2018

HUMAN-CENTERED DASHBOARD DESIGN

Deep Dive Training

IT | HUE

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Agenda

- Introduction to Dashboards
- Worst Practices
- Best Practices
- Charts
- Tables
- Q&A

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Human-Centered Dashboard Design

Introduction to Dashboards

Why Dashboards?

If they're well designed, then they…

… allow gaining insights from BIG DATA

→ informative and useful

… are easy to understand and pleasant to look at

→ people actually use them

… get everyone on the same page – literally

→ communication and decisions are based the same agreed upon information

After: http://www.thetingleyadvantage.com/2013/06/the-importance-of-dashboards.html

Misconceptions

- **Dashboards are comprehensive**

  Dashboards are not comprehensive tools for analysis, decision making or management.

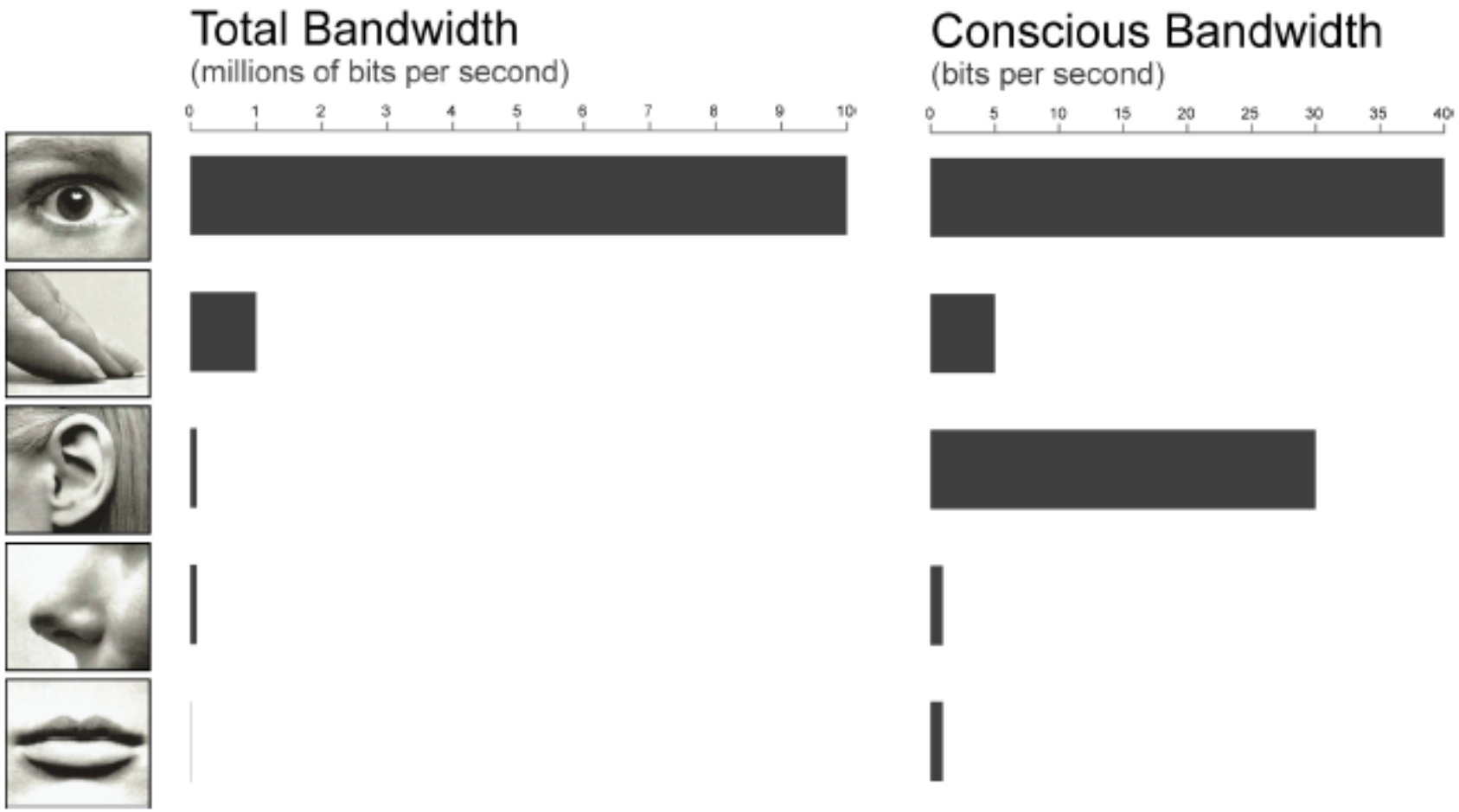
  Instead, they may be the start of an exploration into comprehensive information.

- **Dashboards are all visual**

  Dashboard do not need to be all visual.

  Instead, they may also feature data tables or other structured alphanumeric information.

Why is it good to present information visually?



Few, S. (2009). Now You See It: Simple Visualization Techniques for Quantitative Analysis. Analytics Press, Oakland, CA.

Why is it good to present information visually?

- Visualizations are more attractive to look at than numeric data
- Humans are better in processing graphical than numeric data

I'll show you the height of 10 persons (in meters).

Speed test: What person is the tallest?

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Why is it good to present information visually?

Person	Height (meters)
1	1.75
2	1.79
3	1.76
4	1.86
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8	1.76
9	1.85
10	1.77

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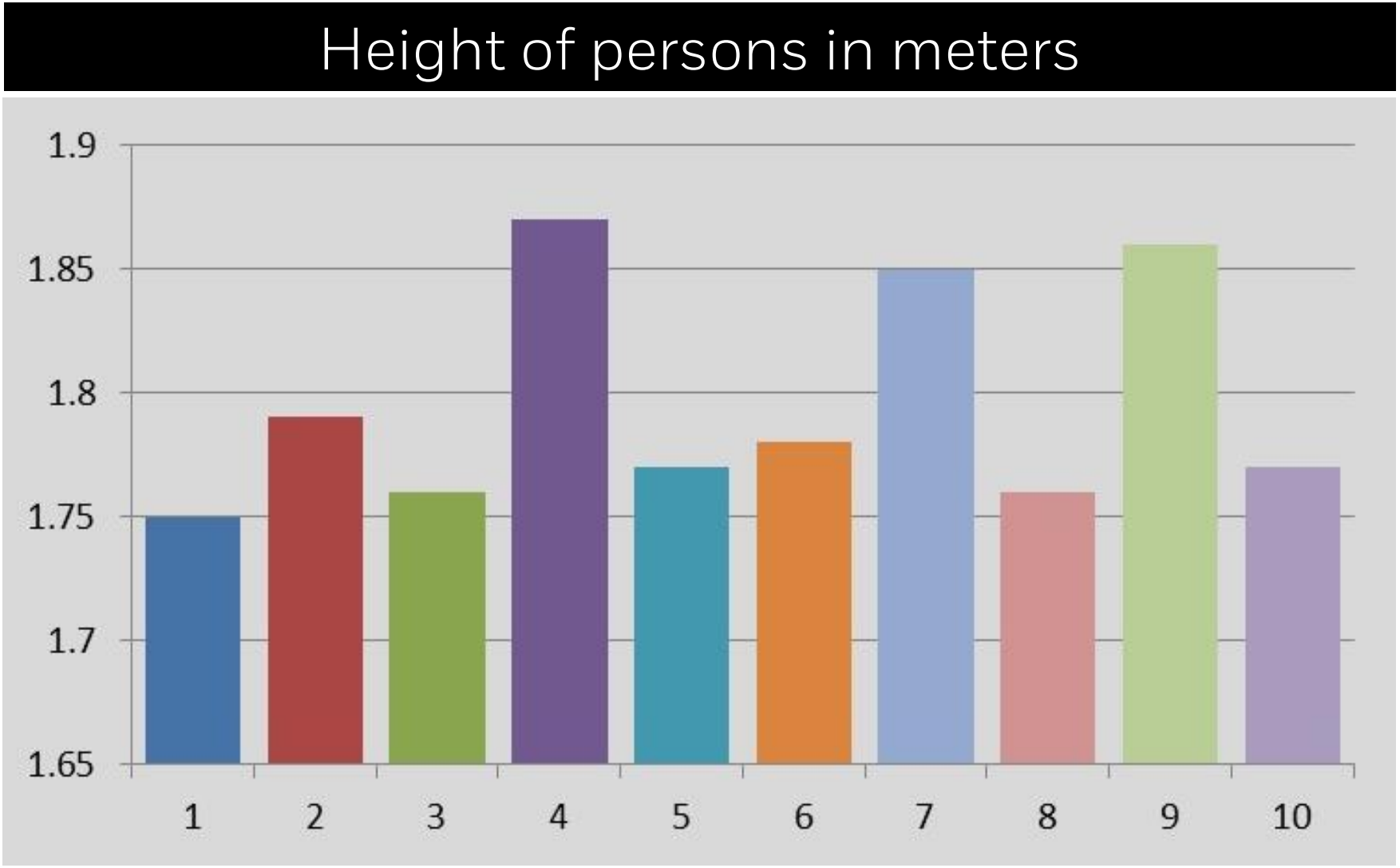


Dashboards vs. Reports

Dashboard

- Dynamic & Interactive
- High-level
- At a glance
- 1 screen
- Graphics
- Information

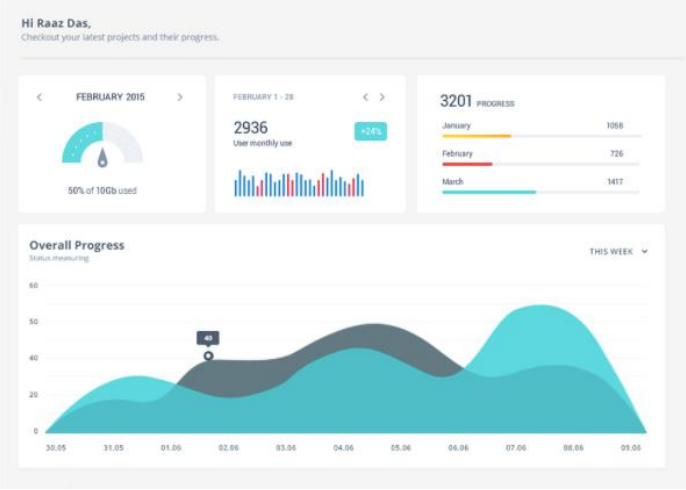
Drill into more details ▶

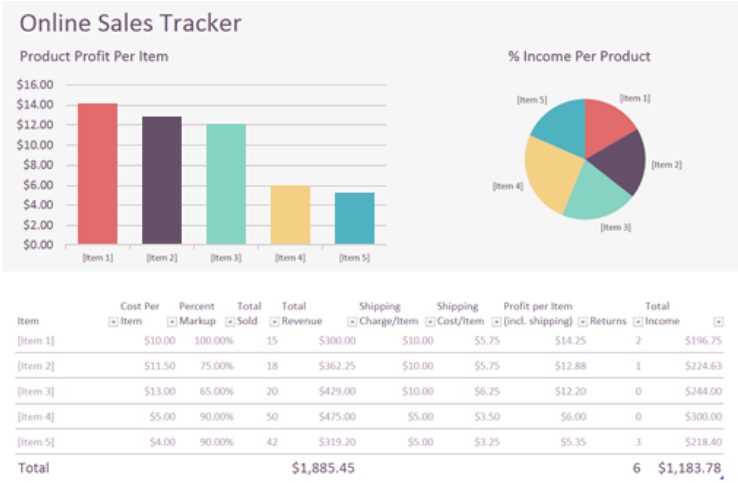
◀ Summarize

CONTINUUM

Report

- Static
- Deep
- Involved
- Many pages
- ASCII
- Data





Item	Cost Per Item	Percent Markup	Total Sold	Total Revenue	Shipping Charge/Item	Shipping Cost/Item	Profit per Item (incl. shipping)	Returns	Total Income
[Item 1]	$10.00	100.00%	15	$300.00	$10.00	$5.75	$14.25	2	$196.75
[Item 2]	$11.50	75.00%	18	$362.25	$10.00	$5.75	$12.88	1	$224.63
[Item 3]	$13.00	65.00%	20	$429.00	$10.00	$6.25	$12.20	0	$244.00
[Item 4]	$5.00	90.00%	50	$475.00	$5.00	$3.50	$6.00	0	$300.00
[Item 5]	$4.00	90.00%	42	$319.20	$5.00	$3.25	$5.35	3	$218.40
Total				$1,885.45				6	$1,183.78

