

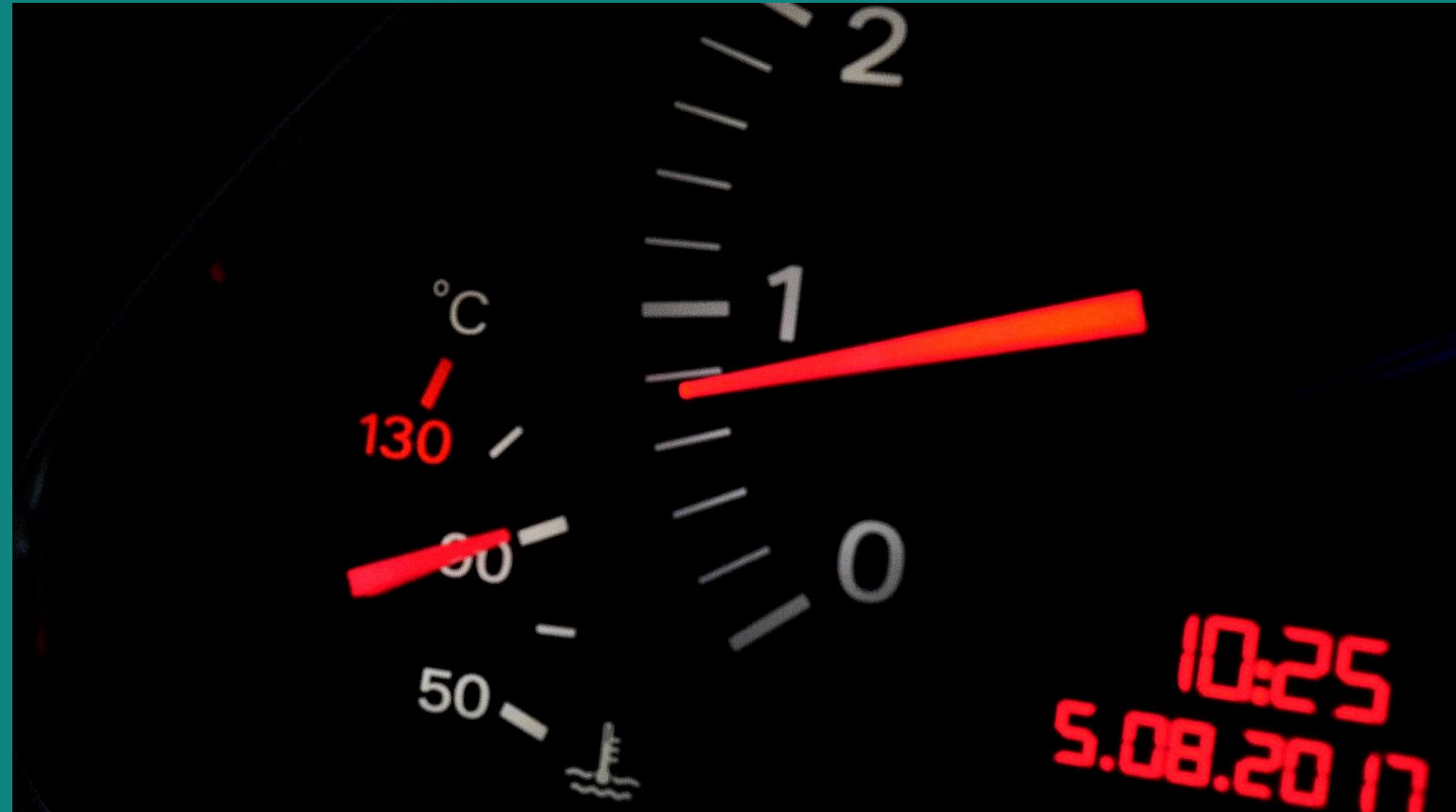
Data Visualisation and Dashboarding

Week 7 – Dashboard design

UNIVERSITY OF
WESTMINSTER 



What is a dashboard?



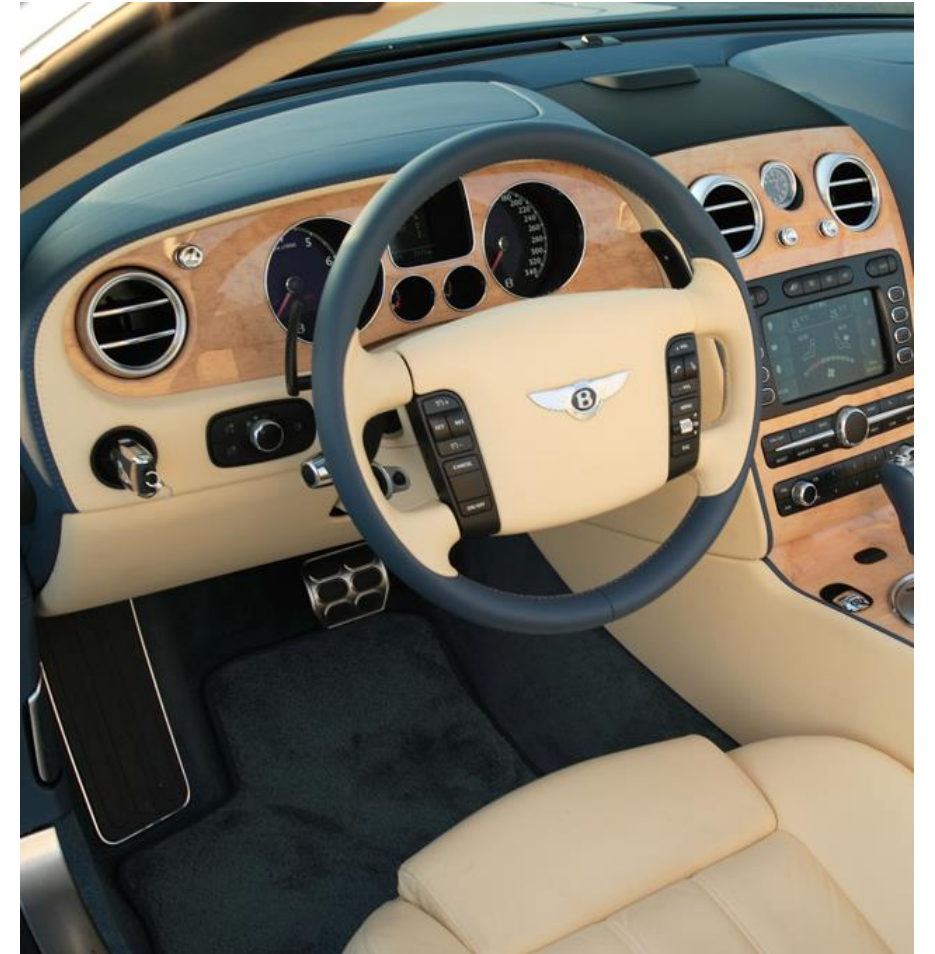
What is a dashboard?

A dashboard is a visual display of the most important information needed to achieve one or more objectives; **consolidated and arranged on a single screen** so the information can be **monitored at a glance**.

Stephen Few (2004)

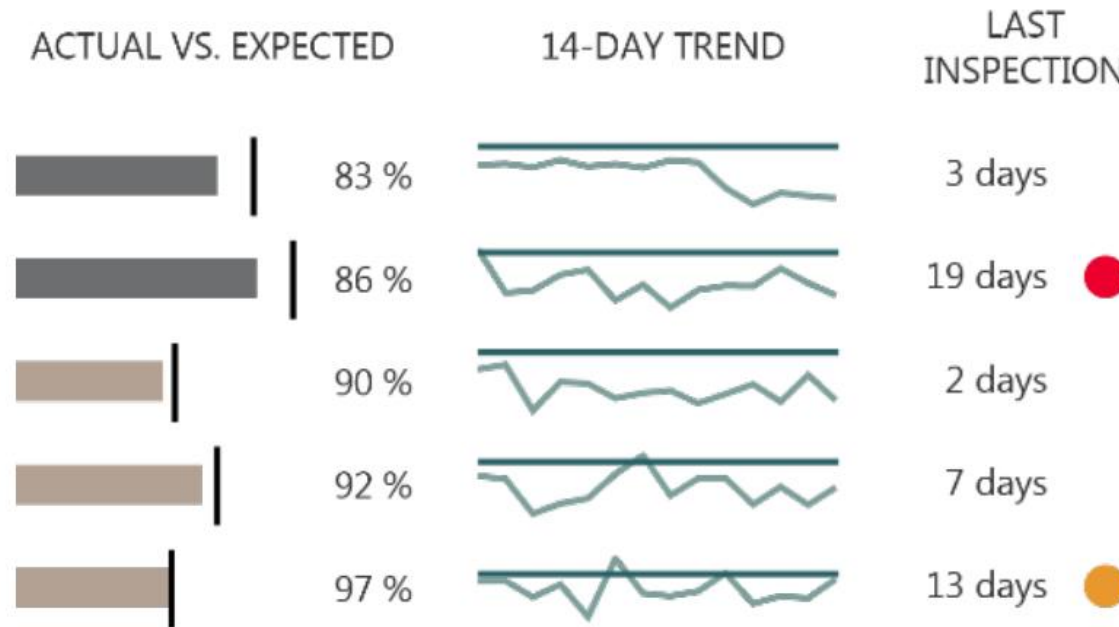
Few's definition is very specific. He does not believe that something interactive or exploratory is by definition a dashboard.

