



Charting Special Topic: Performance Charts

IT 7113 Data Visualization

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Fall 2023

<http://idi.Kennesaw.edu/it7113/>

Overview



This lecture introduces some commonly used chart types for business performance reporting and communication.

- KPI charts
 - Bullet graph
 - Waffle chart
 - Gauge
 - Chart sets
- Other visualization features
 - Traffic light system
 - Indication of differences
 - Score cards and sparkline
- Other performance related chart
 - Waterfall/bridge chart
 - Perceptual map

Performance and KPI



- Performance management (PM) is the process of ensuring that a set of activities and outputs meets an organization's goals in an effective and efficient manner.
- A performance system utilizes KPI (Key Performance Indicator) to define and track performances.
 - A KPI is a metric that is tied to a target.
 - The KPI score and its visual indicator are designed to let a business user know at a glance if results are on target or off target.
 - Meeting budget or goals: meet, warning, not meet
- Commonly components of a KPI
 - Metric value: actual fact
 - Target value: could be a budget, average, goal
 - Status range
- Commonly used charts for KPI
 - Gauge chart
 - Waffle chart
 - Bullet chart

Gauge Chart

- The gauge (dial) chart plots a single value on gauge-type image, similar to an odometer.
 - Basic gauge chart can be of a circle shape or half circle shape.
 - The value needle that represents the value positions itself between the maximum and minimum values for the dial.
- Often used for operational performance monitoring, or single value critical measure

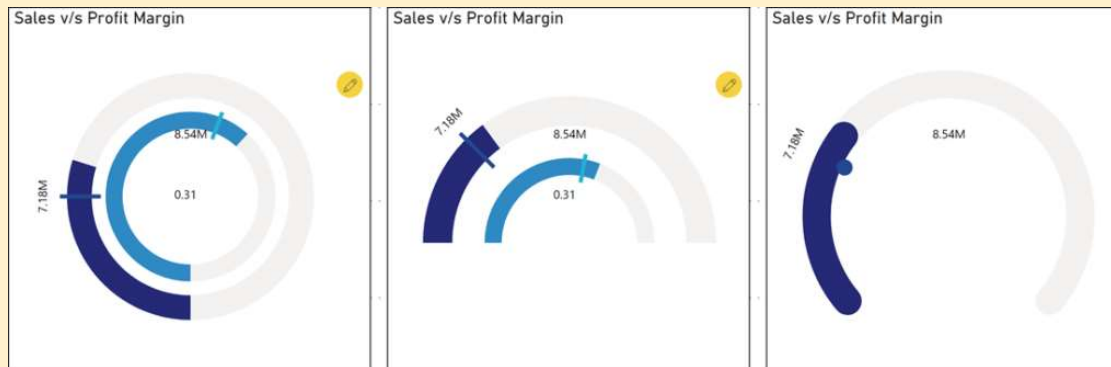


Image from
<https://www.fusioncharts.com/charts/gauges>

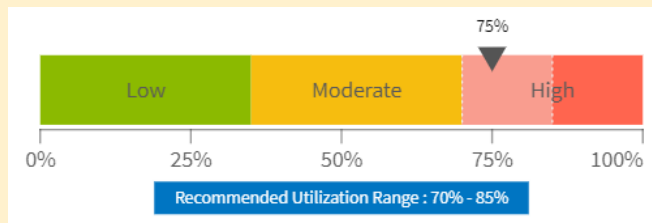
Gauge Chart Variations



- Basic types
 - Circle or partial circle needle dial chart
 - Donut chart
 - Linear or bar gauge chart
- More examples
 - <https://www.datapine.com/blog/gauge-chart-examples/>



Donut gauge chart image from
<https://xviz.com/blogs/5-visuals-that-add-value-to-your-power-bi-dashboards/>



Linear gauge image from
<https://www.fusioncharts.com/dev/chart-guide/gauges-and-widgets/linear-gauge>

Gauge Chart Set

- Gauge chart can also be stacked for multiple KPIs
 - Nested
 - Small multiple matrix
 - Multiple needles
 - One line Row/Column

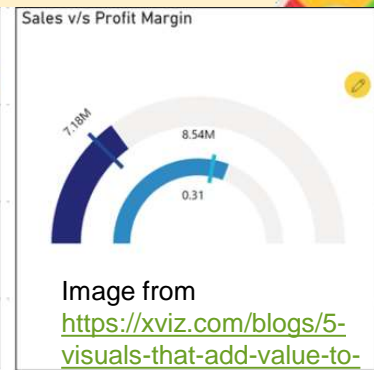
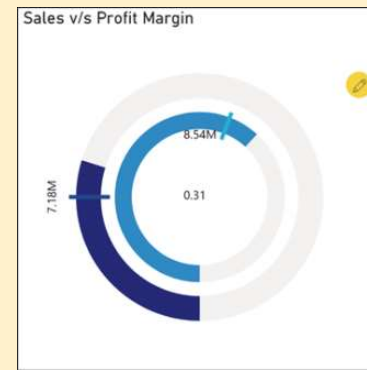


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<https://xviz.com/blogs/5-visuals-that-add-value-to-your-power-bi-dashboards/>

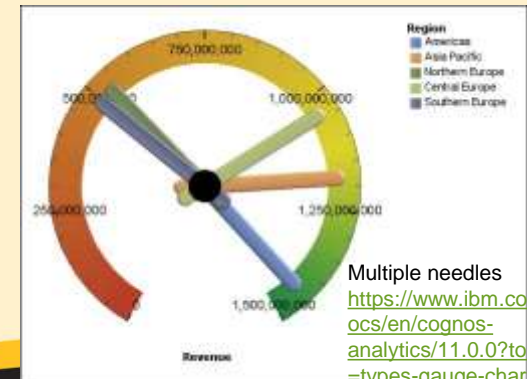


Company Insights Score for CRM

<https://finance.yahoo.com/quote/CRM/company-insights?p=CRM>

Updated 12 hours ago

Overall score is calculated based on proprietary scores based on sector averages in key company indicators: fair value, dividends, innovation, hiring, and insider sentiment. Note: if you don't see a key indicator sub score below it is because this company's data is not currently available for that area.