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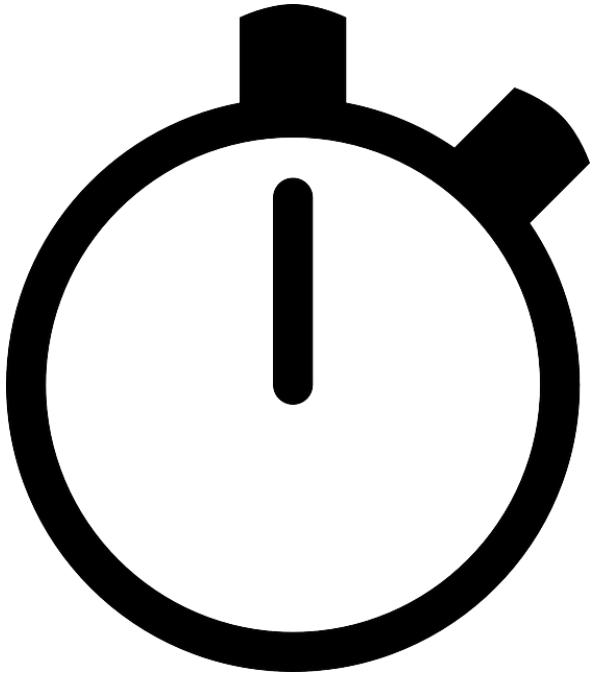
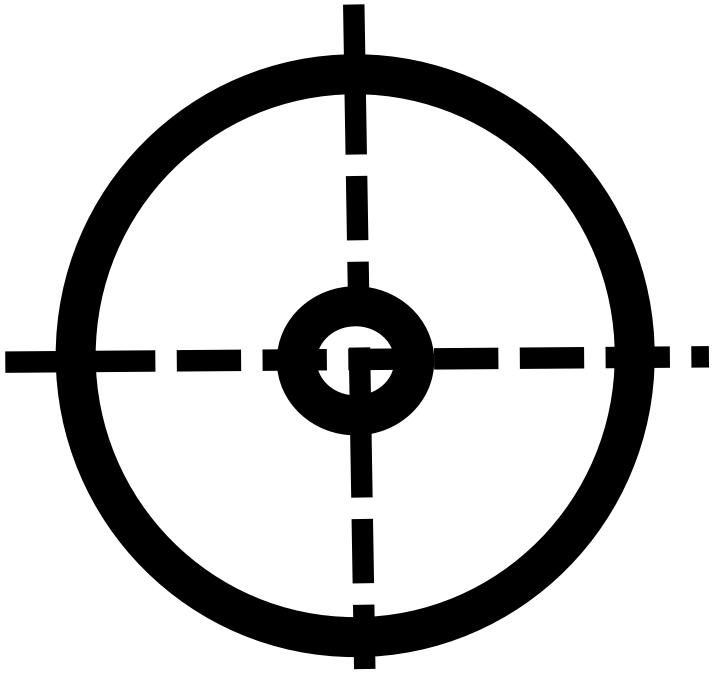
When is a dashboard a good dashboard?

When it provides overview and insight – fast and accurately



Speed

How fast can I understand the information?



Accuracy

How accurate is my interpretation of the information?

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Human-Centered Dashboard Design

Worst Practices

Worst Practices

- Exceeding boundaries of single screen
- Supplying inadequate context for data
- Displaying excessive detail or precision
- Introducing meaningless variety
- Not highlighting important data
- Showing useless decoration
- Designing an unattractive display

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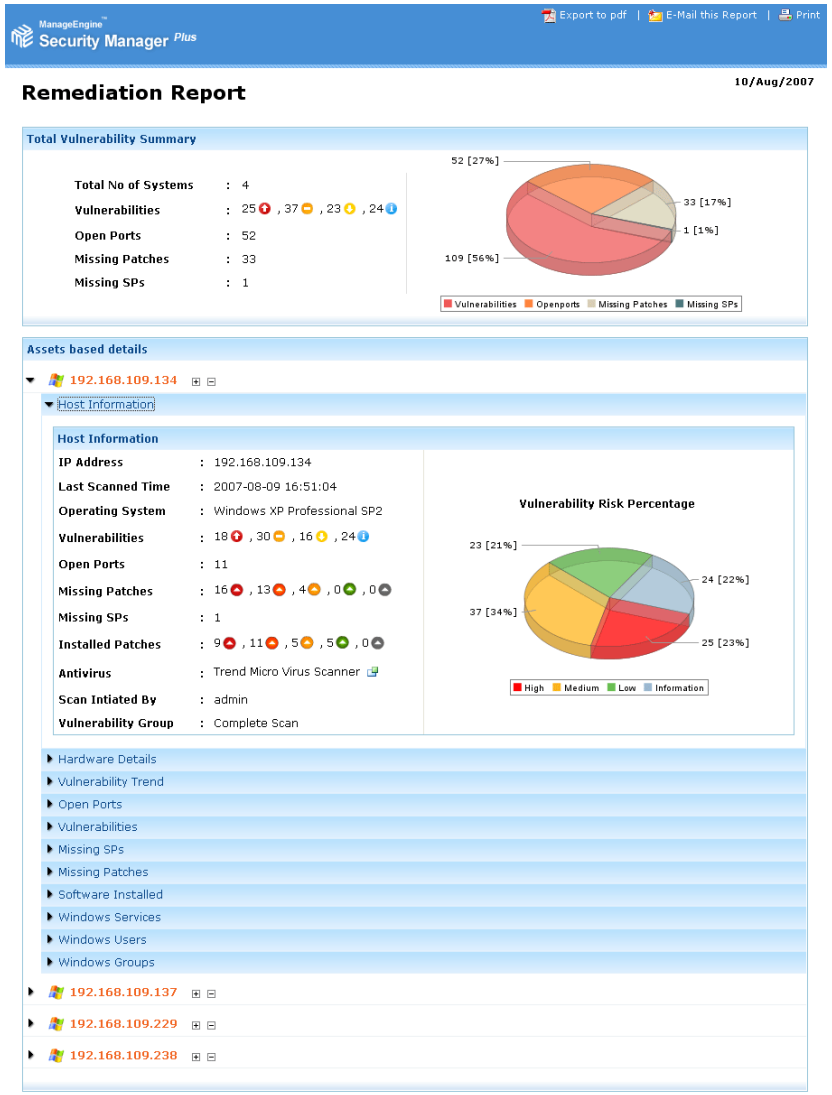

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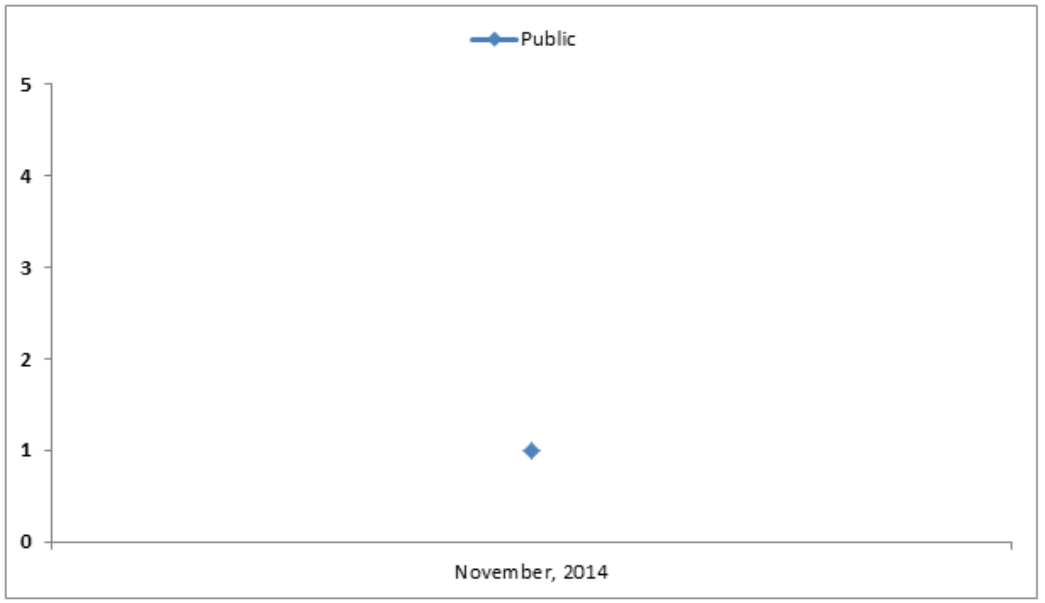

