



Dashboard Content and Layout Design

IT 7113 Data Visualization

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

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Fall 2023

<https://www.edocr.com/v/pb9delzd/jgzheng/dashboard-layout>

Overview



- Dashboard layout design elements and best practices
- Dashboard layout patterns
- Content organization patterns

Dashboard Layout Design



- Layout is about the placement and arrangement of dashboard elements on the screen.
- Dashboard elements include
 - Visual elements like charts, styled numbers, maps, tables
 - Other data and informational elements like updates, texts
 - UI elements like header, footer, logo, title, menu, etc.
- Components of layout – what to consider?
 - Size and shape of the complete screen area
 - Number of elements
 - Positioning of elements
 - Sizing/shaping of elements
 - Grouping of elements
 - Content features of elements

General Principles and Best Practices



- Clean and organized
 - Alignment of elements
 - Spacing between elements
 - Sub-regions and grouping
 - Attention shaping: focus and priority
- Simple and clear
- Consistent and balanced

Alignment

- Alignment is the basic requirement to make UI look tidy
 - Align charts and regions
 - Misalignment makes dashboard look disorganized

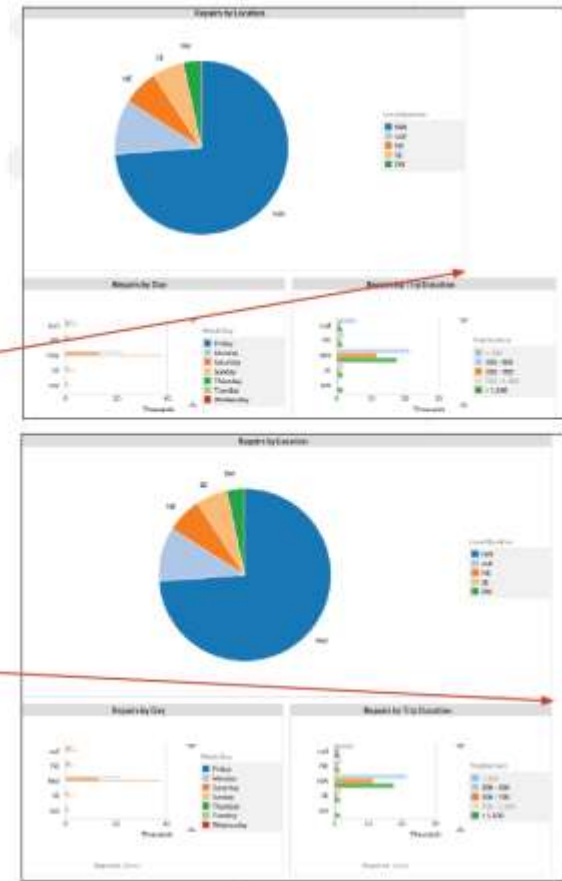
Layout

Before

The pie chart's right edge doesn't line up with the bottom charts. It's distracting to the eye.

After

The pie chart has been widened to the right so that the symmetry is uniform which is much cleaner.



Misalignment of the line chart on the top row

Spacing

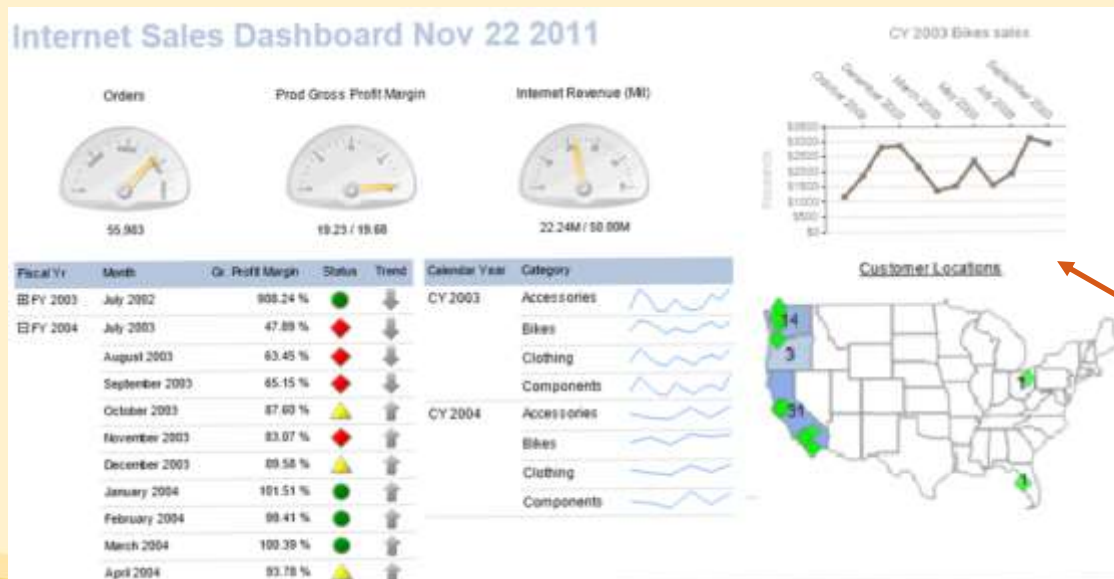
- Appropriate spacing makes dashboard look clean
- But avoid too much spacing between elements or large white spaces

White space; adjust gauge size and line chart position to fill the white space.