Multiple needles
<https://www.ibm.com/docs/en/cognos-analytics/11.0.0?topic=types-gauge-charts>

Waffle Chart



- A waffle chart is an alternative style to show progress towards a target or a completion percentage. There is a grid of small units, of which colored cells represent the data.
- A chart can consist of one category or several categories. *Multiple* waffle charts can be put together to show a set of related measures for comparison.
- Some argues it is a good replacement of pie charts
 - <https://www.barefootdatascience.com/2017/09/17/waffle-vs-pie-a-visualization-showdown/>
 - See discussions in this thread <https://twitter.com/storywithdata/status/634145280649068544>
- Reference
 - <https://www.storytellingwithdata.com/blog/what-is-a-square-area-chart>
 - <https://datavizproject.com/data-type/percentage-grid/>

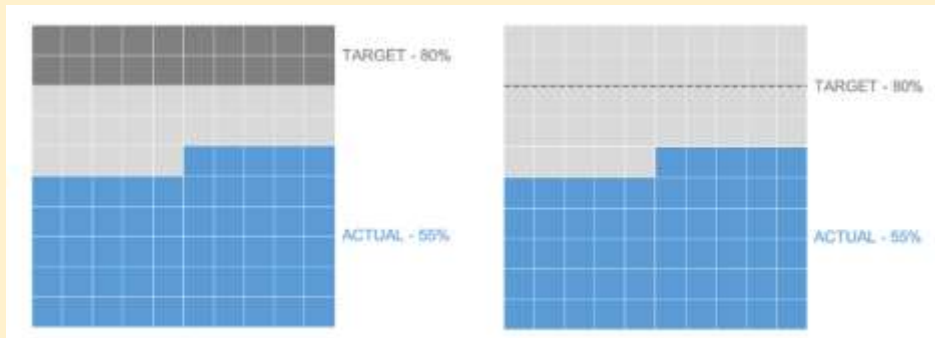
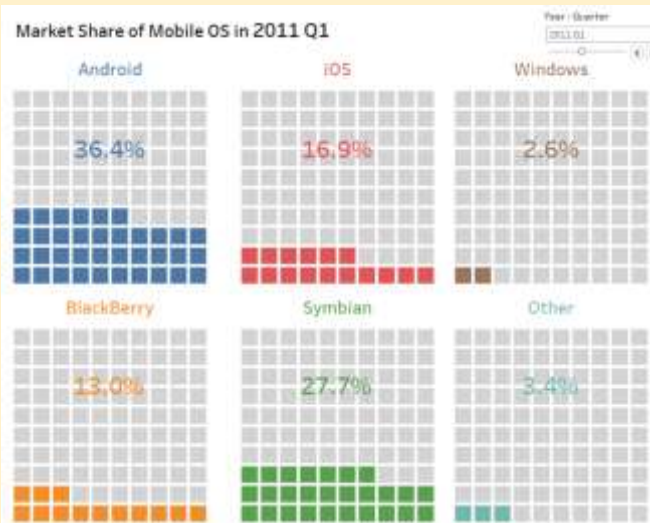


Image from
<https://www.storytellingwithdata.com/blog/what-is-a-square-area-chart>

A case for waffle chart



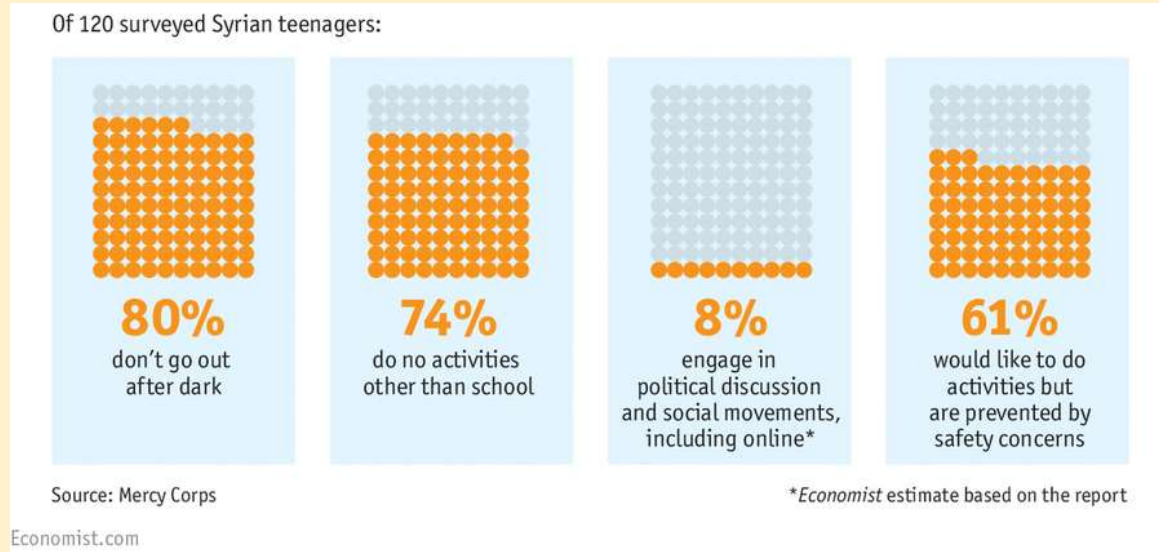
- Waffle chart set for a list of measures – alternatives to pie charts.



https://public.tableau.com/app/profile/reclnac/viz/WaffleChart_15649955440870/Dashboard1