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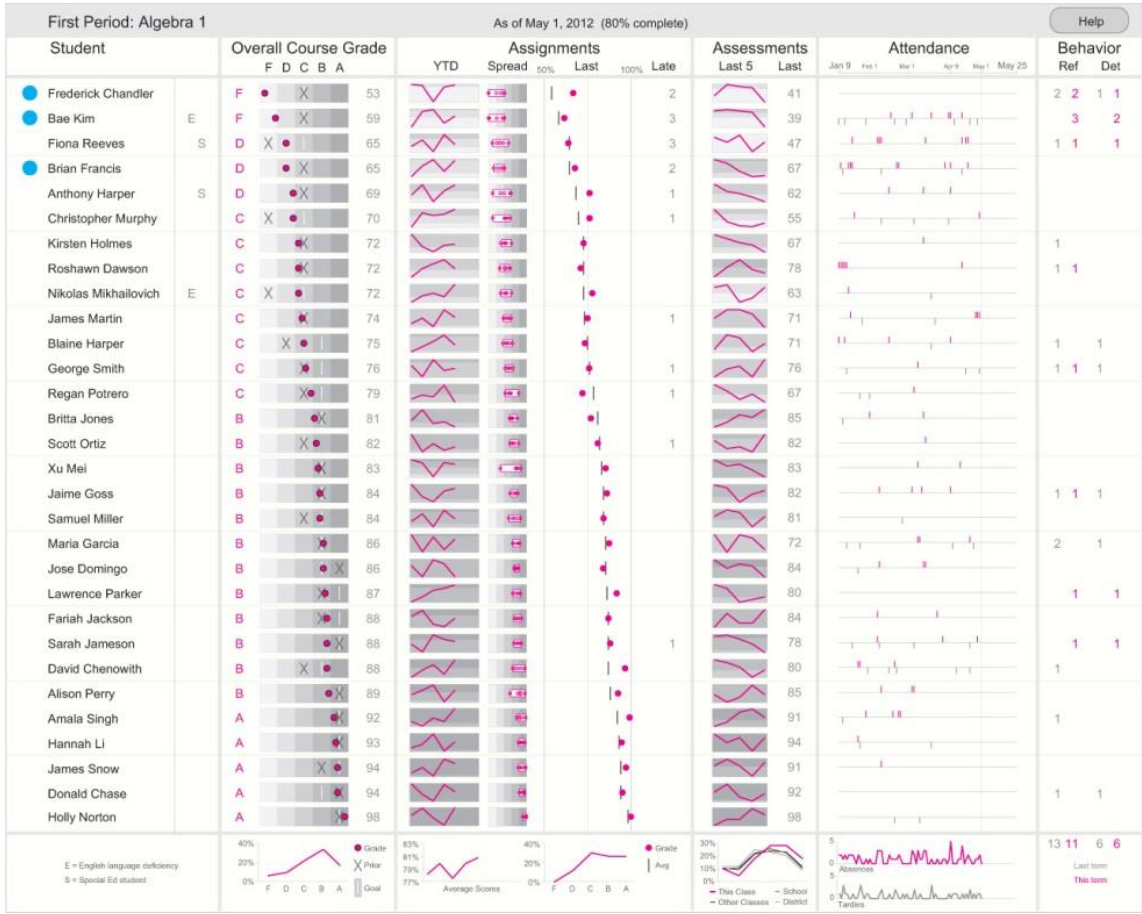

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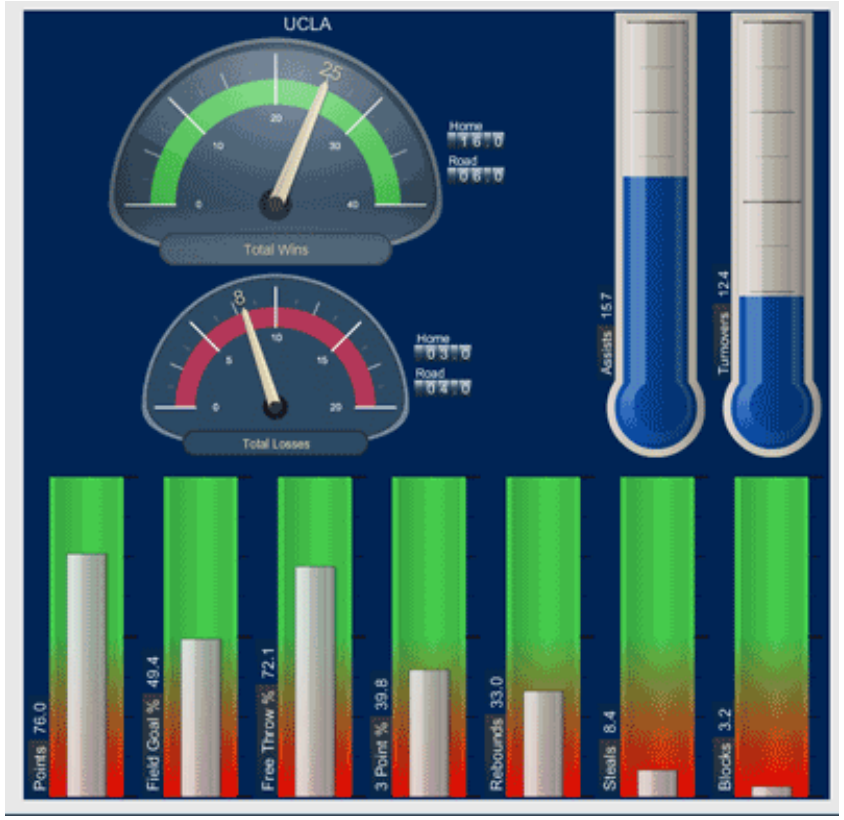

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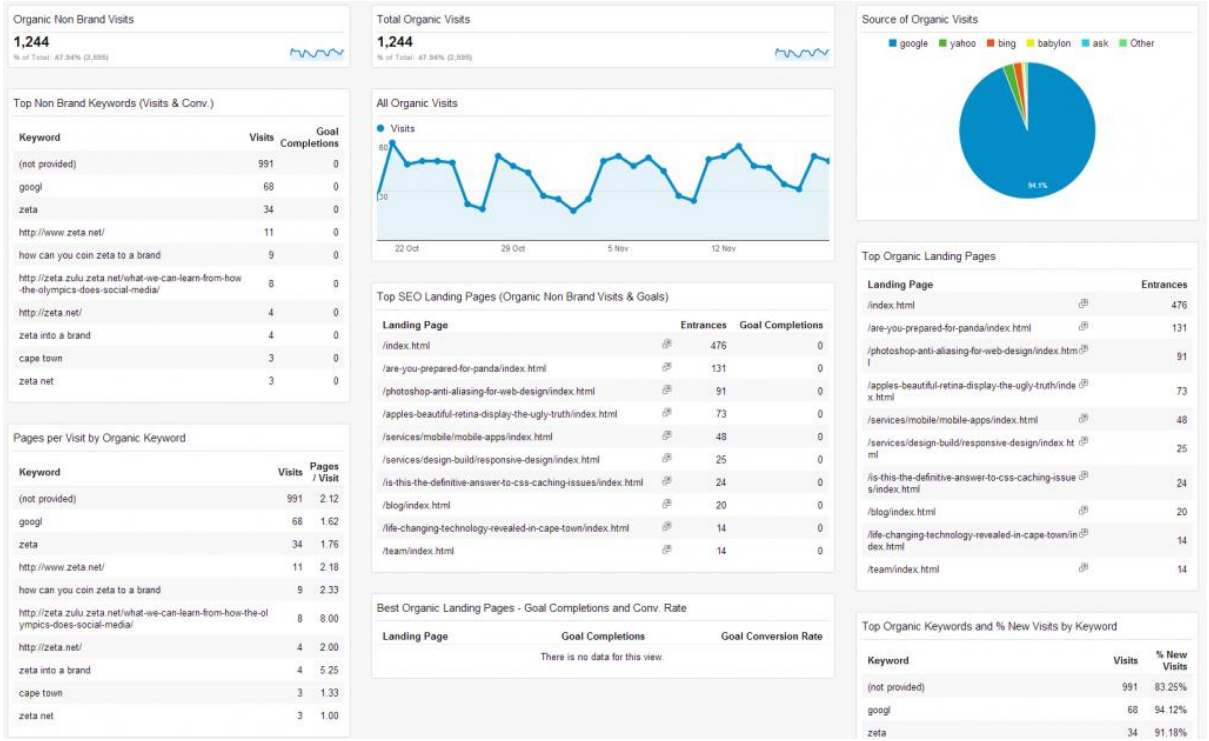

Organic Non Brand Visits

1,244

Total Organic Visits

1,244

Source of Organic Visits

google yahoo bing babylon ask Other

Top Non Brand Keywords (Visits & Conv.)

Keyword	Visits	Goal Completions
(not provided)	991	0
googl	68	0
zeta	34	0
http://www.zeta.net/	11	0
how can you coin zeta to a brand	9	0
http://zeta.zulu.zeta.net/what-we-can-learn-from-how-the-olympics-does-social-media/	8	0
http://zeta.net/	4	0
zeta into a brand	4	0
cape town	3	0
zeta net	3	0

All Organic Visits

Visits

22 Oct 29 Oct 5 Nov 12 Nov

Top Organic Landing Pages

Landing Page	Entrances
/index.html	476
/are-you-prepared-for-panda/index.html	131
/photoshop-anti-aliasing-for-web-design/index.html	91
/apples-beautiful-retina-display-the-ugly-truth/index.html	73
/services/mobile/mobile-apps/index.html	48
/services/design-build/responsive-design/index.html	25
/is-this-the-definitive-answer-to-css-caching-issues/index.html	24
/blog/index.html	20
/life-changing-technology-revealed-in-cape-town/index.html	14
/team/index.html	14

Top SEO Landing Pages (Organic Non Brand Visits & Goals)

Landing Page	Entrances	Goal Completions
/index.html	476	0
/are-you-prepared-for-panda/index.html	131	0
/photoshop-anti-aliasing-for-web-design/index.html	91	0
/apples-beautiful-retina-display-the-ugly-truth/index.html	73	0
/services/mobile/mobile-apps/index.html	48	0
/services/design-build/responsive-design/index.html	25	0
/is-this-the-definitive-answer-to-css-caching-issues/index.html	24	0
/blog/index.html	20	0
/life-changing-technology-revealed-in-cape-town/index.html	14	0
/team/index.html	14	0

Pages per Visit by Organic Keyword

Keyword	Visits	Pages / Visit
(not provided)	991	2.12
googl	68	1.62
zeta	34	1.76
http://www.zeta.net/	11	2.18
how can you coin zeta to a brand	9	2.33
http://zeta.zulu.zeta.net/what-we-can-learn-from-how-the-olympics-does-social-media/	8	8.00
http://zeta.net/	4	2.00
zeta into a brand	4	5.25
cape town	3	1.33
zeta net	3	1.00

Best Organic Landing Pages - Goal Completions and Conv. Rate

Landing Page	Goal Completions	Goal Conversion Rate
There is no data for this view.		