White space; the map can be enlarged to fill the white space.

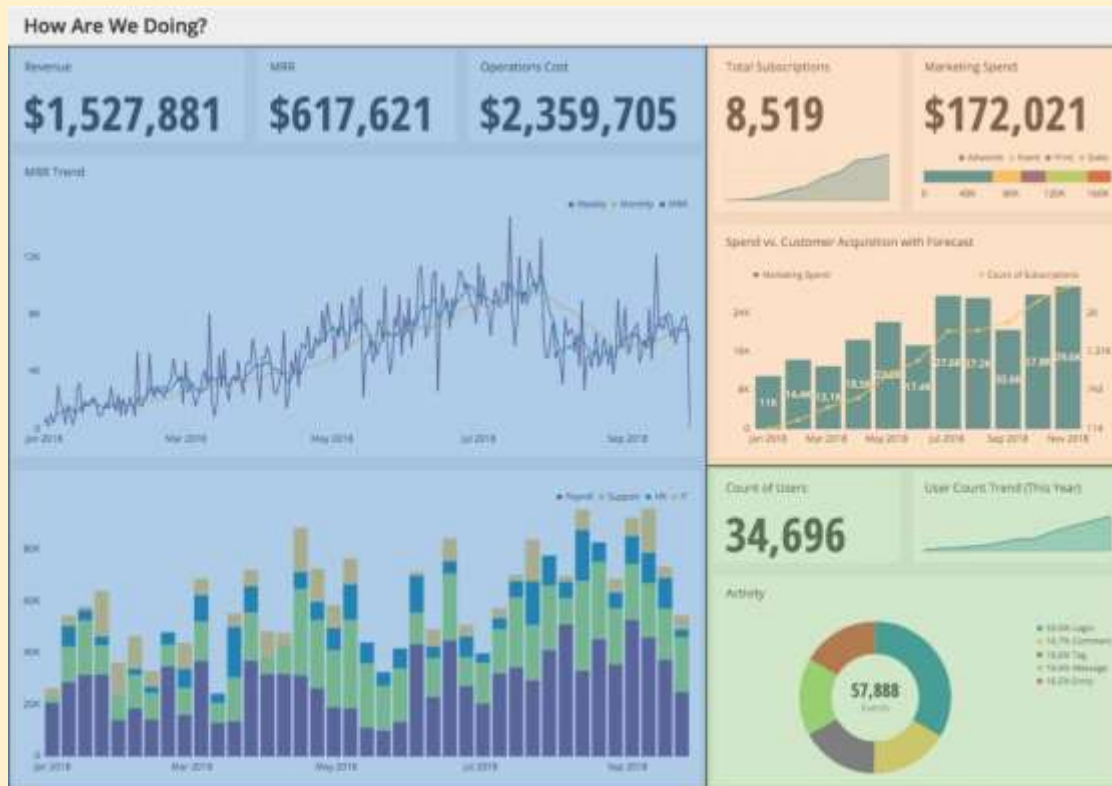
Better alignment and spacing



Sections (sub-regions)



- Organize the content into sections and subsections that reflect users' needs.
- Make a big dashboard into smaller sub-regions, with similar content logically grouped together
 - Having the information logically organized makes browsing easier and helps to understand the content quickly.
 - People like well-organized sites that make important information easy to find.
- Leave space for header (and footer) and visually different them



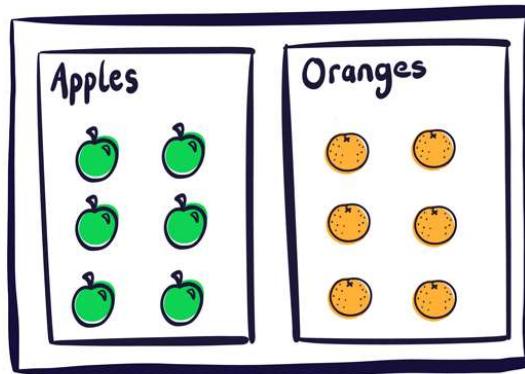
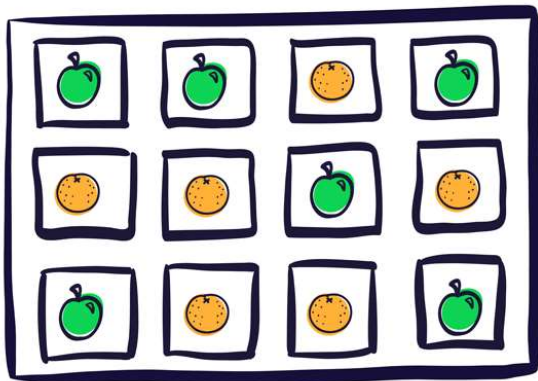
A sub region may contain multiple closely relevant elements