Also refer to

<https://www.pluralsight.com/guides/tableau-playbook-individual-waffle-chart>

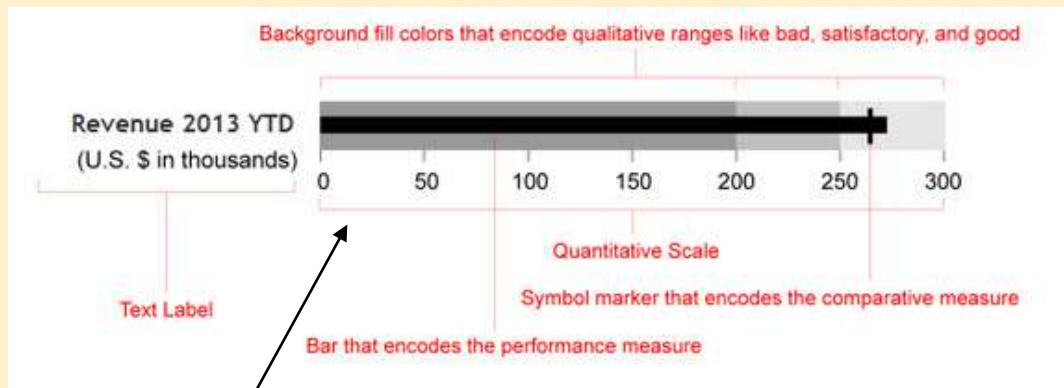


<https://twitter.com/storywithdata/status/634145280649068544>

Bullet Chart/Graph

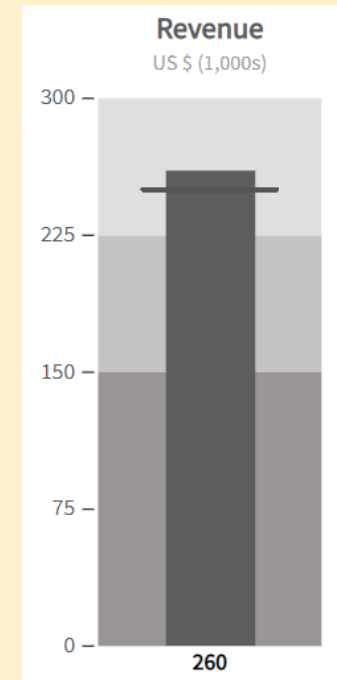


- A bullet chart/graph is a chart to indicate performance against benchmarks and goals.
 - A variation of a bar graph
 - Serves as a replacement for dashboard gauges and meters
- A bullet graph can be either horizontal or vertical depending on the alignment of the quantitative scale. The choice of vertical or horizontal alignment depends on the available space for the visualization.
- Reference
 - http://en.wikipedia.org/wiki/Bullet_graph
 - http://www.datavizcatalogue.com/methods/bullet_graph.html



The bullet combines four related measures/values and shows them in a compact style.

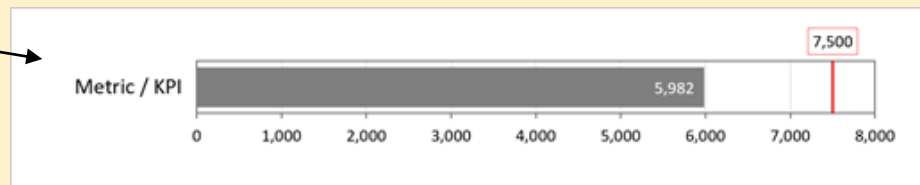
<https://www.fusioncharts.com/resources/chart-primers/bullet-graph>



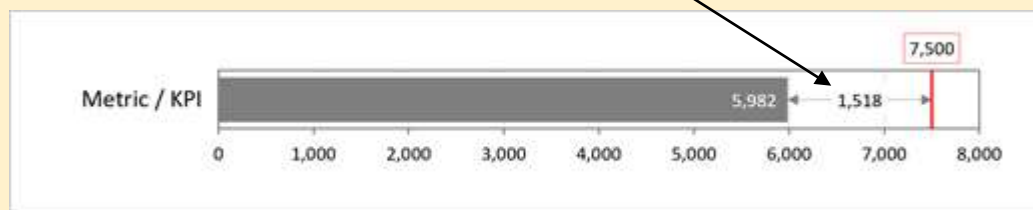
Bullet Graph Variations



Without performance ranges



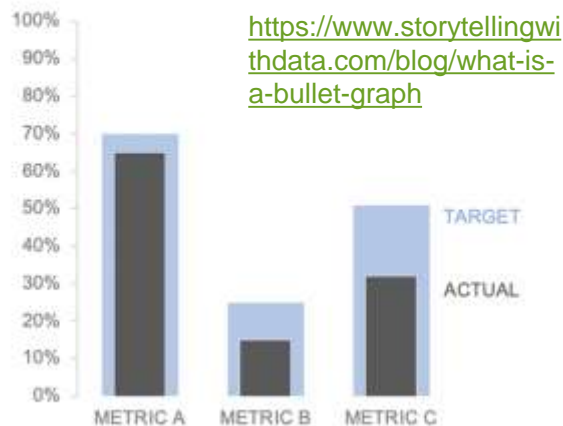
Emphasizing the gap



https://www.clearlyandsimply.com/clearly_and_simply/2017/05/an-alternative-design-of-bullet-graphs.html

OVERLAPPING BARS BULLET GRAPH

Performance metrics



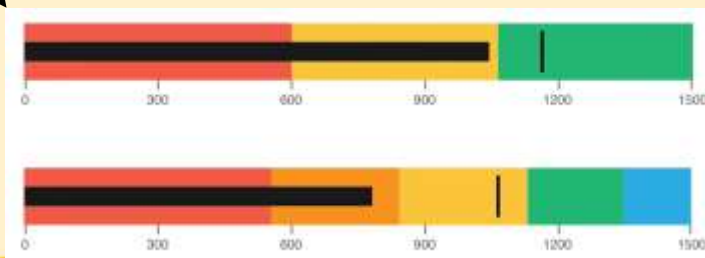
<https://www.storytellingwithdata.com/blog/what-is-a-bullet-graph>