Do we agree with this?



What is a dashboard? Directed Discovery

An information display designed for people to help maintain situational awareness.



What is a dashboard? Faceted analytical display

A “faceted analytical display” is a set of interactive charts (primarily graphs and tables) that simultaneously reside on a single screen, each of which presents a somewhat different view of a common dataset, and is used to analyse that information.

Stephen Few (2007)

Stephen Few’s definition for an interactive dashboard or and exploratory data visualization is a “faceted analytical display”.

This still “resides on a single screen”, but provides different views of the data based on the user’s interaction.

Assessing what's needed

Define Purpose

- Monitor performance
- Not a report
- Communicate information clearly

Focus on Goals

- Form follows function
- Requirements inform graphical elements

Identify requirements

- Work with Stakeholders to elicit requirements
- Draw dashboard

Define Audience

- How will be using the dashboard?
- How much time will they spend analysing data?

Identify Information that really matters

- What data needs to be displayed?
- What data is irrelevant?

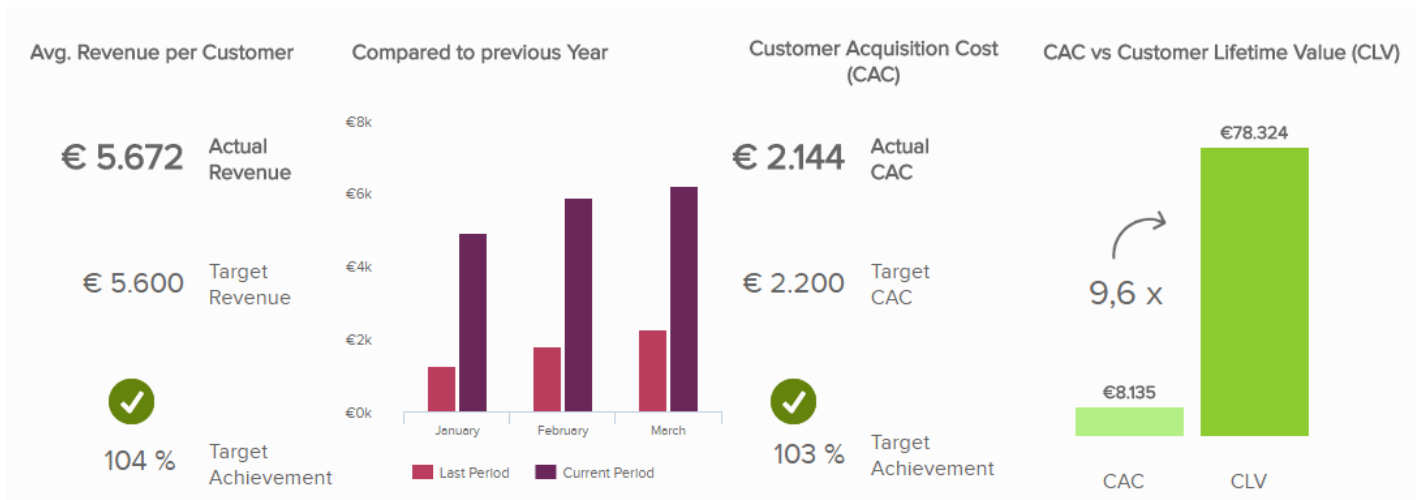
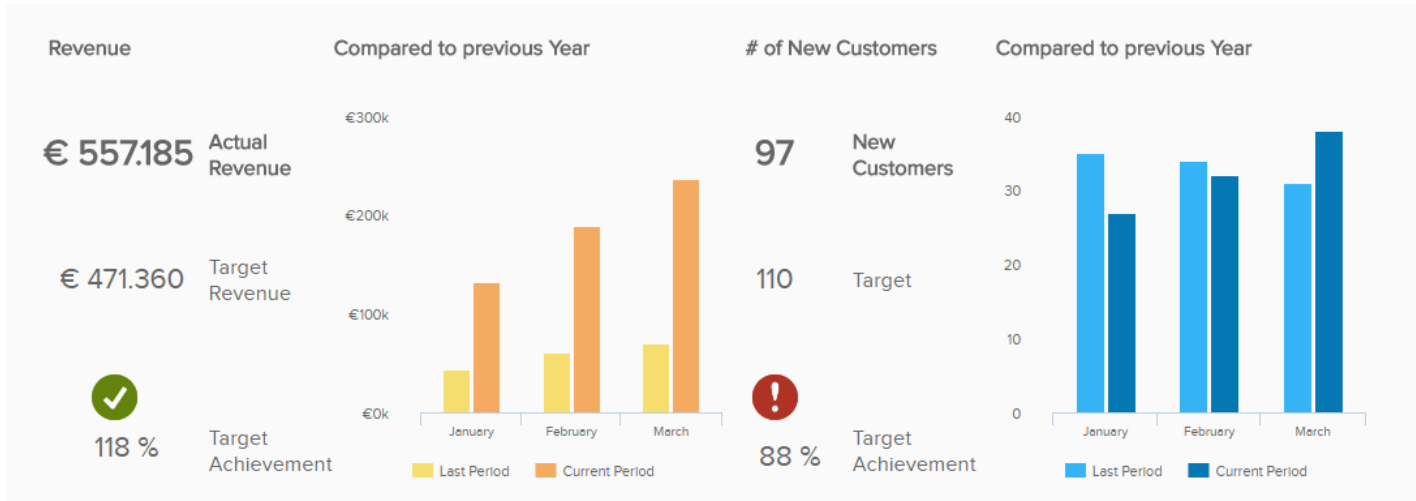
Types of dashboards

Scope	Strategic	Operational	Analytical
Application	Monitoring	Management	Analysis
Users	Executive	Team leaders	Analysts
Content	Few measures, strongly focused, high-level	More measures, enough granularity to help understand operational drivers	Many measures, enough granularity to analyse root causes
Interactivity	Little	Some	Highly interactive
Purpose	Display top-line KPIs	Increase data awareness, access to time-sensitive data	Access to trends or deeper insights

