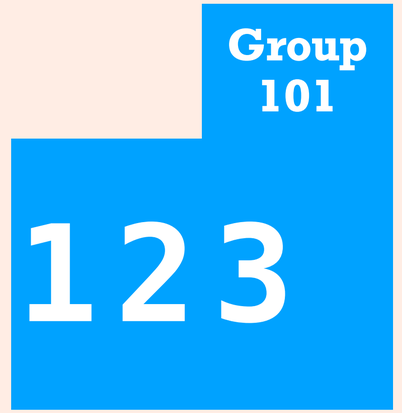

1 1 3

2 3 1

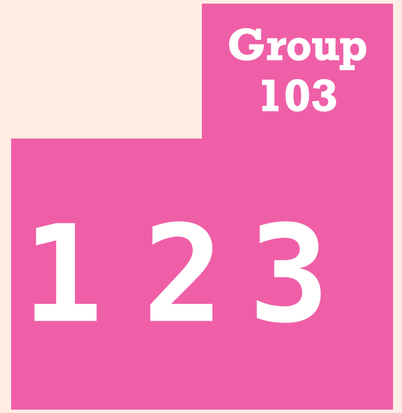

Group
101
Group
102
Group
103


1 1 3
2 3 1
3 2 2

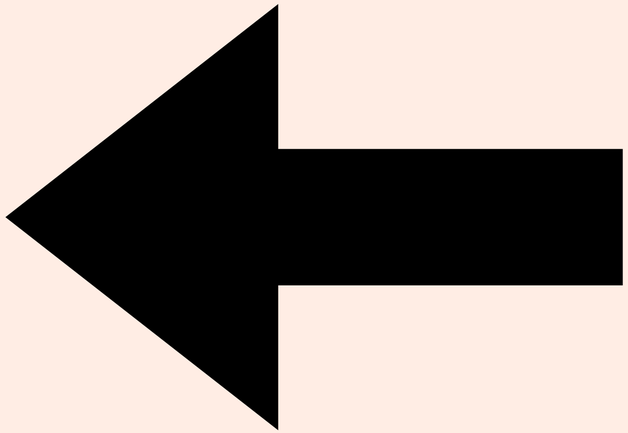

Group
101
Group
102
Group
103


Group
101
1 2 3


Group
102
1 2 3


Group
103
1 2 3

GitHub Issue summarizing all three issues



Group 101

1 2 3

Group 102

1 2 3

Group 103

1 2 3

Outline

- We will make new groups of 3 (person A,B,C)
- Feedback cycle for Person A [15 mins]
    - [5 mins] **Fly on the wall**:
        - A is a silent fly on the wall and watches/listens while B and C interact with A's dashboard
    - [2-3 mins] **Informed run**:
        - A "presents" their dashboard to B and C.
        - B takes notes on any discussion/feedback that occurs in a GH issue.
    - [7-8 mins] **Discussion.**
        - During discussion, B adds to the GH issue additional feedback, action items, and suggestions

Outline - 2

- Feedback cycle for Person B [15 mins]
- Feedback cycle for Person C [15 mins]
- **Debrief with your own group [30+ mins]**
    - There should now be 3 issues containing feedback for each dashboard
    - Discuss the feedback as a group
    - Create a new issue summarizing action items, link to other issues as needed
    - Close the issues with the raw notes
    - Come up with a game plan for milestone 4
    - HAVE **REASONABLE** EXPECTATIONS !!