Color coded bullet chart

Unit, 2012



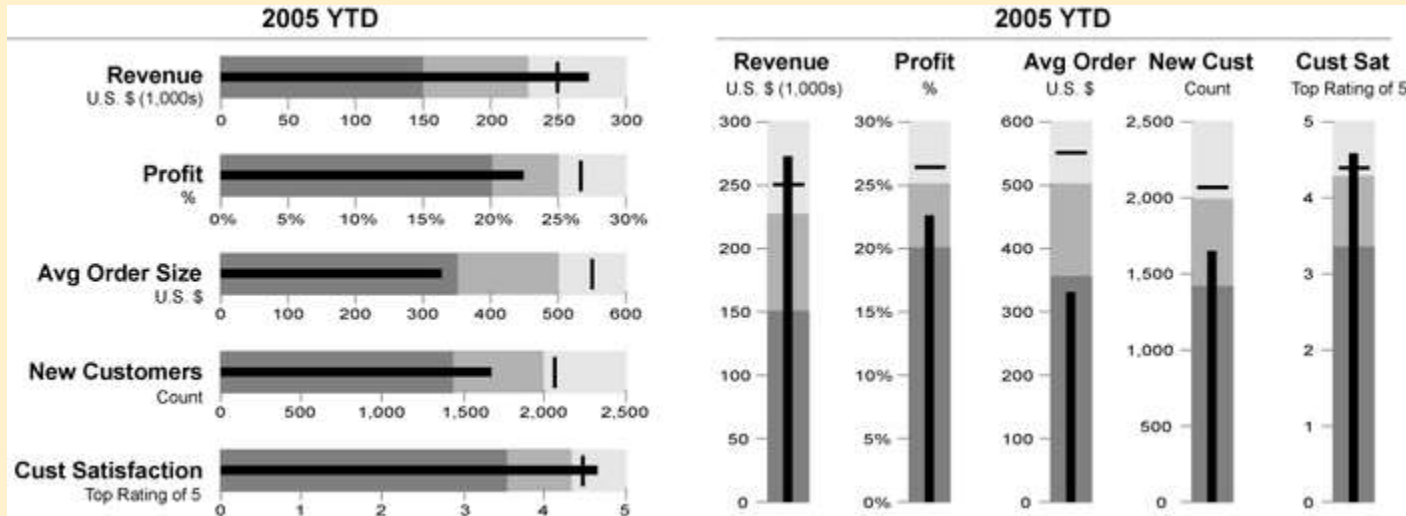
Classic traffic light coloring system can be used
https://datavizcatalogue.com/methods/bullet_graph.html



Bullet Graph Sets



- Because of its compact style, a set of bullet graphs can be placed together to show a set of measures and compare them at once.

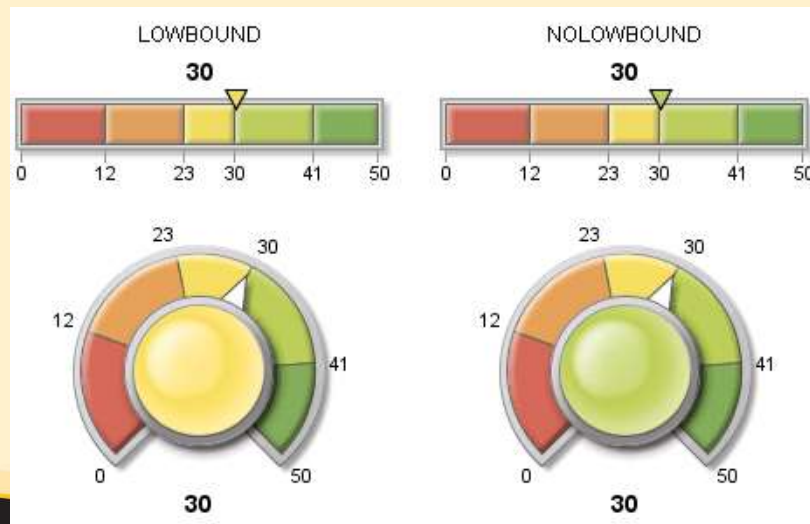
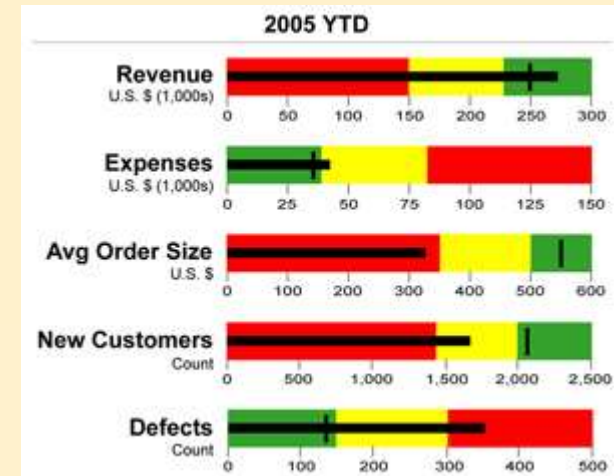


13-Month Trend	Categories	YTD Sales and Contribution Levels		YTD Sales to Target	
	Electronics	120,808	32%		93%
	Hardware	118,733	31%		102%
	Software	52,270	14%		84%
	Peripherals	47,259	12%		97%
	Photo	43,634	11%		113%
	Grand Total	382,704	100%		104%

Because of its small size, it can be used like sparklines in a table.

Traffic Light System

- Traffic light color system (also called RAG system) uses three to represent performance
 - Red: trouble/alert
 - Amber/yellow: warning
 - Green: good
 - <https://www.linkedin.com/pulse/traffic-light-concept-stephen-lynch/>
- Sometimes more steps of colors are used
- More references
 - <https://citoolkit.com/articles/traffic-light-assessment/>
 - https://en.wikipedia.org/wiki/Traffic_light_rating_system
 - <https://www.researchgate.net/publication/312292748> The traffic light procedure for decision making its rapid extension from fisheries to other sectors of the economy

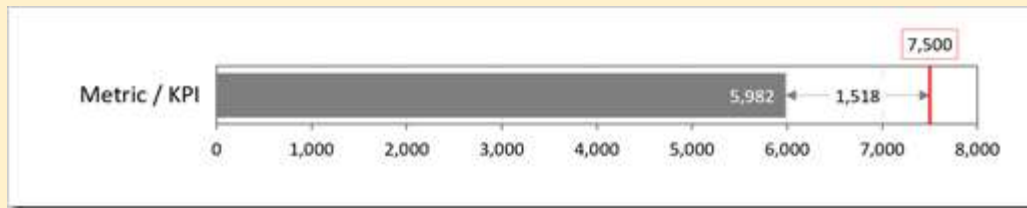


Row Labels	Sales Value	Sales target	Sales Status
Andrew Fuller	166,538	126,979	●
Anne Dodsworth	77,308	126,979	●
Charlton Roger	6,147	126,979	●
Janet Leverling	202,813	126,979	●
John Smith	440	126,979	●
Laura Callahan	126,862	126,979	●
Margaret Peacock	227,196	126,979	●
Michael Suyama	72,002	126,979	●
Moore Geoff	1,863	126,979	●
Nancy Davolio	192,108	126,979	●
Peters Nobby	525	126,979	●
Robert King	123,639	126,979	●
Steven Buchanan	68,352	126,979	●
Target Tommy	3,997	126,979	●
Grand Total	1,269,790	126,979	●