Example

Strategic dashboard

Revenue and Customer Overview - Q1 2016



Example

Operational dashboard

Customer Service Team Dashboard

RESOLUTIONS

First Call Resolution

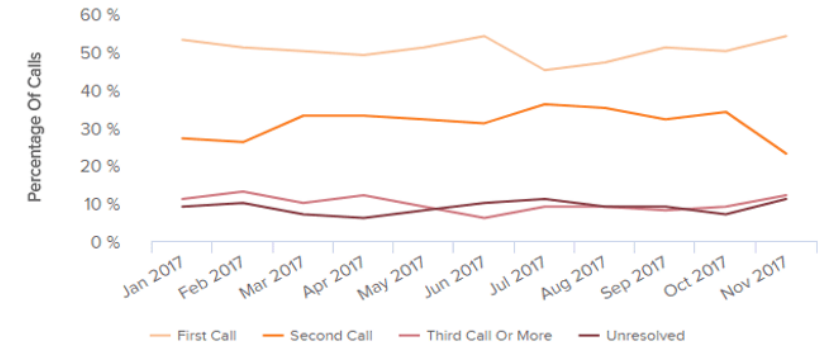


61%

Unresolved Calls



9%



RESPONSE TIME

Avg Response Time



37 sec

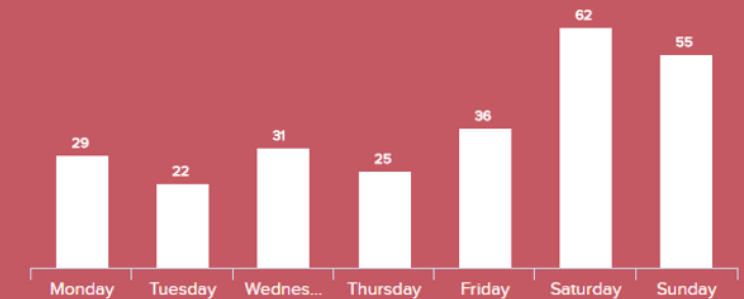
Best Day To Call



Tuesday

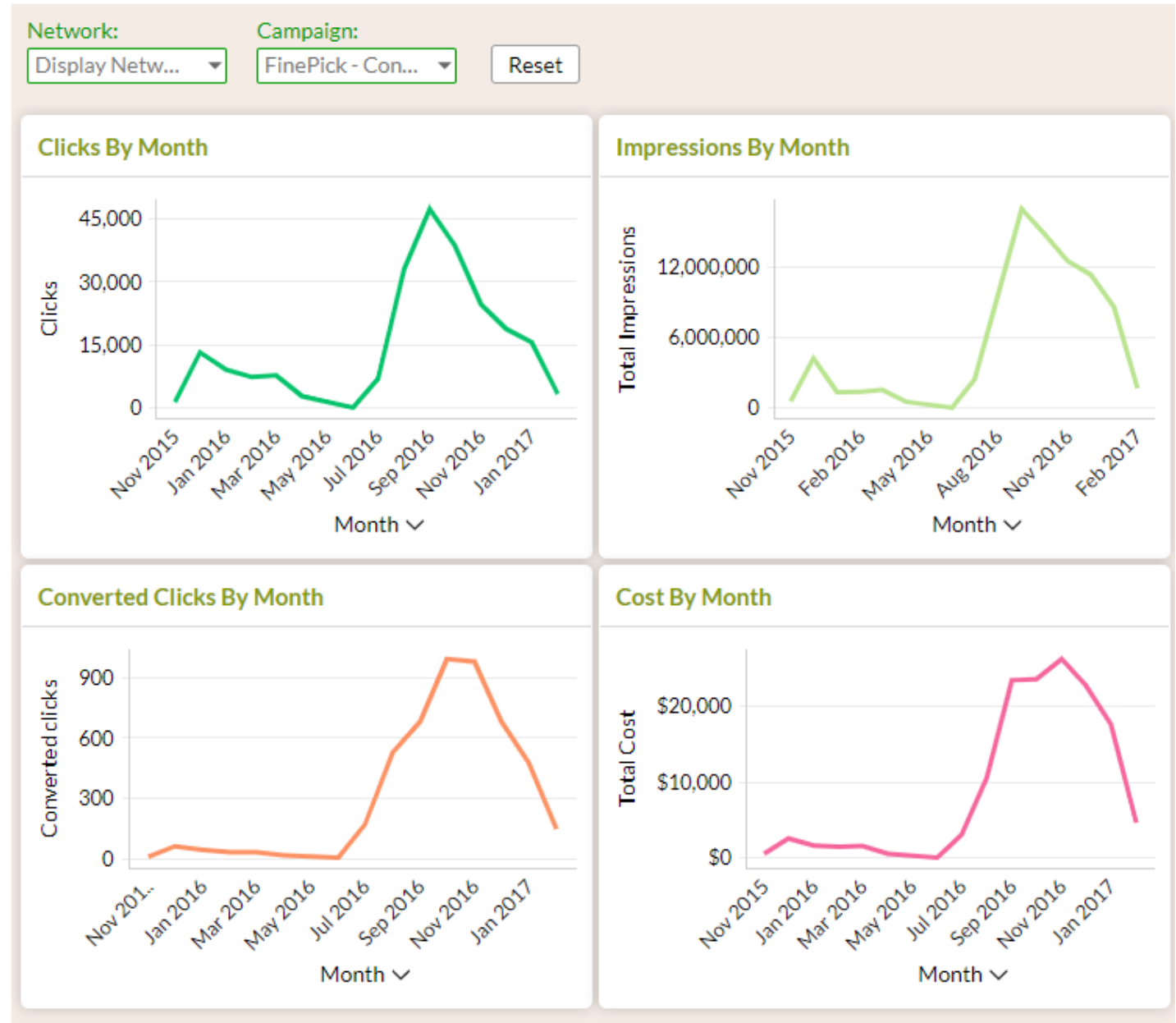
Response Time By Weekday

Response Time In sec



Example

Analytical dashboard



Fundamental considerations

Update Frequency

- Daily / Hourly / Real-time
- May need to show date/time of last update
- Often updated dashboards need to be simpler

User Experience

- Novice or Expert?
- Experts understand more complex charts
- Novices might benefit from less charts and elements

Audience size

- One person?
Small group?
Whole organisation?
- Dashboards for smaller groups can be customised closer to the requirements

Consumer device

- Big Screen?
Laptop? Tablet?
Phone?
- Dashboard might have different aspect ratio
- Dashboard might need to be touch-accessible
- Might need to be available offline

What information is important?

Only include Information that influences people

Every piece of information must inform action

Ask Questions:

What value would you see in an ideal case?

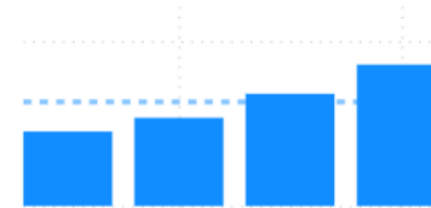
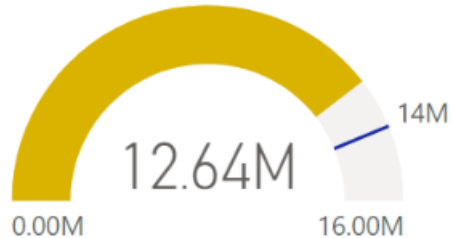
What is the target value of your KPI?

What do you do if the value is below (or above) target?

Examples (quantitative data)

Sales	Marketing	Finance	Customer service	Fulfilment	IT	E-commerce
Bookings Invoicing Pipeline Number of orders Order amounts Discounts	Market share Campaign reactions Customer profiles	Revenues Expenses Profits Days to invoice	Number of calls Resolved cases Customer satisfaction Call durations	Days to ship Inventory levels	System downtime System usage Fixed service calls	Number of visitors Number of page hits Conversion rate Visitor journey

Compare values to give context



Target value

Compare with ideal value
Might use a gauge or bullet chart
Use colours to indicate state (Good, requires attention, critical)

Change over time

How did value develop?
Be mindful about timeframe
Within day, week, month, year?

Point in time

Show relative or absolute value
Year-to-date
Same point in the past

Data-driven Expression

Average, typical range, median

Difference

Show delta value
Absolute value might not always be important

Examples of non-quantitative data






List of top ten customers

Issues that need investigating

People who need to be contacted

Etc...

TOP 5 AGENTS

Monthly		
#1		Todd Woods
#2		Sharin Bailey
#3		Tonia Parappa
#4		Jennifer Abrams
#5		Maria Chan

Layout



Design considerations

Placement: How will the eye scan the page?

Content position and size should match its importance

Use colour and typography to support perception and attention

Use Gestalt principles to visually associate data and content that is related

Focus on the users to drive the design layout, rather than the tools

Eye scanning patterns (web pages)