Top Organic Keywords and % New Visits by Keyword

Keyword	Visits	% New Visits
(not provided)	991	83.25%
googl	68	94.12%
zeta	34	91.18%

Worst Practices

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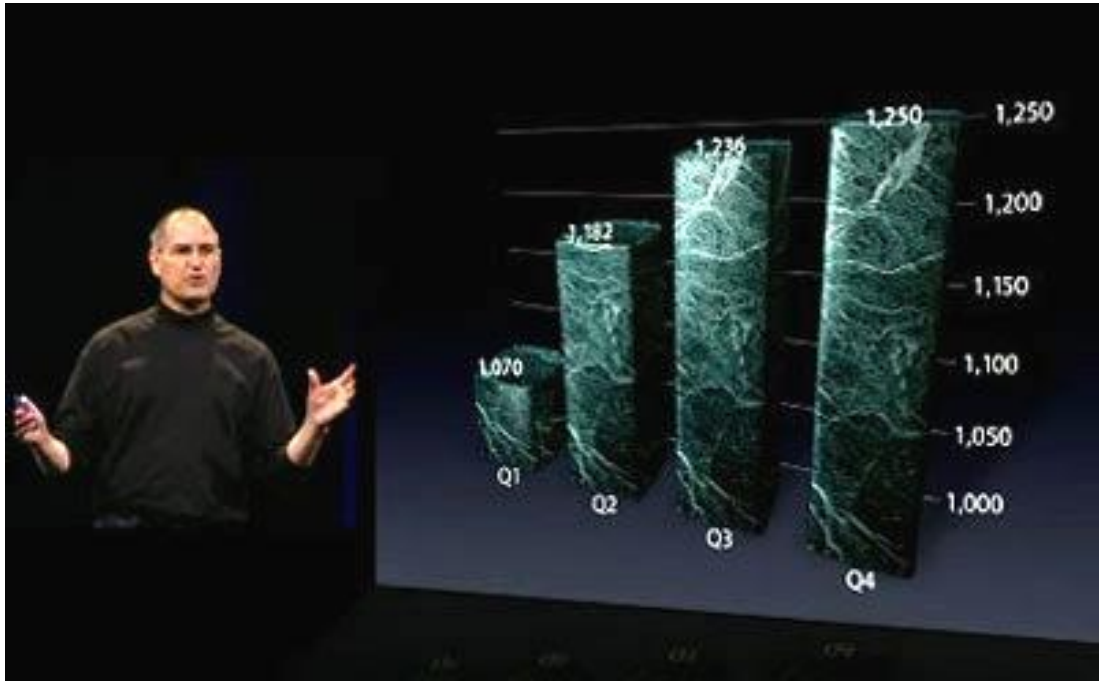

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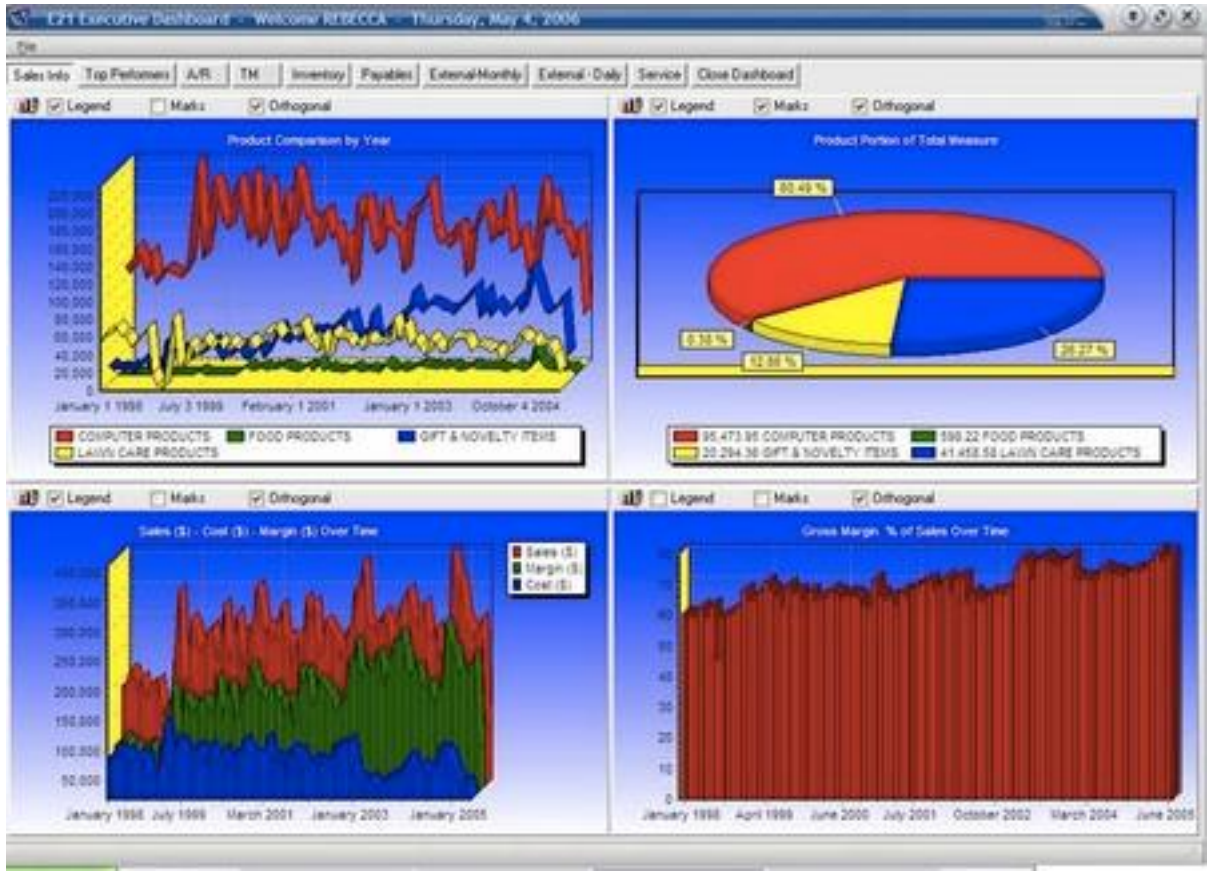


Human-Centered Dashboard Design

Best Practices

Best Practices

1.

Determine WHAT to show

- What information is essential to a person, a team, a company?
- What data and metrics do we have available to turn into information?
- What insights shall the dashboard provide?

2.

Determine HOW to show it

- Layout
- Charts vs. tables
- Chart types
- Ergonomics and Design

Best Practices

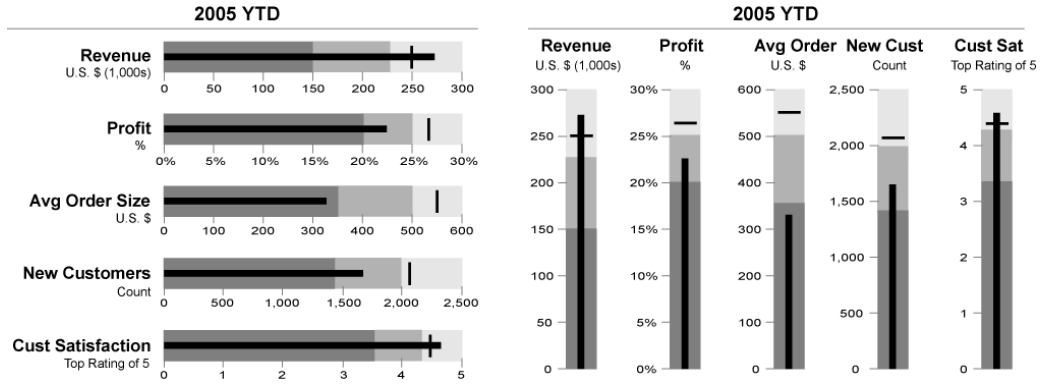
Managing limited screen real estate

→ Use chart types that are optimized for small real estate

Sparklines (E. Tufte)

= Data-intense, design-simple, word-sized graphics

Bullet graphs (S. Few)

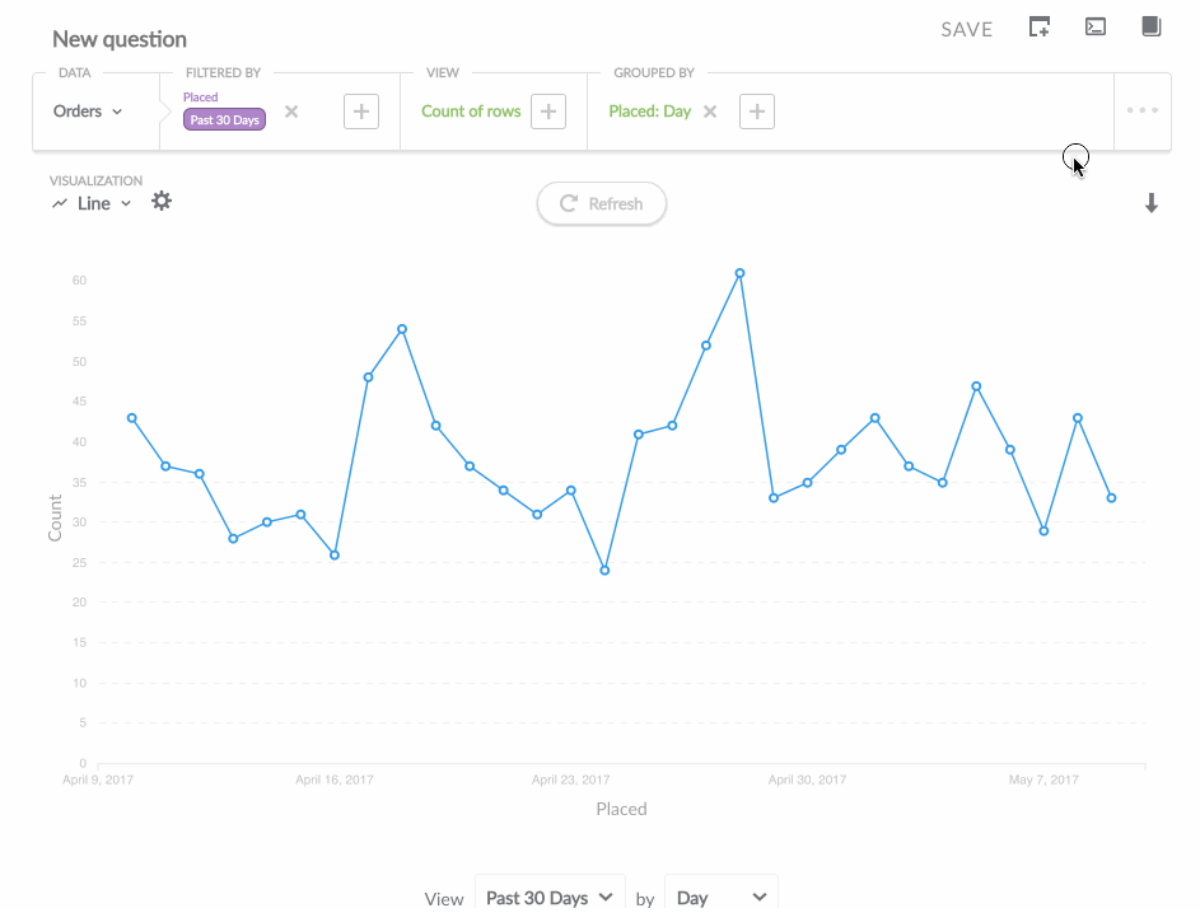


= Column and bar charts enriched with ranges, target values and actual value

Best Practices

Managing limited screen real estate

→ Use drill-in charts so that overview and detail share the same real estate, but not at the same time