Differences/Gaps in Performance



- The differences of actual and target can also be visualized or labelled for special attention.



https://www.clearlyandsimply.com/clearly_and_simply/2017/05/an-alternative-design-of-bullet-graphs.html

- A standard variance chart can be used
 - Tableau example:
<https://public.tableau.com/profile/ceterisag#!/vizhome/ibcs/IBCS>



Sparklines and Scorecards



- Condensed format to show and visualize KPI

13-Month Trend	Categories	YTD Sales and Contribution Levels		YTD Sales to Target	
	Electronics	120,808	<div><div></div></div> 32%	<div><div></div></div> 93%	
	Hardware	118,733	<div><div></div></div> 31%	<div><div></div></div> 102%	
	Software	52,270	<div><div></div></div> 14%	<div><div></div></div> 84%	
	Peripherals	47,259	<div><div></div></div> 12%	<div><div></div></div> 97%	
	Photo	43,634	<div><div></div></div> 11%	<div><div></div></div> 113%	
	Grand Total	382,704	<div><div></div></div> 100%	<div><div></div></div> 104%	

Because of its small size, it can be used like sparklines in a table.

Row Labels	Sales Value	Sales target	Sales Status
Andrew Fuller	166,538	126,979	🟢
Anne Dodsworth	77,308	126,979	🟡
Charlton Roger	6,147	126,979	🔴
Janet Leverling	202,813	126,979	🟢
John Smith	440	126,979	🔴
Laura Callahan	126,862	126,979	🟡
Margaret Peacock	227,196	126,979	🟢
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Robert King	123,639	126,979	🟡
Steven Buchanan	68,352	126,979	🟡
Target Tommy	3,997	126,979	🔴
Grand Total	1,269,790	126,979	🟢

Image from <https://zebrabi.com/ibcs/>

Region	PY	ΔPY	ΔPY%	AC	ΔBU	ΔBU%	BU
Austria	81	+13	+16,6	95	-29	-23,4	123
Greece	72	+50	+70,1	122	+10	+8,6	112
Italy	13	+3	+23,5	17	+1	+8,5	15
Germany	114	-31	-27,6	82	-58	-41,2	140
Netherlands	102	+24	+23,7	126	-50	-28,5	177
W. Europe	382	+60	+15,6	442	-126	-22,2	568
Bulgaria	500	-107	-21,3	393	+77	+24,4	316
Czech Republic	929	+140	+15,1	1.069	+45	+4,4	1.024
Hungary	205	+77	+37,6	281	-146	-34,2	428
Poland	475	+161	+33,9	637	+54	+9,2	583
Russia	234	+40	+16,9	274	-31	-10,1	304
E. Europe	2.343	+311	+13,3	2.654	-1	-0,0	2.655
Canada	15	-4	-27,3	11	+0	+3,6	11
USA	26	+16	+63,0	42	-8	-15,1	50
N. America	41	+12	+29,7	53	-7	-11,9	61

Creating Performance Charts



- A simple single measure gauge chart: <https://www.evolytics.com/blog/tableau-201-how-to-make-donut-charts/> and another alternative tutorial (choose any one for submission)
 - <https://www.clearintelligence.com/post/gauge-charts-without-data-densification>
- Bullet chart:
 - <https://playfairdata.com/dashboard-gauge-1-how-to-make-bullet-graphs-in-tableau/>
 - Tableau: Bullet graphs are a “Show Me” option in Tableau, but many found that this option did not always provide the best results
 - https://help.tableau.com/current/pro/desktop/en-us/qs_bullet_graphs.htm
 - <https://playfairdata.com/dashboard-gauge-1-how-to-make-bullet-graphs-in-tableau/>
 - <https://evolytics.com/blog/tableau-201-how-to-make-bullet-graphs/>
- Waffle chart (choose just one of the following to submit):
 - <https://www.youtube.com/watch?v=wRpBkl6-uhU> (This one is one of the originals but it is a bit aged; you may need some research and trouble shooting. You can create the grid data file yourself or follow the blog post <http://www.vizwiz.com/2017/01/tableau-tip-tuesday-how-to-create.html> to get the template)
 - <https://www.pluralsight.com/guides/tableau-playbook-waffle-chart> - inspired by the above (there is a second part of this <https://www.pluralsight.com/guides/tableau-playbook-individual-waffle-chart>)
- A more complex gauge <https://www.phdata.io/blog/how-to-make-a-gauge-chart-in-tableau/>
- Gauge chart set: <https://intellipaas.com/blog/tableau-gauge-chart/>
- More bullet chart customizations: <https://playfairdata.com/3-ways-to-make-brilliant-bullet-graphs-in-tableau/>
- Performance related data: <https://www.kenflerlage.com/2017/09/alternatives-to-nps-gauges.html>