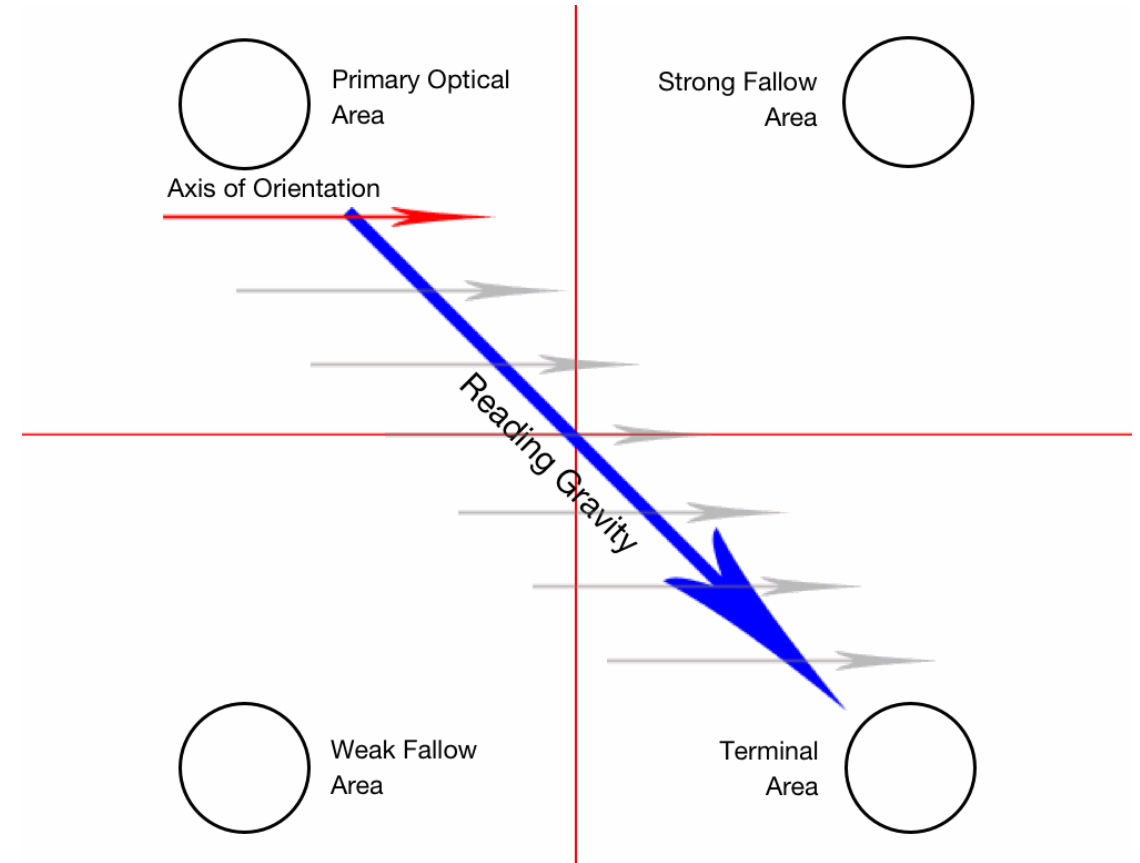
Red indicates more visual attention

“F-Pattern” is widely cited, but is partially a product of text-heavy pages

User focus: Gutenberg Diagram

Upper-right and lower-left areas draw less attention.

Beware: Attention is mirrored for Right-to-Left scripts like Arabic.



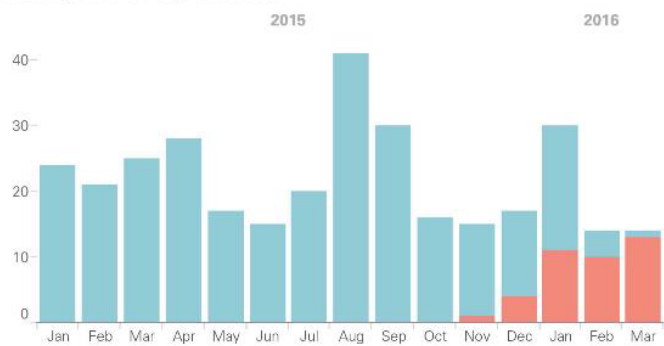
Complaints Dashboard

Total Complaints: **Closed 288** **Open 39** **Total 327**

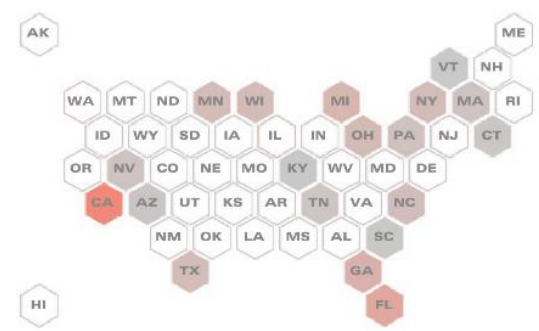
Date Received
1/1/2015 3/18/2016

Source Type Show Open/Closed

Complaints by Month



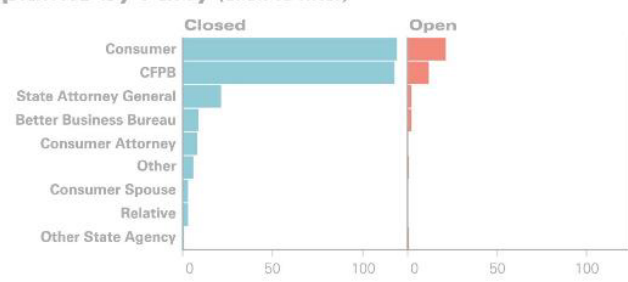
Open Complaints by State (click to filter)

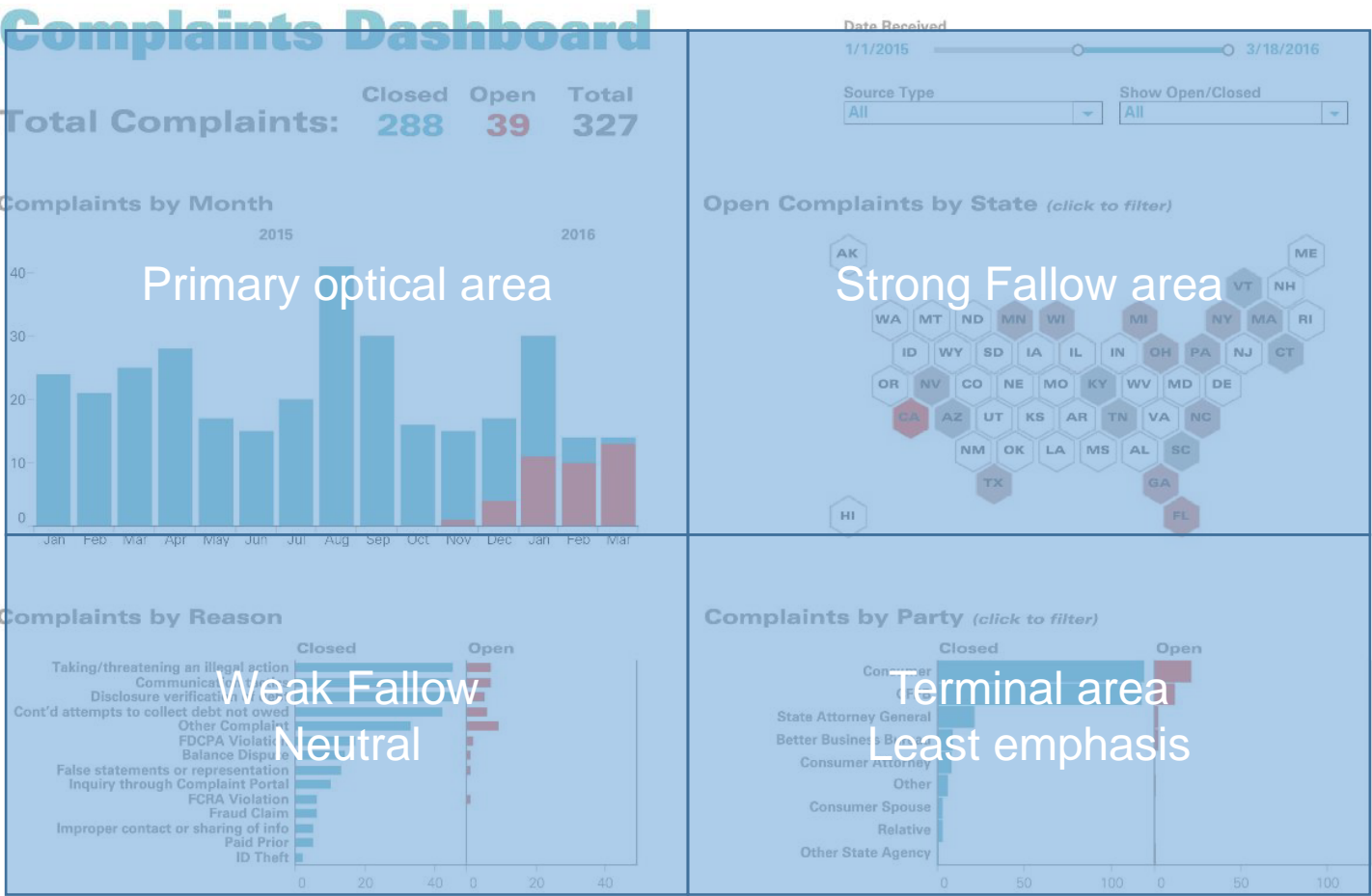


Complaints by Reason



Complaints by Party (click to filter)