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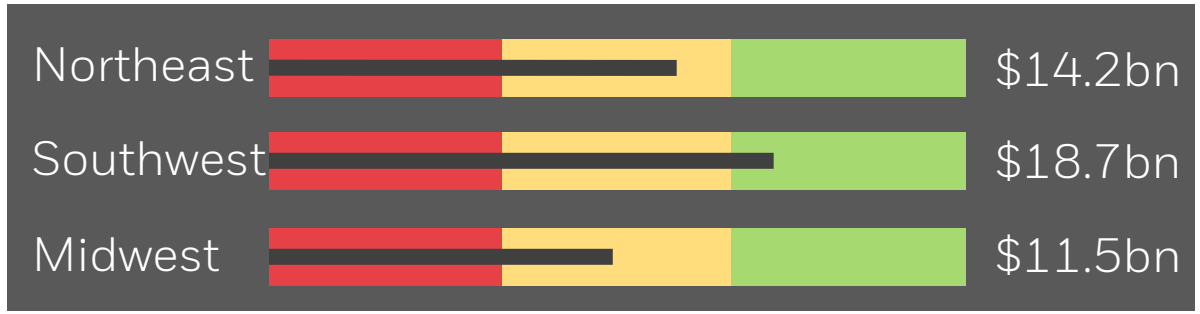
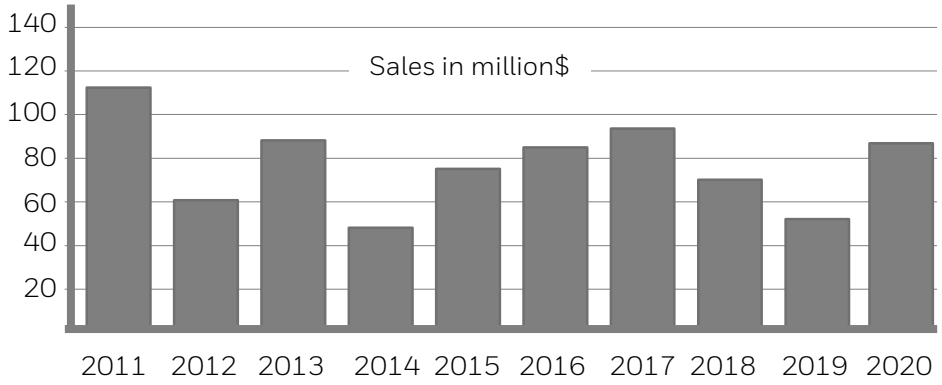
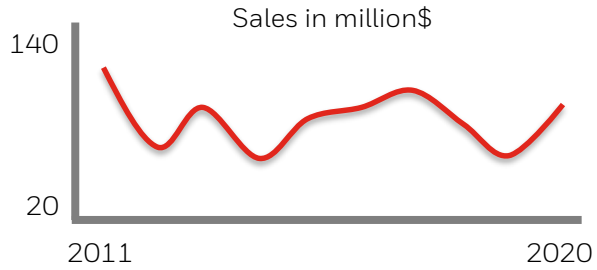
Best Practices

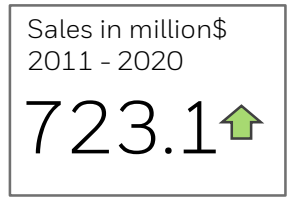
Managing limited screen real estate

→ Gracefully degrade the detail rendered (aka RWD for graphs)







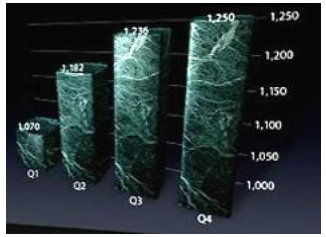


Best Practices

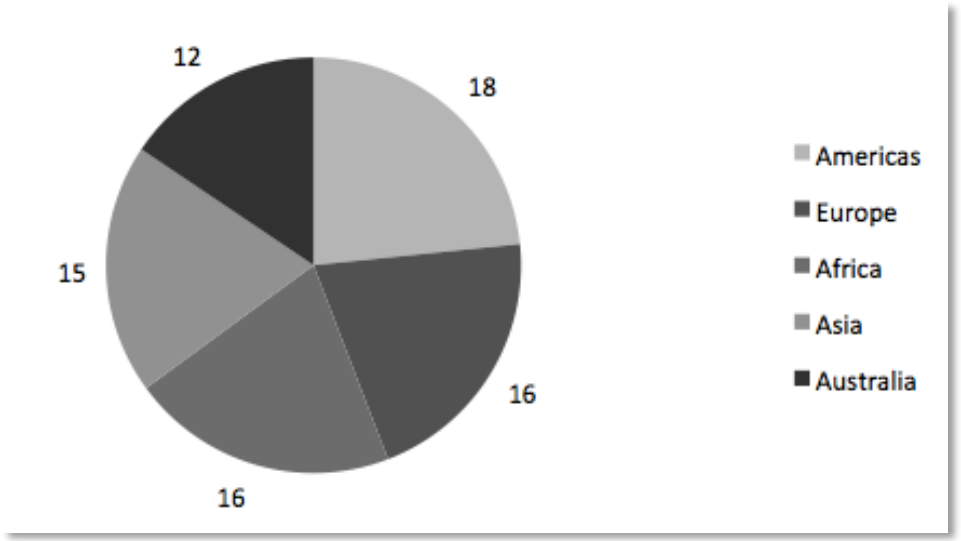
- Maximize the data-to-ink ratio (E. Tufte)

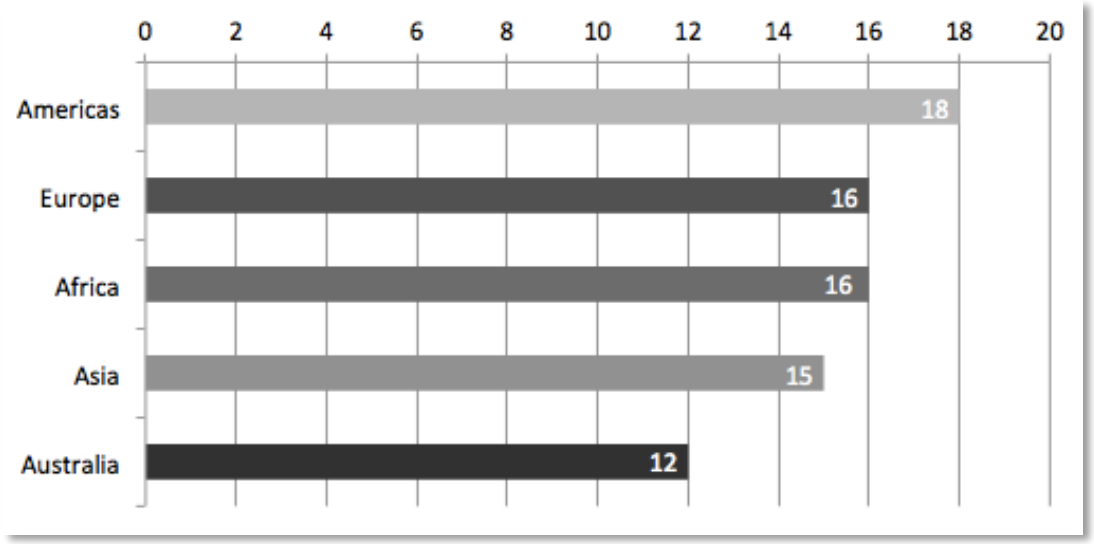
  → The higher, the better

  $$\frac{data}{ink} = 1 = \text{ideal}$$



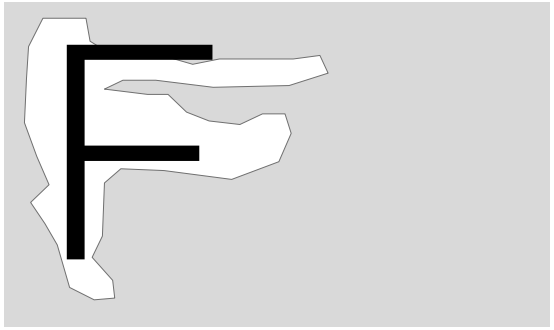
- Place values and labels as close to the graphic as possible

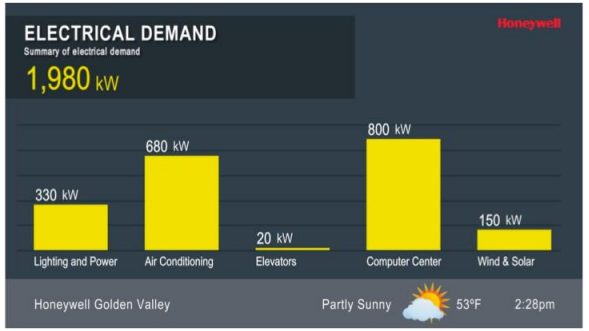




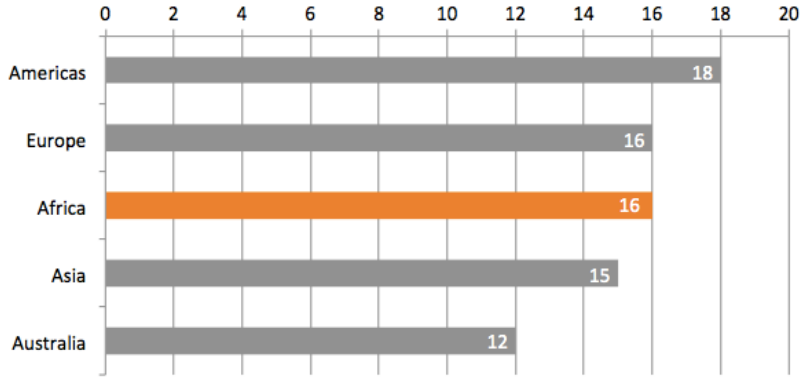
Best Practices

- Place most important info towards the top left to support F-shaped visual scanning paths





- Highlight important things (but then: isn't everything on a dashboard important?)