OTHER PERFORMANCE RELATED CHARTS

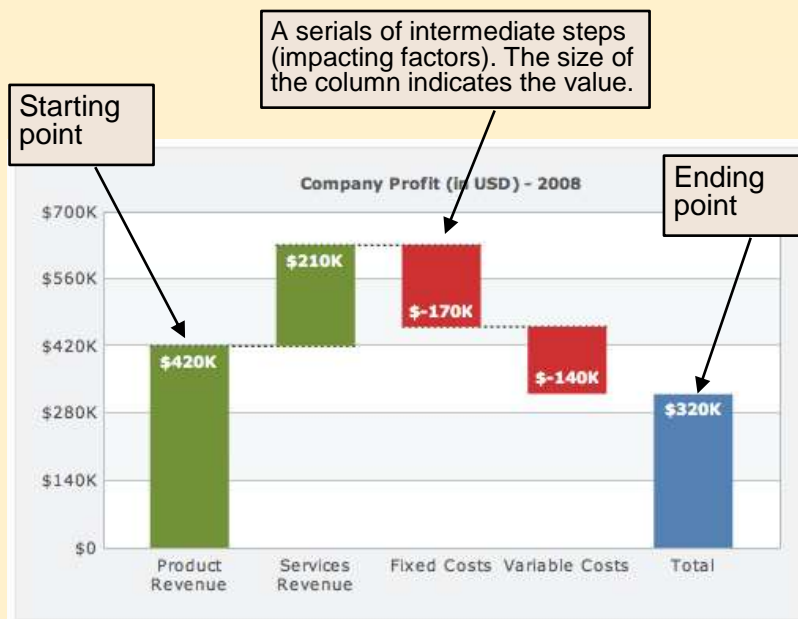
Waterfall/bridge chart

Perceptual map

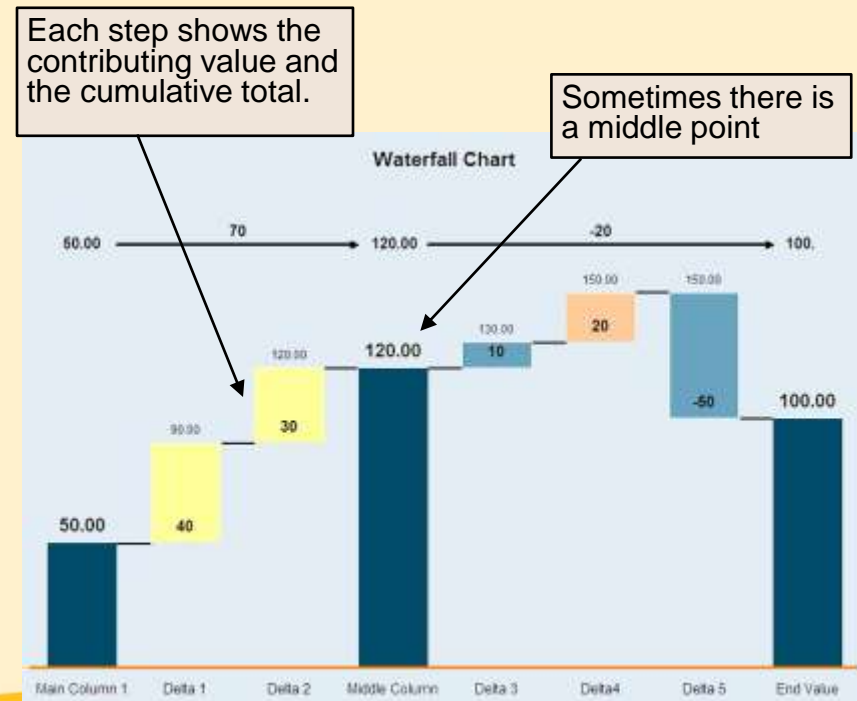
Waterfall/Bridge Chart



- A waterfall chart helps in understanding the cumulative effect of sequentially introduced positive or negative values. It shows how an initial value is affected by a series of intermediate positive or negative values.
 - <https://datavizproject.com/data-type/waterfall-chart/>
 - These intermediate values can either be time based or category based.
- Why use this chart?
 - Mainly used to show important factors or components that drives the performance change.
 - But at the same time also shows the cumulative total.



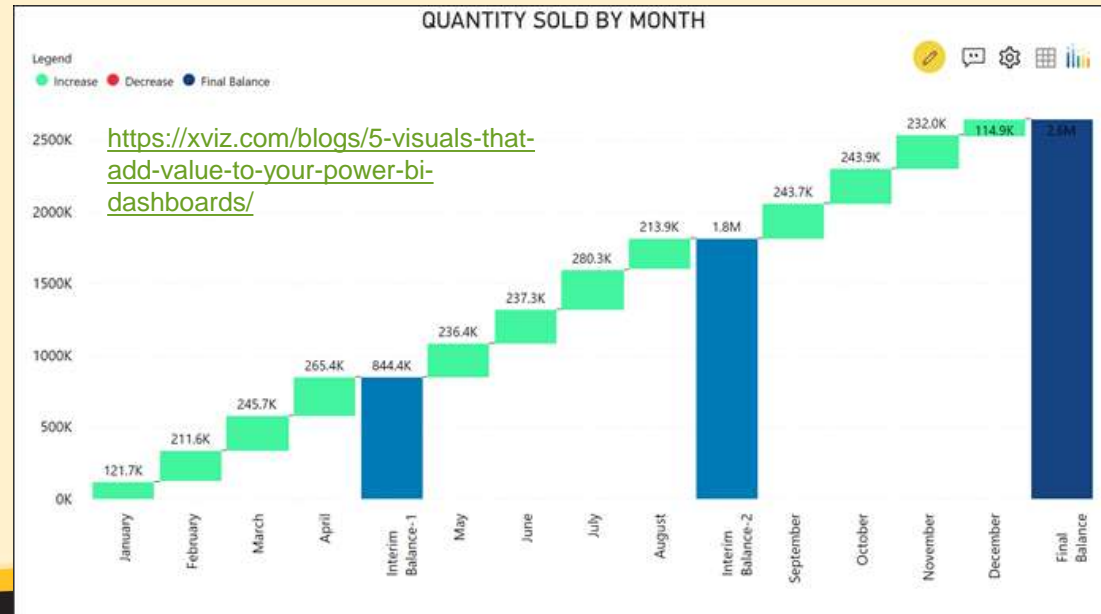
Images from https://en.wikipedia.org/wiki/Waterfall_chart



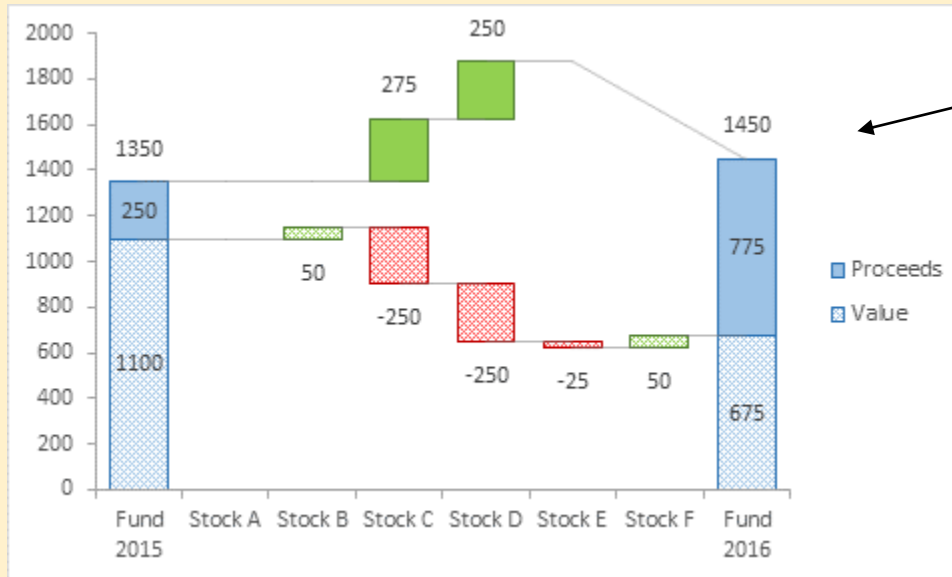
Waterfall Chart Use Cases



- To show categorical impact
 - Product lines
 - Initiatives
 - Departments
 - Account type
 - Etc.
- To show periodical contribution
 - Year
 - Month
 - Week