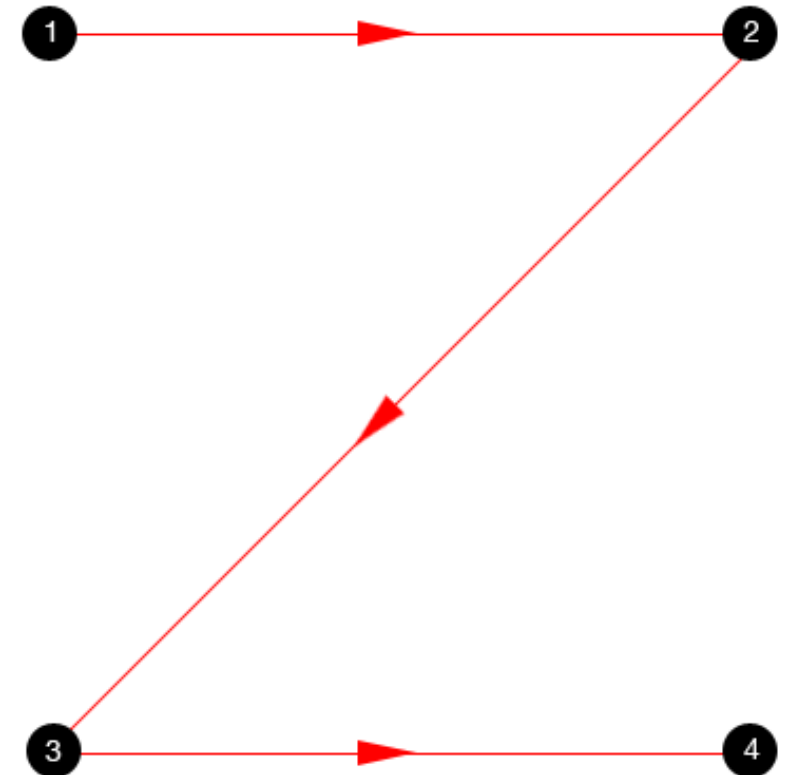
User focus: Z-pattern

Similar to Gutenberg

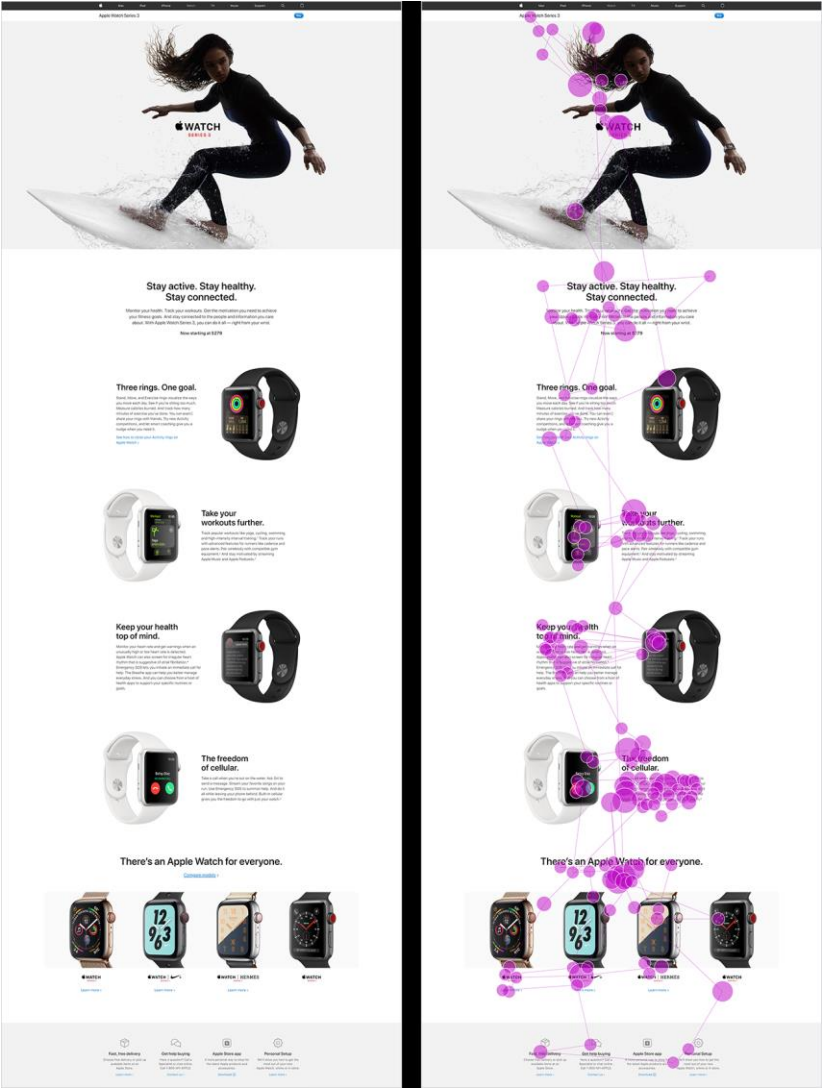
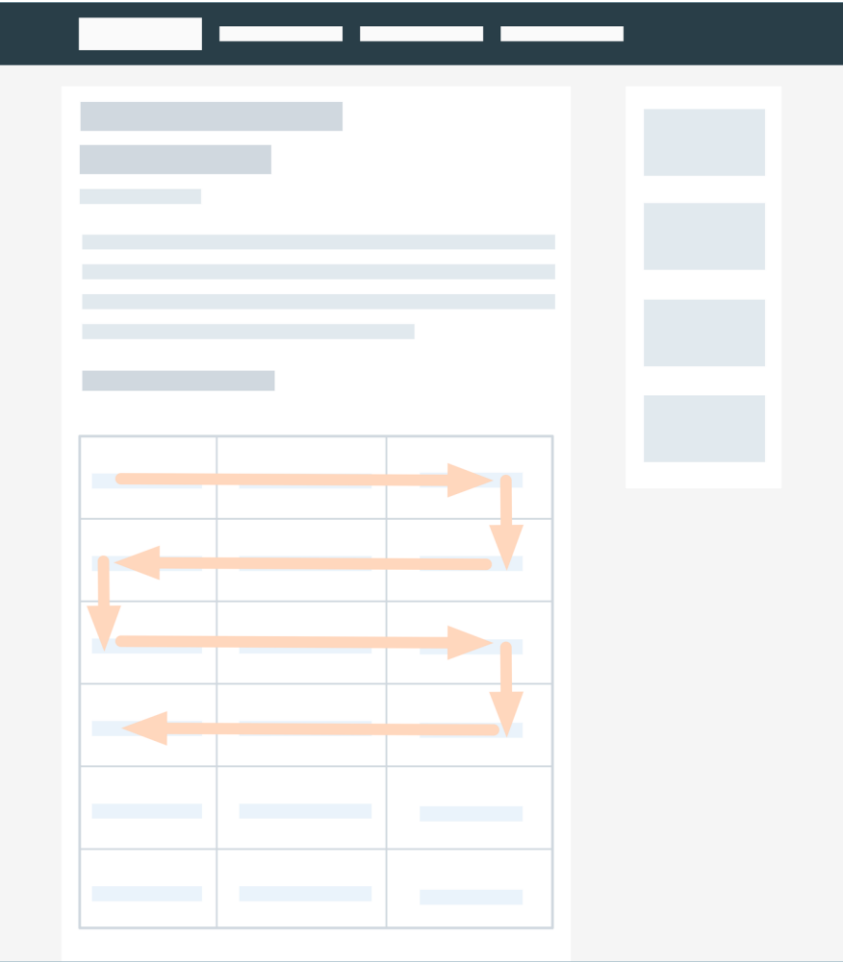
Main difference: Z-pattern suggests viewer will pass through the two fallow areas.

Place the most important information along the Z-pattern's path

Good for storytelling aspects



User focus: Lawn-mower pattern



Visuals



Gauges

Visualise one KPI

Data-ink ratio?

Readability?

Good use of space?



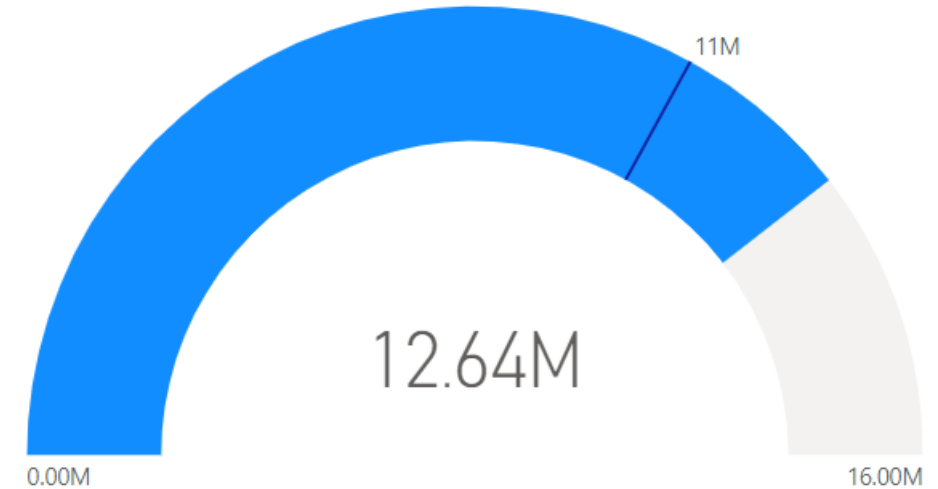
Gauges revisited

Keep it simple

Colour indicates status

Useful if you need exact value

What value does the visual add?