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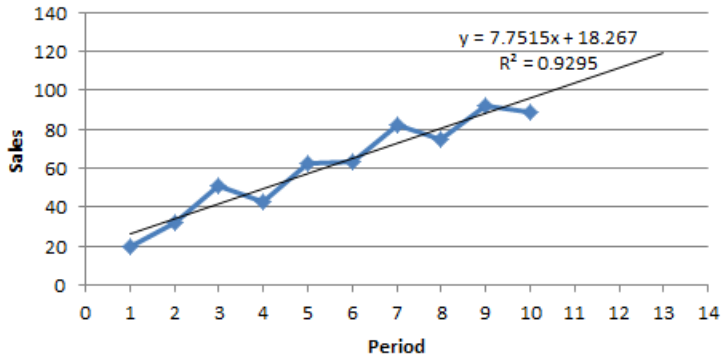
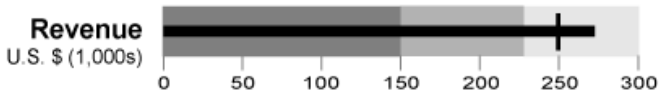
Best Practices

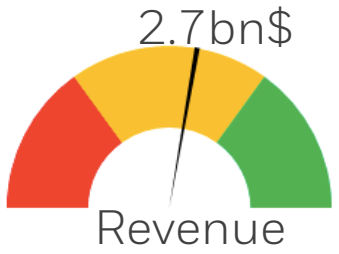
- Provide context for data

→ Extrapolation into the future

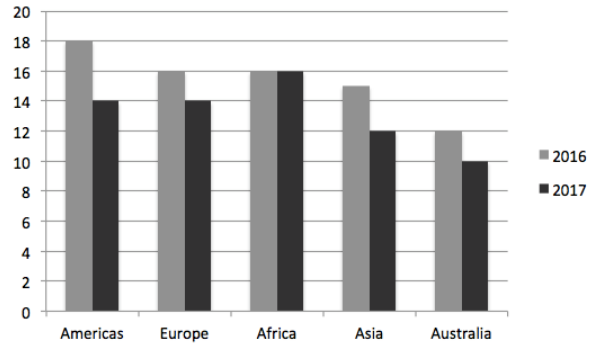


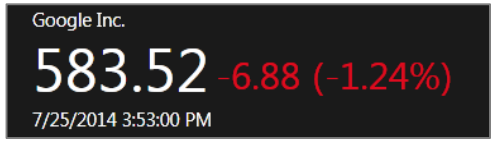
→ Display of target values or ranges





→ Reference to historical values





Best Practices

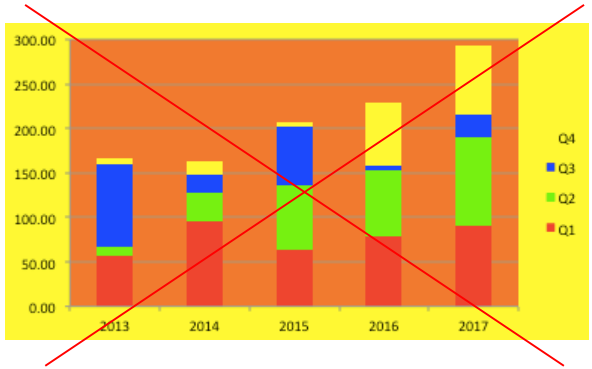
Use of Text

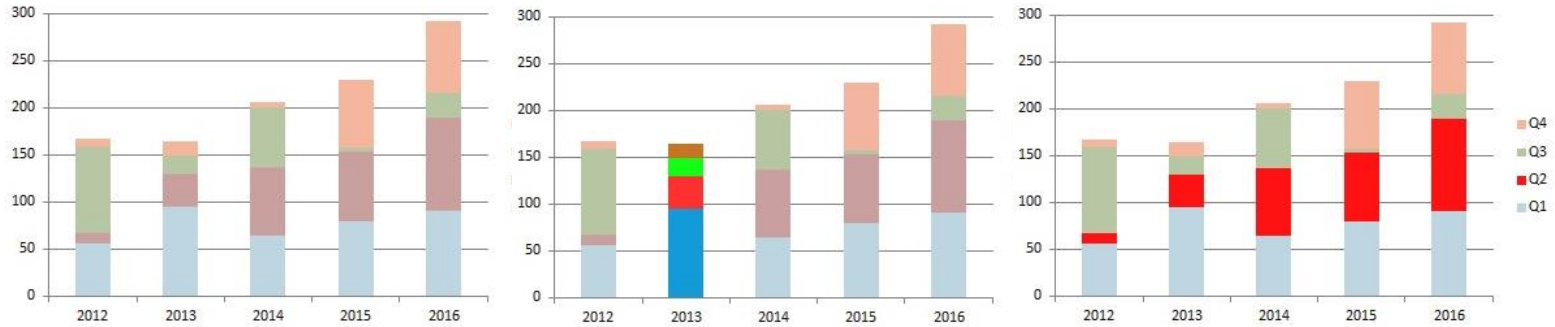
- Use as few font types as possible
- Use as few text orientations as possible
- Provide for legibility: size, contrast, type
- Use text treatment such as size, color or bolding for highlighting

Best Practices

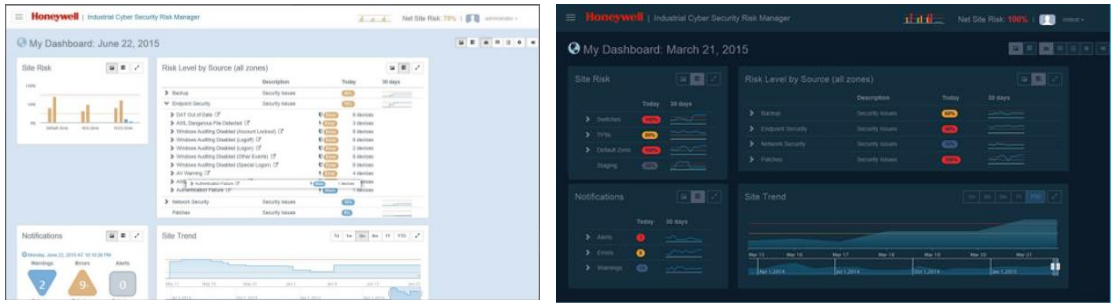
Use of Color

- Don’t over-use color. Use de-saturated colors. Use saturated colors for highlighting data.





- Positive polarity (dark content on light background) is generally better than negative polarity
- Make background achromatic so that you can choose among more foreground colors



Industrial Cyber Security Manager

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Human-Centered Dashboard Design

Charts

Charts

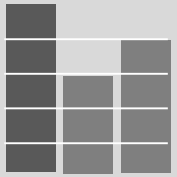
- Time Series
  – categorical scale represents time
- Composition
  – part to whole
- Deviation
  – difference between values and a reference
- Distribution
  – frequency of values
- Relationship
  – correlation of two sets of values
- Comparison and Ranking
  – values against other values

Chart Types & Inventors

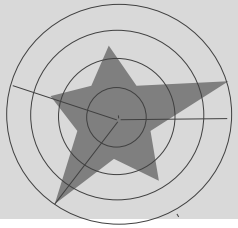
Line, 1786 by William Playfair

Bar, 1801 by William Playfair

Pie, 1801 by William Playfair

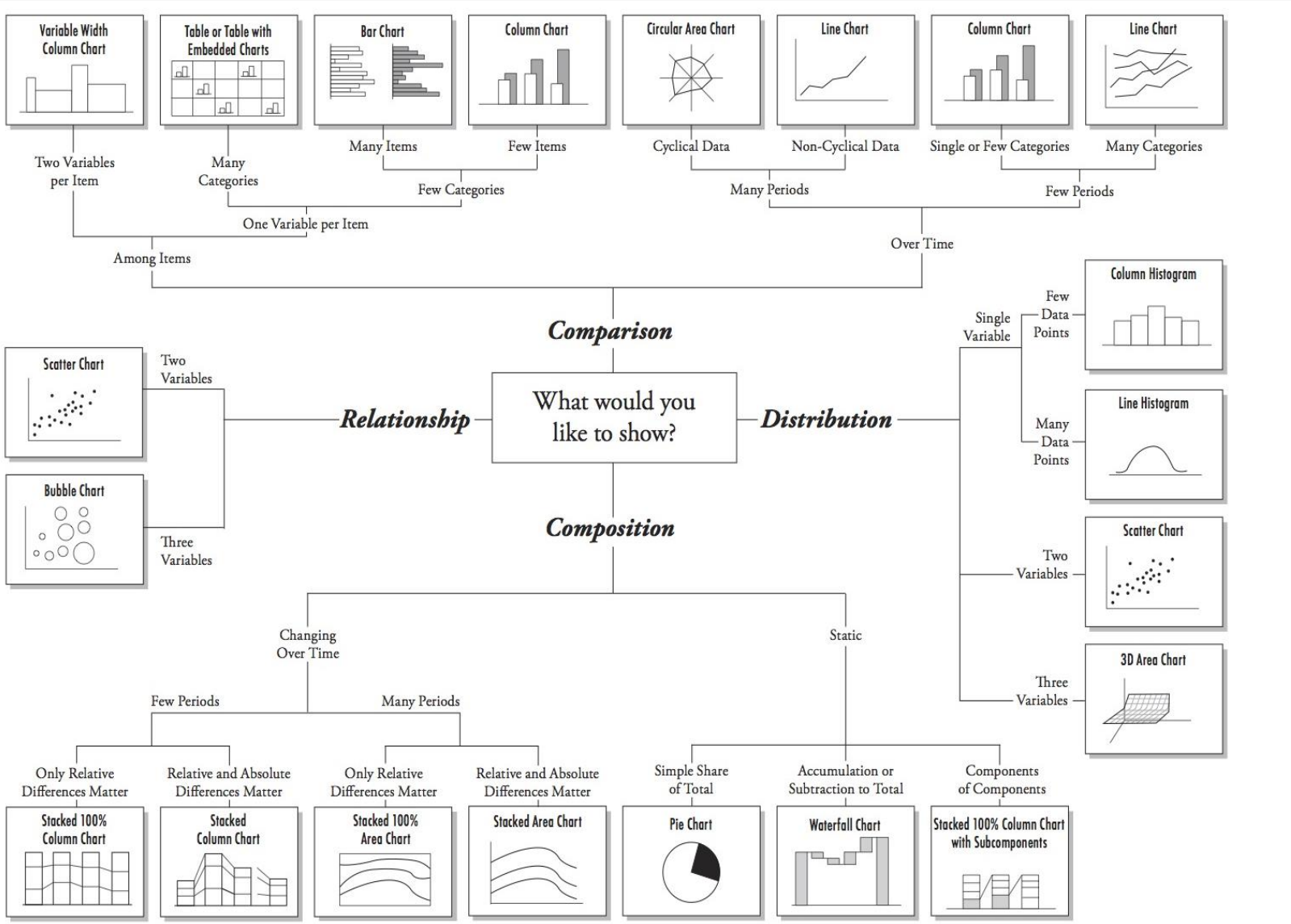


Histogram, 1891 by Karl Pearson



Radar, 1877 by Georg von Mayr

Charts

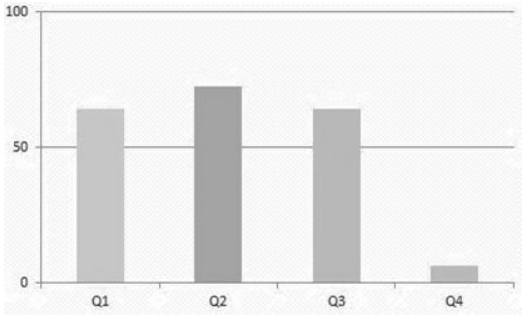


Charts

- Charts on dashboards typically show:
  - Quantitative values (= measures). “How much?“ (e.g. $2,000, $3,000)
  - Categorical labels (= dimensions). “What?” (e.g. Person A, Person B, North, West)

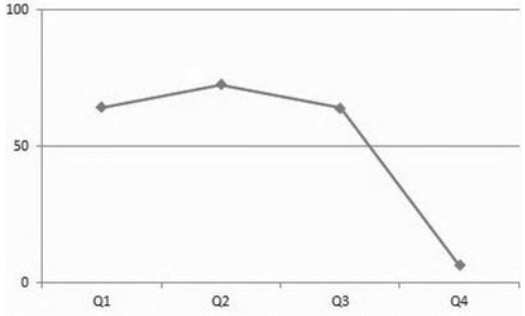
- What’s the best range for quantitative scales?