Waterfall Chart Variations



Paired/stacked waterfall chart
<https://peltiertech.com/paired-waterfall-chart/>

Show percentage of change as well



Creating Waterfall Chart

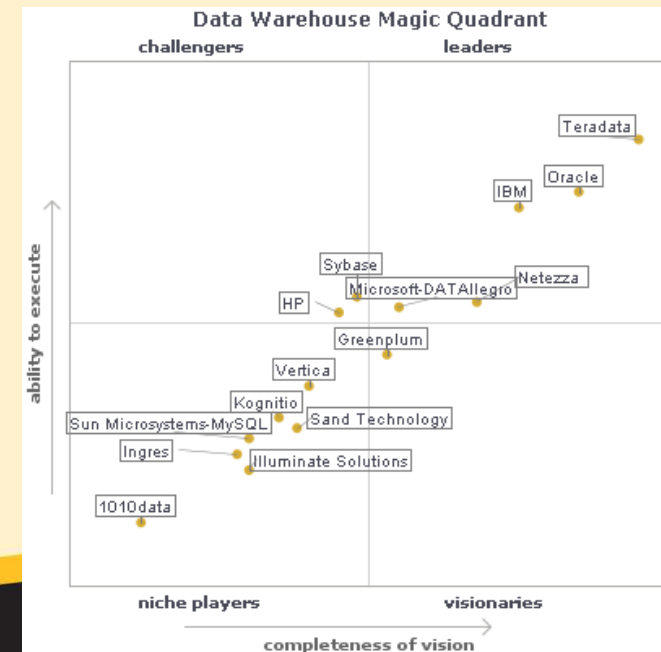
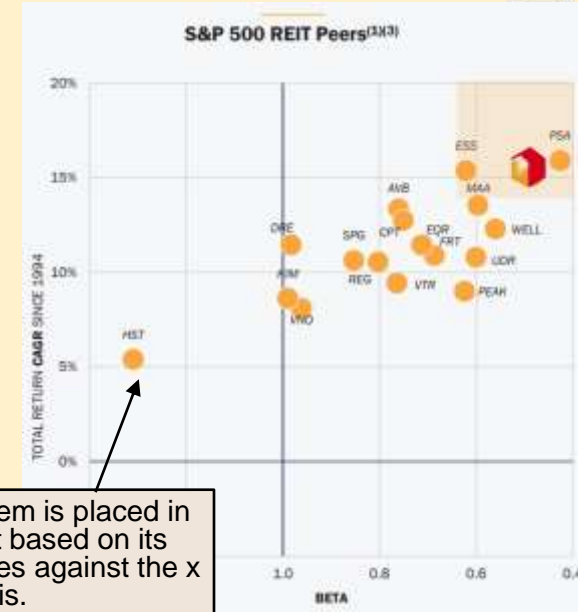


- Tableau – no direct support
 - A blog <https://evolytics.com/blog/tableau-201-make-waterfall-chart/>
 - A video tutorial <https://www.youtube.com/watch?v=R15nXtKq-MQ>
 - <https://playfairdata.com/3-ways-to-make-wonderful-waterfall-charts-in-tableau/>
- Power BI – direct support
 - <https://docs.microsoft.com/en-us/power-bi/visuals/power-bi-visualization-waterfall-charts>
 - <https://xviz.com/blogs/7-visualization-techniques-with-waterfall-chart-in-power-bi/>
- Excel – direct support
 - <https://support.microsoft.com/en-us/office/create-a-waterfall-chart-8de1ece4-ff21-4d37-acd7-546f5527f185>