12.64M +19.8%

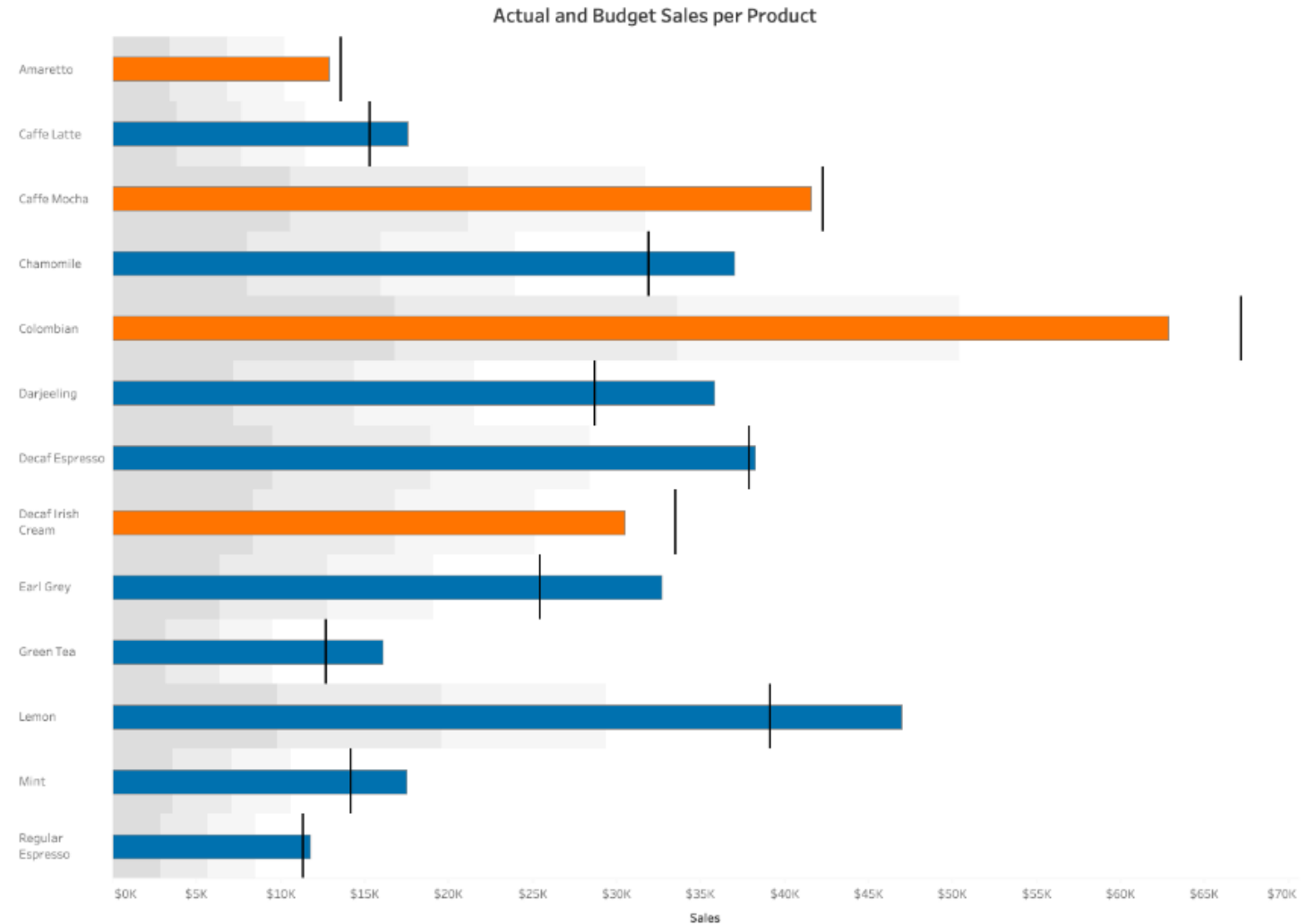
Bullet charts

A space saving alternative to gauges

Target is indicated by vertical line

Target ranges are indicated by background shading

Colour indicates status



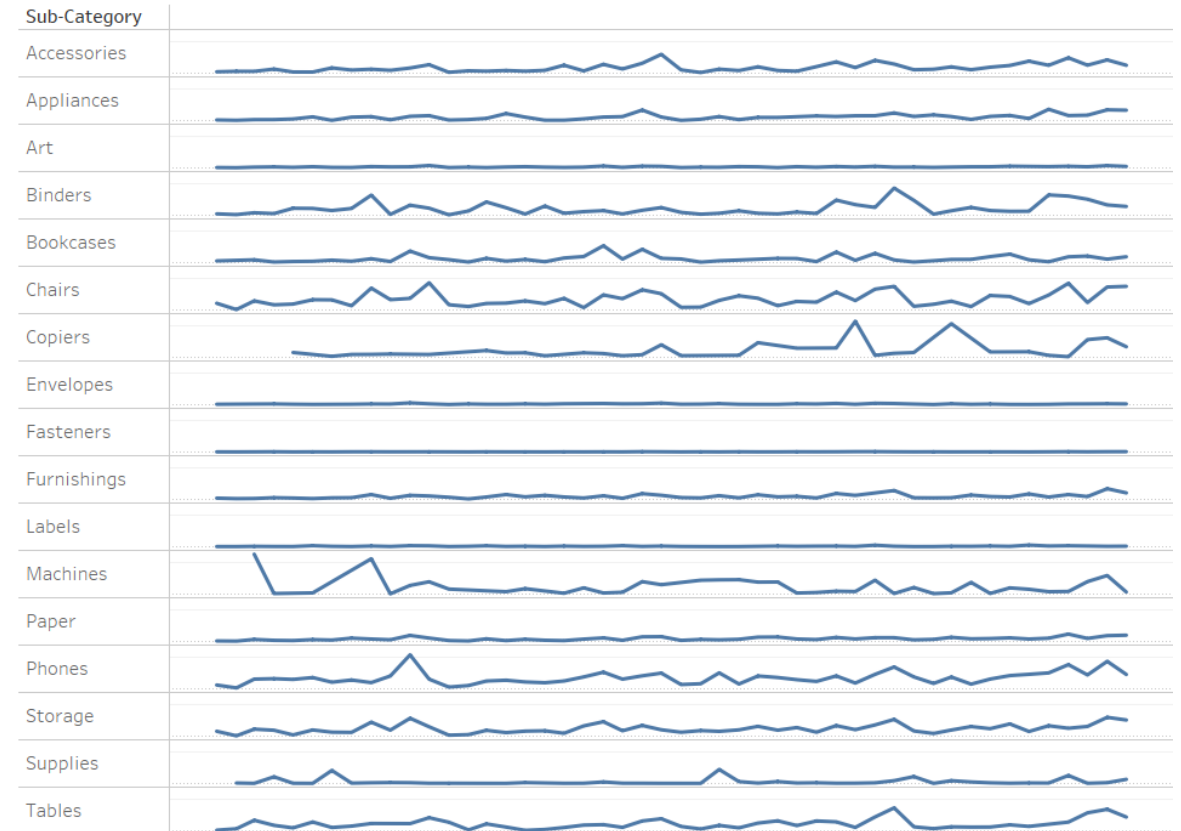
Sparklines

Invented by Edward Tufte

Became available in mainstream products in 2006

Very small line chart, typically without axes or coordinates

Good to add context/show trends



Bringing it all together

Combining number, bullet charts and sparklines

Exact values

Target

Target fulfillment

Trend

Details (All Locations)

LOCATION	CURRENT OUTPUT (kW)	EXPECTED OUTPUT (kW)			14-DAY TREND	LAST INSPECTION
1833 Appleby Line	350,370	420,453	<div><div></div></div>	83 %	<div><div></div></div>	3 days
1833 Highway 4	3,374	3,917	<div><div></div></div>	86 %	<div><div></div></div>	
48 Davis Dr	5,058	5,602	<div><div></div></div>	90 %	<div><div></div></div>	
144 Howard Cavasos	655,698	714,991	<div><div></div></div>	92 %	<div><div></div></div>	
2 Jack Hanoka Dr	5,342	5,521	<div><div></div></div>	97 %	<div><div></div></div>	
22 Daybreak Dr	3,053	3,148	<div><div></div></div>	97 %	<div><div></div></div>	
1 Whitestone Rd	4,579	4,711	<div><div></div></div>	97 %	<div><div></div></div>	
1552 Flintrock Rd	5,342	5,488	<div><div></div></div>	97 %	<div><div></div></div>	
1335 County Line	5,087	5,210	<div><div></div></div>	98 %	<div><div></div></div>	
1 Jack Hanoka Dr	3,307	3,338	<div><div></div></div>	99 %	<div><div></div></div>	
1525 West Line	946,311	954,645	<div><div></div></div>	99 %	<div><div></div></div>	
1335 Omoo Rd	847,260	854,289	<div><div></div></div>	99 %	<div><div></div></div>	
18819 Guelph St	1,060,307	1,068,858	<div><div></div></div>	99 %	<div><div></div></div>	
1 Adam West Rd	652,373	650,426	<div><div></div></div>	100 %	<div><div></div></div>	
11820 Dover Tr	900,606	884,292	<div><div></div></div>	102 %	<div><div></div></div>	
15 Rural Rd	1,200,261	1,174,570	<div><div></div></div>	102 %	<div><div></div></div>	