Column Charts



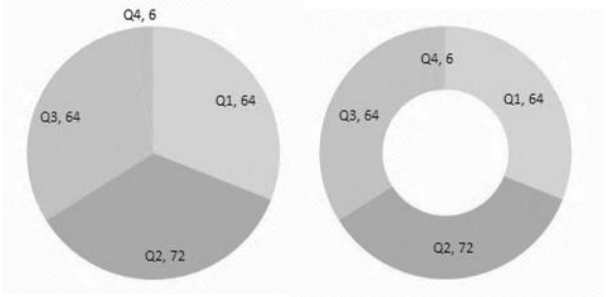
High end > highest value
Low end is zero

Line Charts



High end > highest value
Low end < lowest value

Pie & Donut Charts

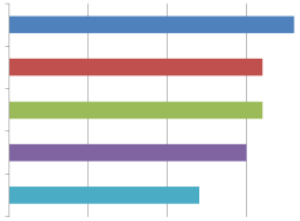


No worries, scale to 100%

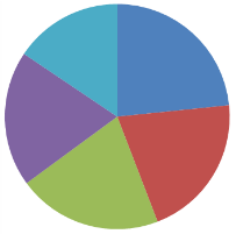
Charts

Select the chart type based on aesthetics and human cognitive abilities

Position along scale



Angle



Area

Volume

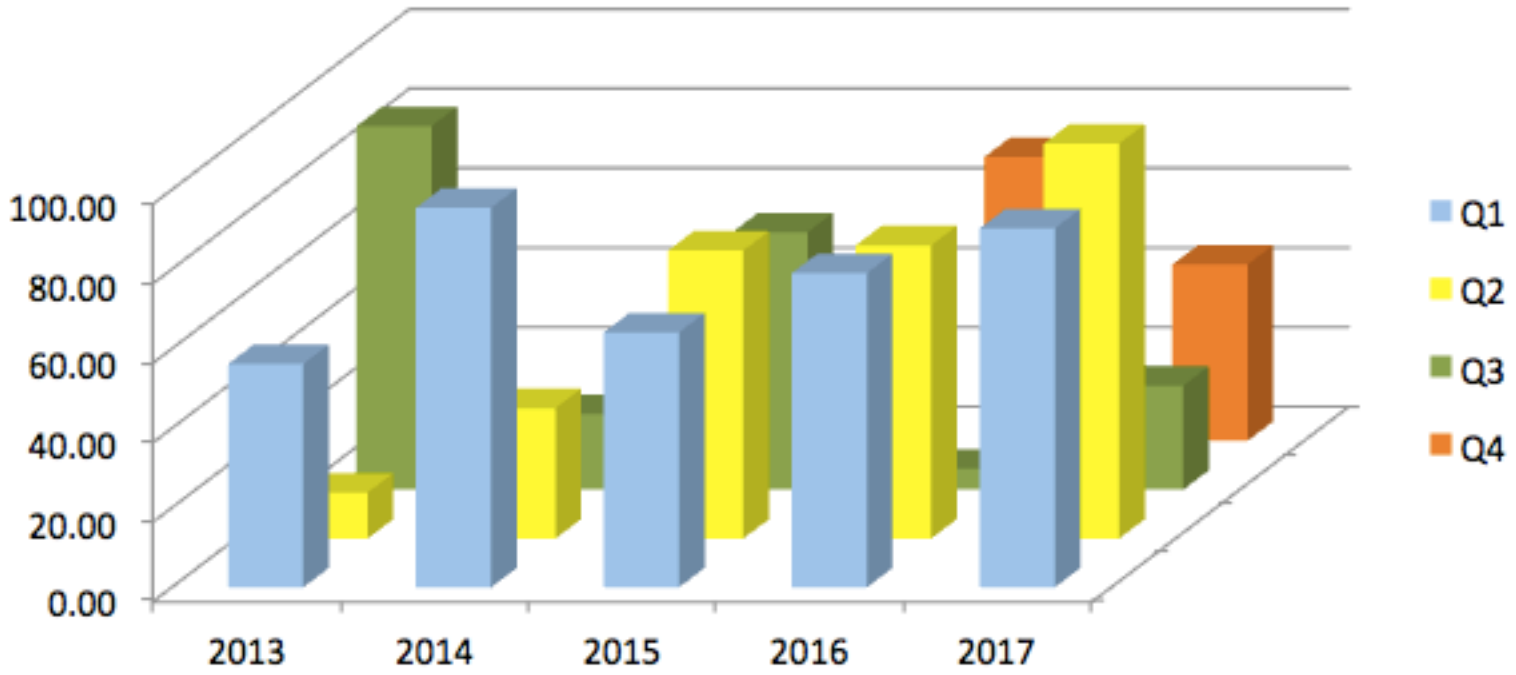
Easy

Hard

Cleveland, W.S. (1985). The Elements of Graphing Data. Wadsworth, Belmont, CA.

Charts

“So, how were sales in Q4, 2013?” – “No idea. But this chart is a beauty!”



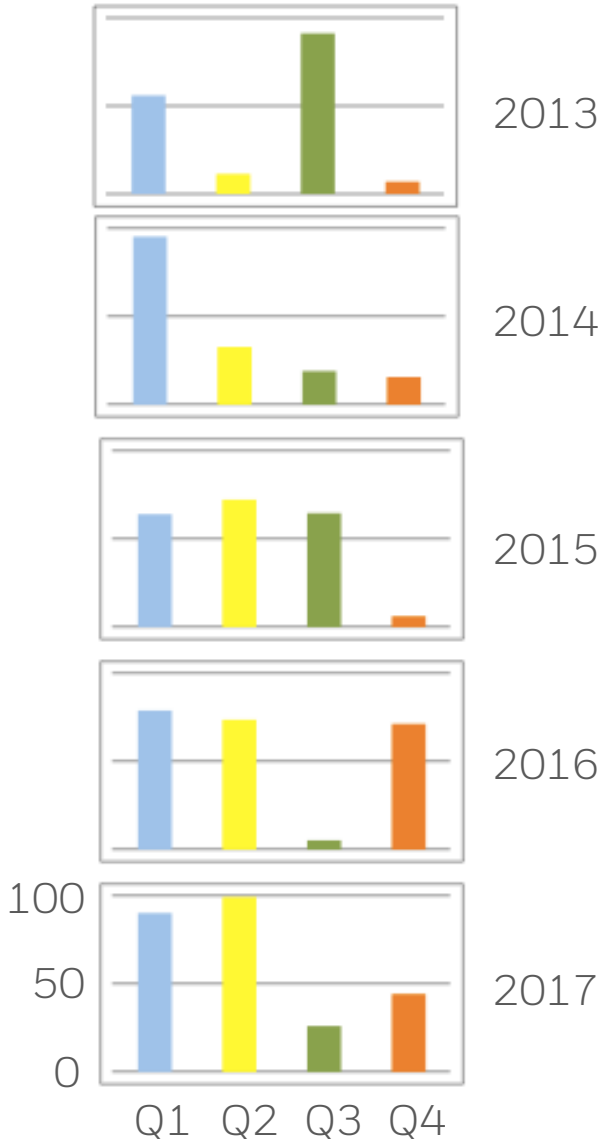
3d is usually not the best way to visualize data!

Charts

Alternative 1:

Panel Chart

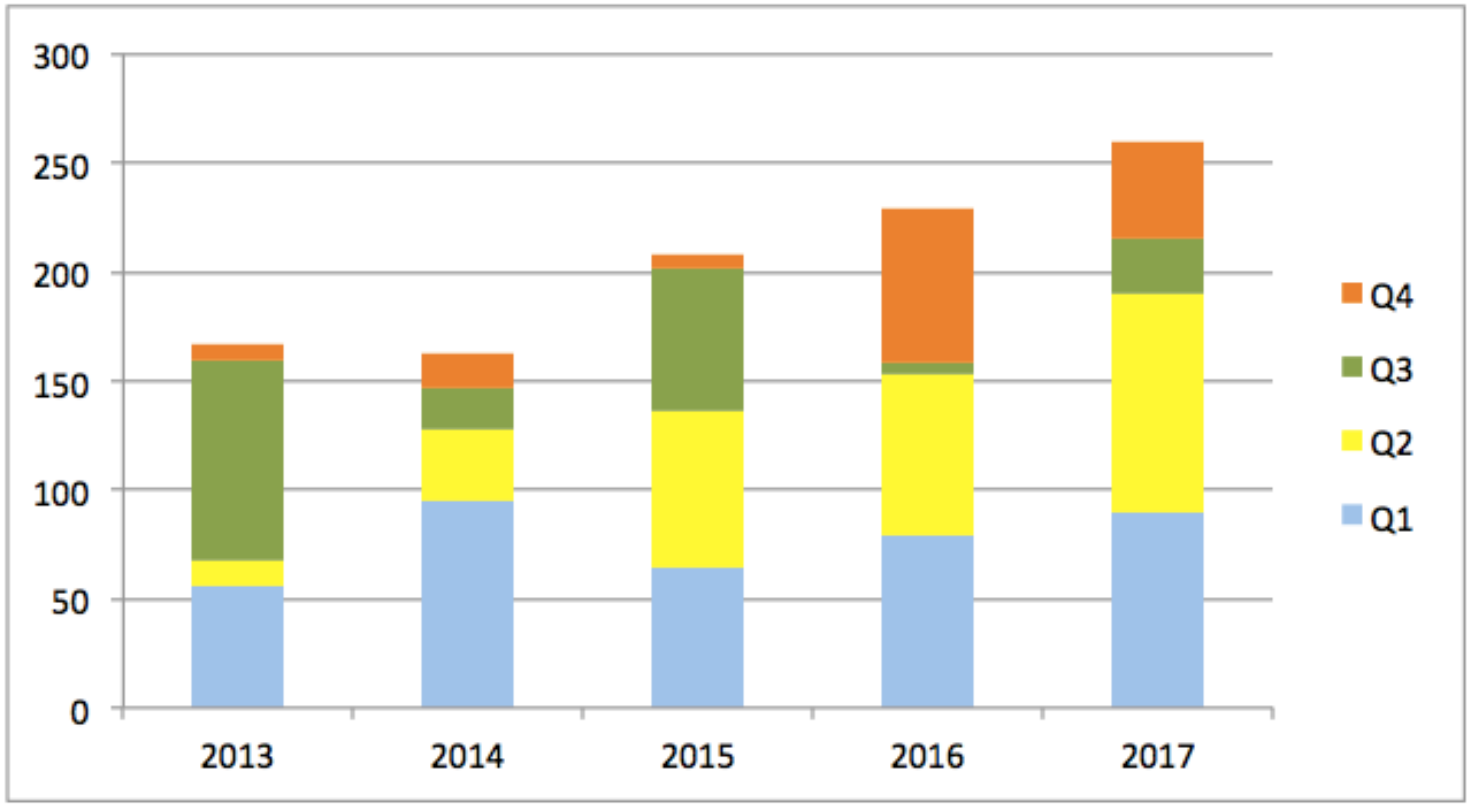
(aka Small Multiples)