Perceptual/Positioning Map



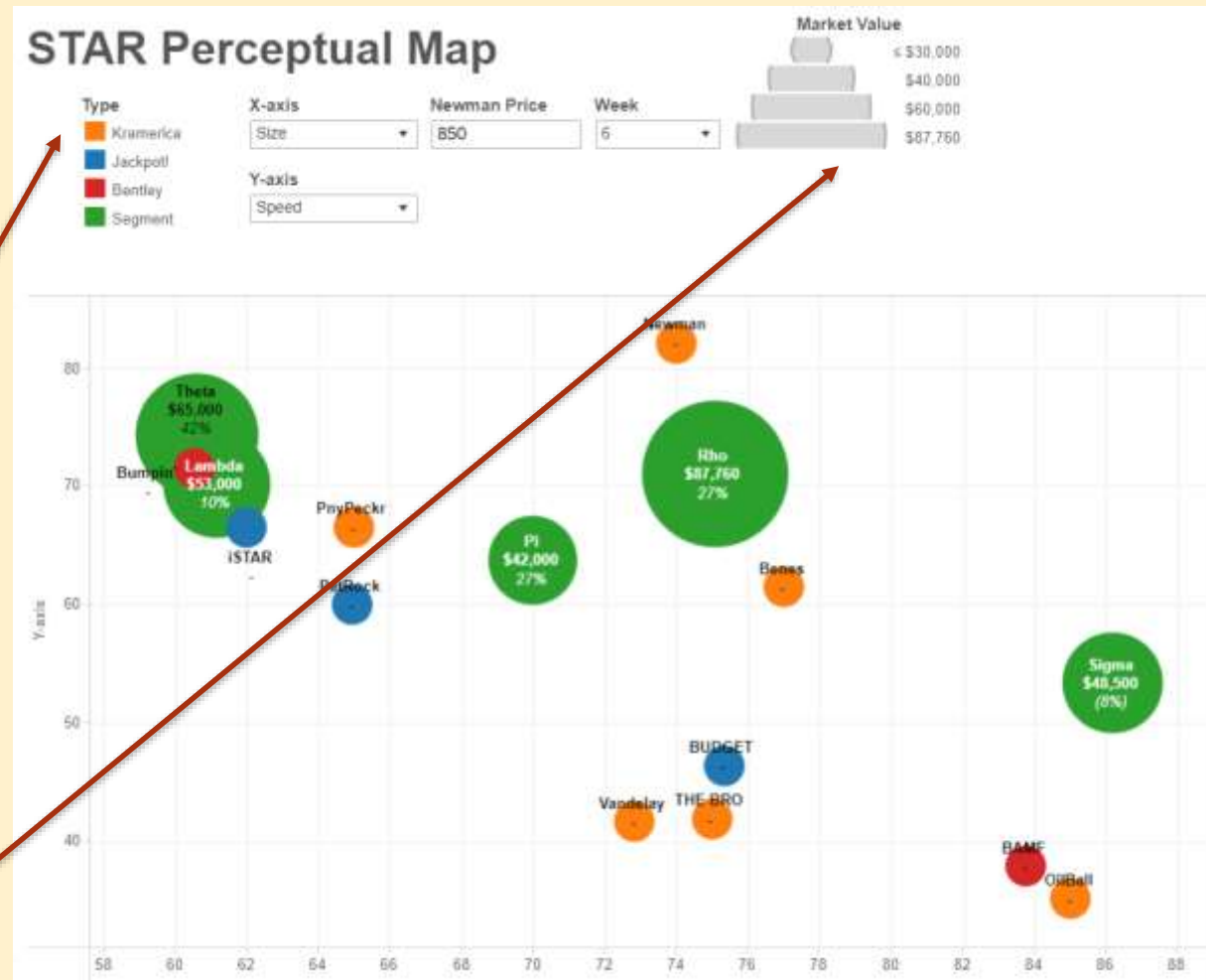
- Firms use perceptual or positioning maps to help them develop a market positioning strategy for their product or service. As the maps are based on the perception of the buyer they are sometimes called perceptual maps. Positioning maps show where existing products and services are positioned in the market so that the firm can decide where they would like to place (position) their product.
 - Positioning map looks very similar, but it measures objective features rather than perceptions.
- The most common chart type used for perceptual map is basically a scattered plot or a bubble chart.
 - <https://www.storytellingwithdata.com/blog/2021/5/11/what-is-a-bubble-chart>
- Perceptual mapping was initially used for marketing to display the perceptions of customers, products, or brands. It then has been applied in many areas (such as stocks, projects, players, etc.) just to see how things are related in a typical two-dimension (axis) map.
- Reference
 - <https://www.alchemer.com/resources/blog/perceptual-map/>



Mapping Two More Attributes



- In addition to positions in the plot. Two attributes are usually added
 - Color coding for categories
 - Bubble size for a third quantitative measure



<https://public.tableau.com/profile/levy2725#!/vizhome/2015-163-and-D-ness/Dashboard1>

Perceptual Maps Uses and Variations



- Perceptual maps are commonly used for data exploration, showing large number of items with many filtering and axes settings
- Products (management, exploration, evaluation)
 - <https://www.productchart.com>
 - G2 Grid <https://www.g2.com/categories/data-visualization#grid>
 - Gartner Magic Quadrant: <https://www.gartner.com/en/research/methodologies/magic-quadrants-research>
- Player performance
 - <https://public.tableau.com/profile/levy2725#!/vizhome/2015-163-and-D-ness/Dashboard1>
 - <https://theanalyst.com/na/2021/10/nba-stats-and-player-projections/>
- Stock portfolio
 - <https://finviz.com/bubbles.ashx>
- Countries
 - [https://www.gapminder.org/tools/#\\$chart-type=bubbles&url=v1](https://www.gapminder.org/tools/#$chart-type=bubbles&url=v1)
- Company positioning
- Others
 - Market segments <https://public.tableau.com/app/profile/danw5765/viz/Wk3-STARPerceptualMap/STARPerceptualMap>
 - <https://ourworldindata.org/grapher/share-of-dietary-energy-supply-from-carbohydrates-vs-gdp-per-capita>

Key Learning Resources



- Gauge chart: <https://www.datapine.com/blog/gauge-chart-examples/>
- Waffle chart: <https://www.storytellingwithdata.com/blog/what-is-a-square-area-chart>
- Bullet chart
 - What is a bullet graph? <https://www.storytellingwithdata.com/blog/what-is-a-bullet-graph>
 - 5 Use Cases For Bullet Charts <https://visualbi.com/blogs/business-intelligence/dashboards/bullet-charts-use-cases/>
- Waterfall chart
 - What is a waterfall? <https://www.storytellingwithdata.com/blog/2020/11/16/what-is-a-waterfall>
 - <https://www.fusioncharts.com/resources/chart-primers/waterfall-chart>
- Perceptual map (bubble chart)
 - What is a bubble chart? <https://www.storytellingwithdata.com/blog/2021/5/11/what-is-a-bubble-chart>
 - <https://www.alchemer.com/resources/blog/perceptual-map/>
- The traffic light concept: <https://www.linkedin.com/pulse/traffic-light-concept-stephen-lynch/>

Additional Good Resources



- <https://xviz.com/blogs/5-visuals-that-add-value-to-your-power-bi-dashboards/>
- Performance related data: <https://www.kenflerlage.com/2017/09/alternatives-to-nps-gauges.html>
- Accessibility design for traffic light system
 - <https://www.visualisingdata.com/2019/08/five-ways-to-design-for-red-green-colour-blindness/>
 - <https://uxdesign.cc/beautiful-accessible-traffic-light-colors-b2b14a102a38>
- Bullet graph
 - https://datavizcatalogue.com/methods/bullet_graph.html
 - <https://storyiq.com/sparklines-and-bullet-graphs-in-excel-how-to-make-advanced-charts-to-track-your-companys-performance/>
 - <https://www.tableau.com/data-insights/reference-library/visual-analytics/charts/bullet-graphs>
- Perceptual maps
 - <https://www.perceptualmaps.com>
 - <https://www.segmentationstudyguide.com/understanding-perceptual-maps/perceptual-maps/>
 - <https://www.groupmap.com/map-templates/perceptual-map/>
 - <https://www.youtube.com/watch?v=clncNOBx1C8>
- Variance analysis charts
 - <https://datadriven.pro/2019/04/16/9-ways-to-do-variance-analysis-in-power-bi/>