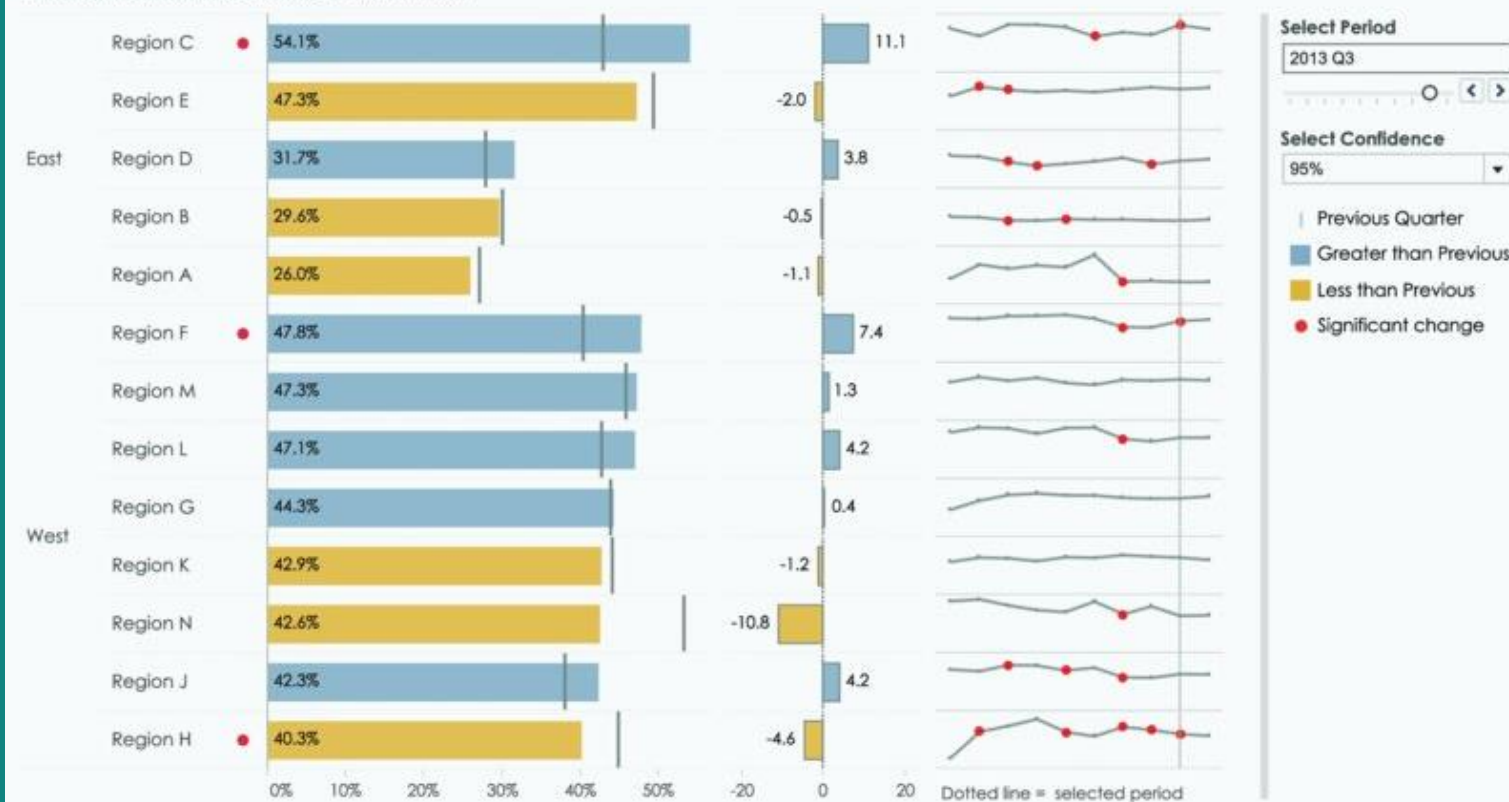
Another example

Deviation from target

Dots in sparklines mark significant change

Customer Satisfaction Comparison

Bar length represents percentage of promoters



Small multiples

Show variation of variation

Easy to compare trends

Good to show a lot of information



A few examples

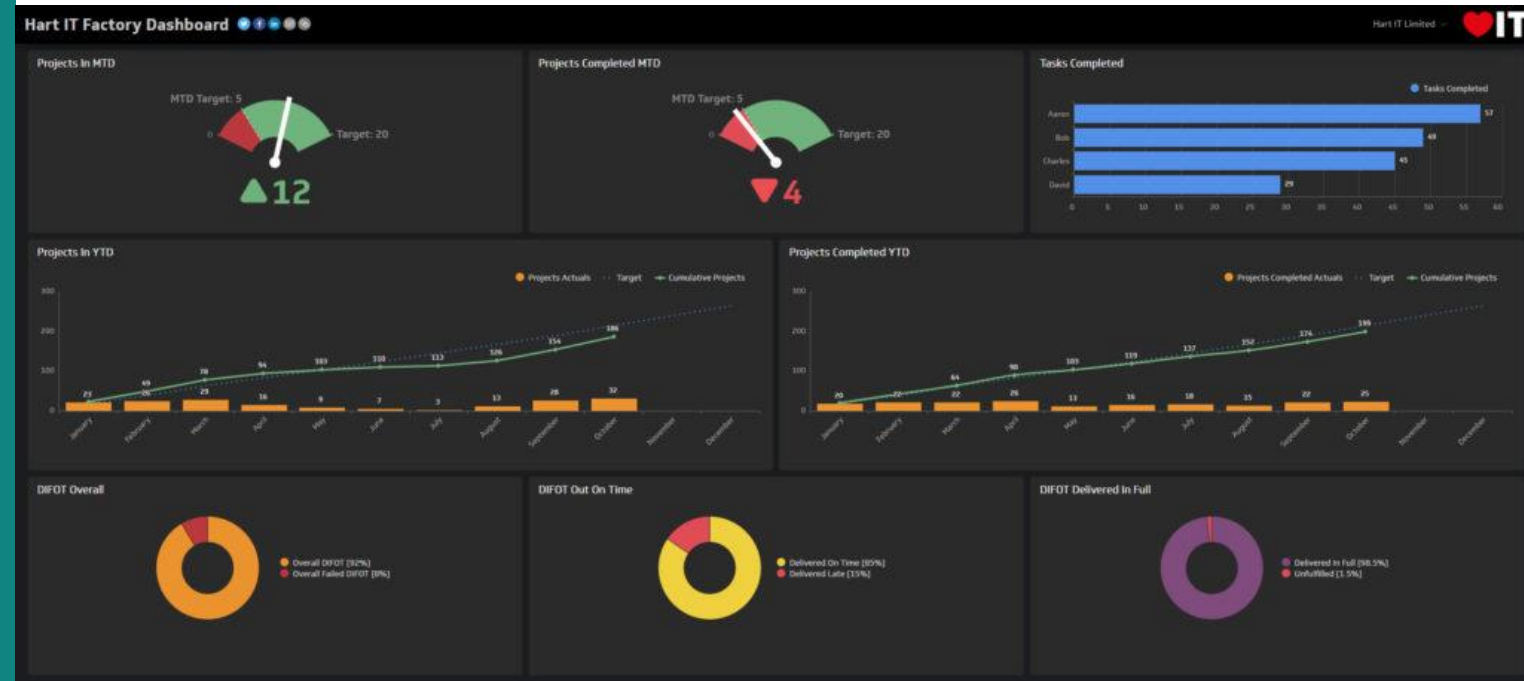
—

Look what I can do!