Charts

Alternative 2:

Stacked Colum Chart



Human-Centered Dashboard Design

Tables

Tables

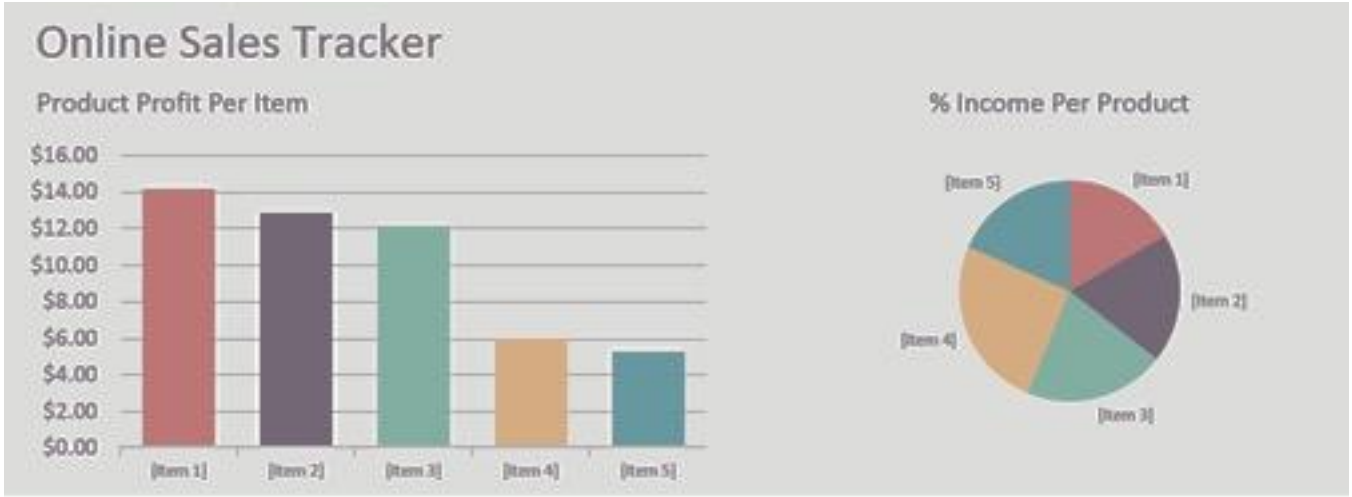
When to use:

- For showing individual values
- For numeric precision
- For combining summary and details in the same display

Tables

Best practices

- Use white space to support readability
- Use alternate row colors for improved visual scanning
- Use highlighting to show important values
  - Fill colors
  - Border around cells
  - Text treatment (bold, color)
- Proper text and number alignment



Item	Cost Per Item	Percent Markup	Total Sold	Total Revenue	Shipping Charge/Item	Shipping Cost/Item	Profit per Item (incl. shipping)	Returns	Total Income
[Item 1]	$10.00	100.00%	15	$300.00	$10.00	$5.75	$14.25	2	$196.75
[Item 2]	$11.50	75.00%	18	$362.25	$10.00	$5.75	$12.88	1	$224.63
[Item 3]	$13.00	65.00%	20	$429.00	$10.00	$6.25	$12.20	0	$244.00
[Item 4]	$5.00	90.00%	50	$475.00	$5.00	$3.50	$6.00	0	$300.00
[Item 5]	$4.00	90.00%	42	$319.20	$5.00	$3.25	$5.35	3	$218.40
Total				$1,885.45				6	$1,183.78

Tables

Year	Q1	Q2	Q3	Q4	Total
2008	120.30	118.76	143.23	78.55	460.84
2009	118.77	113.55	128.27	15.70	376.29
2010	64.12	72.39	154.23	6.20	296.94
2011	79.01	73.73	8.99	71.37	233.10
2012	89.78	99.32	66.36	76.80	332.26
2013	100.03	21.27	102.80	82.51	306.60
2014	103.33	22.92	123.74	42.80	292.78
2015	112.78	59.86	77.22	4.82	254.68
2016	104.60	9.03	9.88	31.20	154.71
2017	37.44	40.19	98.49	83.97	260.09
2018	9.98	8.14	35.77	86.64	140.53
Total	940.14	639.15	948.98	580.56	3108.83

Tables

Maximizing Data-to-Ink Ratio

Year	Q1	Q2	Q3	Q4	Total
2008	120.30	118.76	143.23	78.55	460.84
2009	118.77	113.55	128.27	15.70	376.29
2010	64.12	72.39	154.23	6.20	296.94
2011	79.01	73.73	8.99	71.37	233.10
2012	89.78	99.32	66.36	76.80	332.26
2013	100.03	21.27	102.80	82.51	306.60
2014	103.33	22.92	123.74	42.80	292.78
2015	112.78	59.86	77.22	4.82	254.68
2016	104.60	9.03	9.88	31.20	154.71
2017	37.44	40.19	98.49	83.97	260.09
2018	9.98	8.14	35.77	86.64	140.53
Total	940.14	639.15	948.98	580.56	3108.83

Tables

Emphasizing categorical labels – through text treatment

Year	Q1	Q2	Q3	Q4	Total
2008	120.30	118.76	143.23	78.55	460.84
2009	118.77	113.55	128.27	15.70	376.29
2010	64.12	72.39	154.23	6.20	296.94
2011	79.01	73.73	8.99	71.37	233.10
2012	89.78	99.32	66.36	76.80	332.26
2013	100.03	21.27	102.80	82.51	306.60
2014	103.33	22.92	123.74	42.80	292.78
2015	112.78	59.86	77.22	4.82	254.68
2016	104.60	9.03	9.88	31.20	154.71
2017	37.44	40.19	98.49	83.97	260.09
2018	9.98	8.14	35.77	86.64	140.53
Total	940.14	639.15	948.98	580.56	3108.83

Tables

Emphasizing categorical labels – through reducing (!) Data-to-Ink Ratio

Year	Q1	Q2	Q3	Q4	Total
2008	120.30	118.76	143.23	78.55	460.84
2009	118.77	113.55	128.27	15.70	376.29
2010	64.12	72.39	154.23	6.20	296.94
2011	79.01	73.73	8.99	71.37	233.10
2012	89.78	99.32	66.36	76.80	332.26
2013	100.03	21.27	102.80	82.51	306.60
2014	103.33	22.92	123.74	42.80	292.78
2015	112.78	59.86	77.22	4.82	254.68
2016	104.60	9.03	9.88	31.20	154.71
2017	37.44	40.19	98.49	83.97	260.09
2018	9.98	8.14	35.77	86.64	140.53
Total	940.14	639.15	948.98	580.56	3108.83

Tables

Right-justifying the data for better understanding about high vs. low numbers

Year	Q1	Q2	Q3	Q4	Total
2008	120.30	118.76	143.23	78.55	460.84
2009	118.77	113.55	128.27	15.70	376.29
2010	64.12	72.39	154.23	6.20	296.94
2011	79.01	73.73	8.99	71.37	233.10
2012	89.78	99.32	66.36	76.80	332.26
2013	100.03	21.27	102.80	82.51	306.60
2014	103.33	22.92	123.74	42.80	292.78
2015	112.78	59.86	77.22	4.82	254.68
2016	104.60	9.03	9.88	31.20	154.71
2017	37.44	40.19	98.49	83.97	260.09
2018	9.98	8.14	35.77	86.64	140.53
Total	940.14	639.15	948.98	580.56	3108.83

Tables

Supporting scan-ability through alternating row colors

Year	Q1	Q2	Q3	Q4	Total
2008	120.30	118.76	143.23	78.55	460.84
2009	118.77	113.55	128.27	15.70	376.29
2010	64.12	72.39	154.23	6.20	296.94
2011	79.01	73.73	8.99	71.37	233.10
2012	89.78	99.32	66.36	76.80	332.26
2013	100.03	21.27	102.80	82.51	306.60
2014	103.33	22.92	123.74	42.80	292.78
2015	112.78	59.86	77.22	4.82	254.68
2016	104.60	9.03	9.88	31.20	154.71
2017	37.44	40.19	98.49	83.97	260.09
2018	9.98	8.14	35.77	86.64	140.53
Total	940.14	639.15	948.98	580.56	3108.83

Tables

Adding spark lines for overview

Year	Q1	Q2	Q3	Q4	Total	
2008	120.30	118.76	143.23	78.55	460.84	
2009	118.77	113.55	128.27	15.70	376.29	
2010	64.12	72.39	154.23	6.20	296.94	
2011	79.01	73.73	8.99	71.37	233.10	
2012	89.78	99.32	66.36	76.80	332.26	
2013	100.03	21.27	102.80	82.51	306.60	
2014	103.33	22.92	123.74	42.80	292.78	
2015	112.78	59.86	77.22	4.82	254.68	
2016	104.60	9.03	9.88	31.20	154.71	
2017	37.44	40.19	98.49	83.97	260.09	
2018	9.98	8.14	35.77	86.64	140.53	
Total	940.14	639.15	948.98	580.56	3108.83	

Tables

Highlighting max and min values for overview

Year	Q1	Q2	Q3	Q4	Total	
2008	120.30	118.76	143.23	78.55	460.84	
2009	118.77	113.55	128.27	15.70	376.29	
2010	64.12	72.39	154.23	6.20	296.94	
2011	79.01	73.73	8.99	71.37	233.10	
2012	89.78	99.32	66.36	76.80	332.26	
2013	100.03	21.27	102.80	82.51	306.60	
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2017	37.44	40.19	98.49	83.97	260.09	
2018	9.98	8.14	35.77	86.64	140.53	
Total	940.14	639.15	948.98	580.56	3108.83	

Human-Centered Dashboard Design

Q&A

Recommended Reads

- https://www.honeywell.com/brand/digital/patterns/data-visualization
- Few, S. (2006). Information Dashboard Design: The Effective Visual Communication of Data. O'Reilly, Sebastopol, CA.
- Few, S. (2009). Now You See It: Simple Visualization Techniques for Quantitative Analysis. Analytics Press, Oakland, CA.
- Few, S. (2012). Show Me the Numbers: Designing Tables and Graphs to Enlighten. Analytics Press, Burlingame, CA.
- Few, S. (2013). Information Dashboard Design: Displaying Data for At-a-Glance Monitoring. Analytics Press, Burlingame, CA.
- http://www.perceptualedge.com/
- Tufte, E. (1990). Envisioning Information. Beautiful Evidence. Graphics Press, Cheshire, CT.
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