Not a good use of space

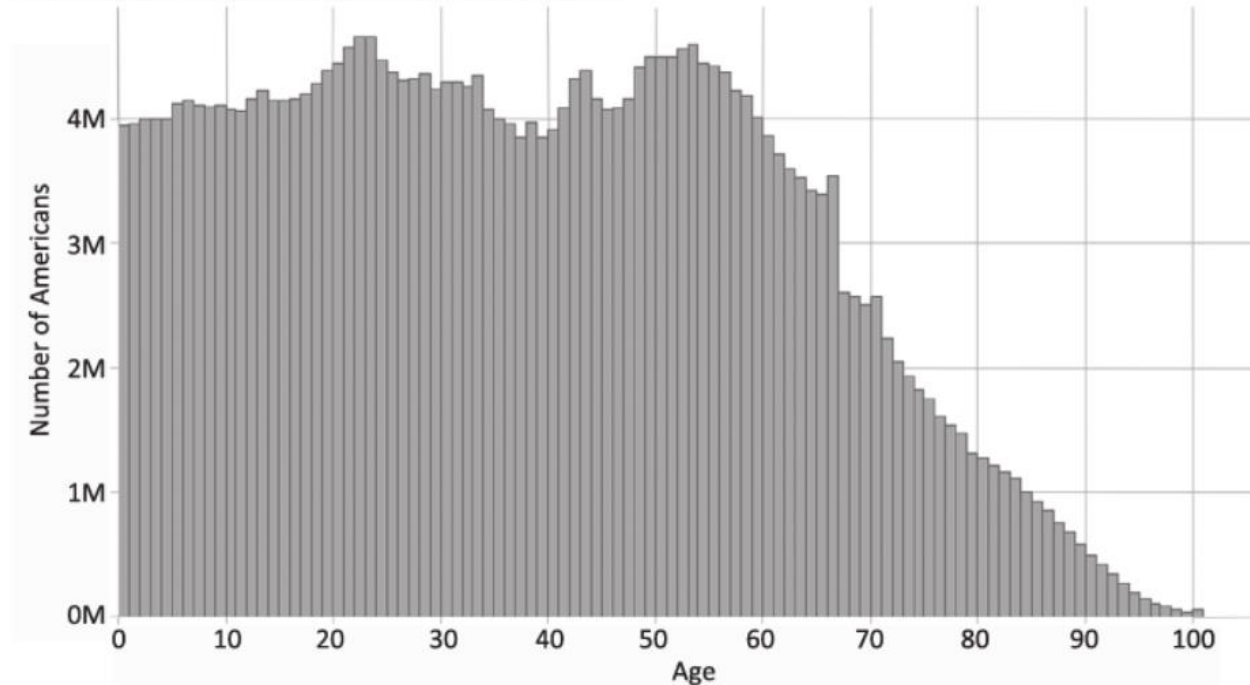
Replace donut charts with bullet charts

Is black background necessary?



Which dashboard is better?

United States Population Breakdown by Age



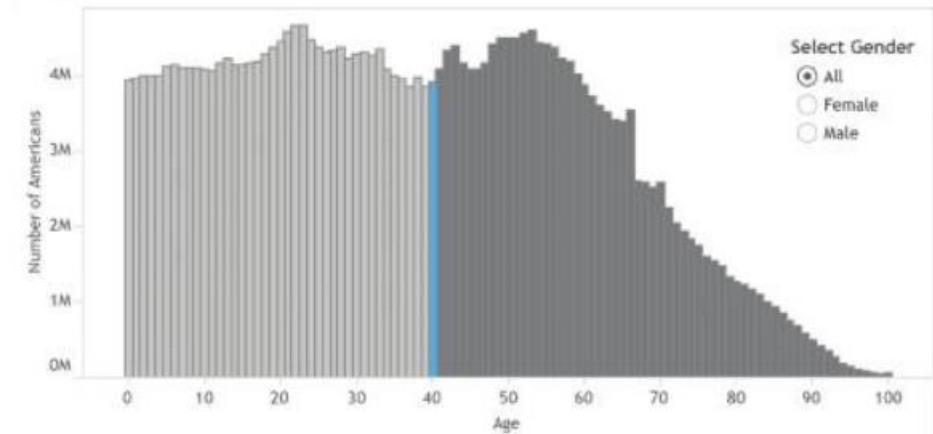
Are **you** over the hill?

See how many Americans are older and younger than you

Move slider to select your age

40

You are older than 53.0% of All Americans



Americans younger than you 167,491,882

Americans the same age as you 3,904,767

Americans older than you 144,732,190

DATA REVELATIONS

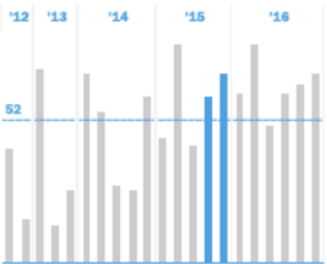
Population estimates as of 2013. Source: United States Census Bureau <https://www.census.gov/popest/data/>. Special thanks to Chad Skelton at <http://blogs.vancouversun.com/author/chadskeltonvancou/>.

Simplicity!

Note use of fonts and colours!

Course Metrics

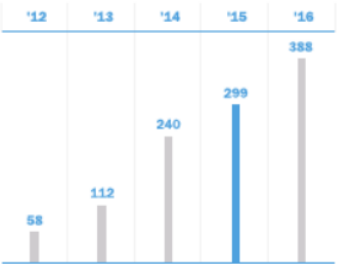
Students



1097

Total students in five years

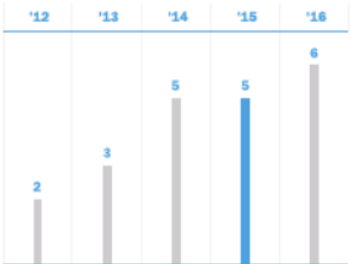
Enrollments



687

Total students in 2015-2016

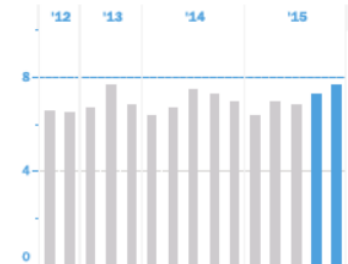
Classes



21

Total classes in five years

Ratings



7.7 of 8

Most Recent Instructor Rating (out of 8.0)

Semesters

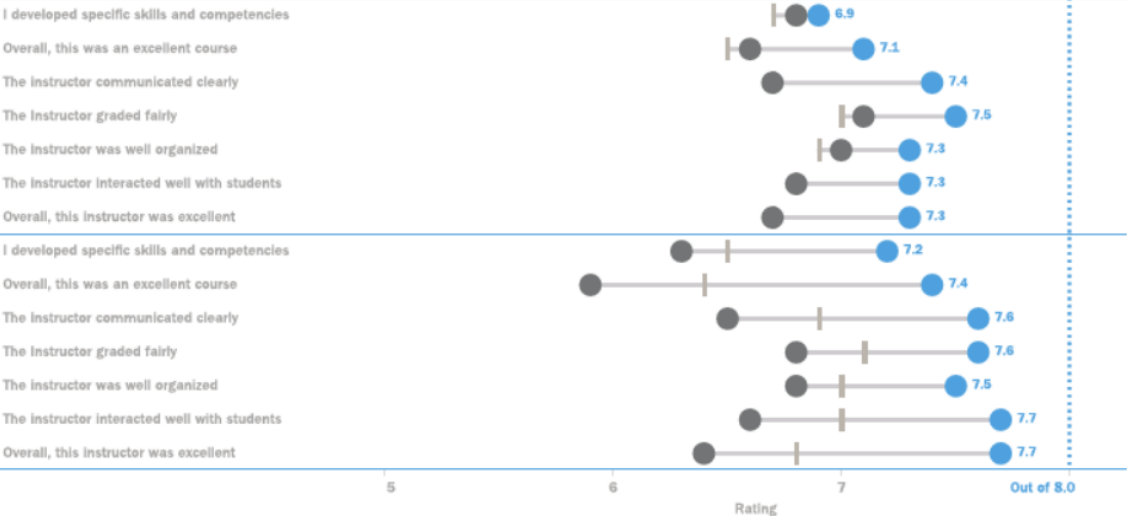
2015 Fall Semester 001

Questions

- I developed specific skills and competencies
- Overall, this was an excellent course
- The instructor communicated clearly
- The instructor graded fairly
- The instructor was well organized
- The instructor interacted well with students
- Overall, this instructor was excellent

● BANA | College ● Shaffer

Ratings



Course Metrics Dashboard created by Jeffrey A. Shaffer. Data from University of Cincinnati Course Evaluations. Blue indicates the 2 most recent rating periods.

Mobile dashboards

Not all dashboards are in landscape format!



Further Reading

Information Dashboard Design: Displaying Data for At-A-Glance Monitoring, Steven Few, ISBN-10: 1938377001

The Big Book of Dashboards: Visualizing Your Data Using Real–World Business Scenarios, Wexler, Steve, 1958- author.; Shaffer, Jeffrey, author.; Cotgreave, Andy, author.; Ebook available