<https://dataschool.com/how-to-design-a-dashboard/arranging-your-charts-as-a-dashboard/>

Grouping based on Logical Relationship



- Logical relationship between sections and elements.
 - Sibling: belongs to the same set or serials
 - Hierarchy: serves the same purpose, but at different levels
 - Use size and position to show hierarchy
 - Purposeful related: comparisons
- Some good practices and patterns - see patterns summarized in the second and third part of this lecture notes
 - Decide is it important to show everything on the same page or would it be better to divide the content into several pages.
 - Give each section a short, descriptive title.
 - Visually differentiate each content group from each other. Apply Gestalt principles: use white space, lines, light borders, and/or background colors for content groups.



Measures and charts serving the same objective should be grouped together.

Gestalt Principles Applied in Grouping

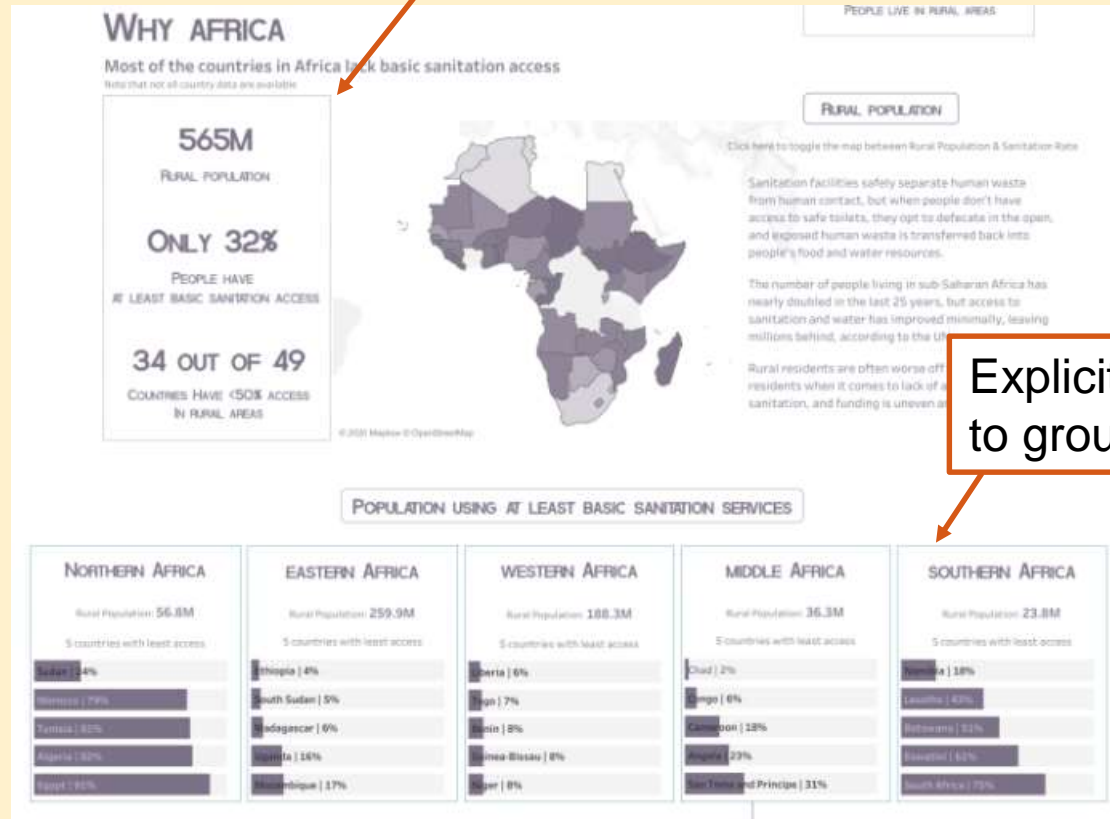


- Use Gestalt principles and visual properties to imply grouping and relationships
 - Refer to module 2 about these principles
 - More applied to dashboard layout
 - <https://vizzendata.com/2020/07/06/utilizing-gestalt-principles-to-improve-your-data-visualization-design/>
- Best practices: use visual containers to logically group or visualize sub-sections
 - separators and borders
 - background color
 - box
 - effective use of spacing (sparsity and density): margin, padding, and blank space
 - alignment and distance

Using Border



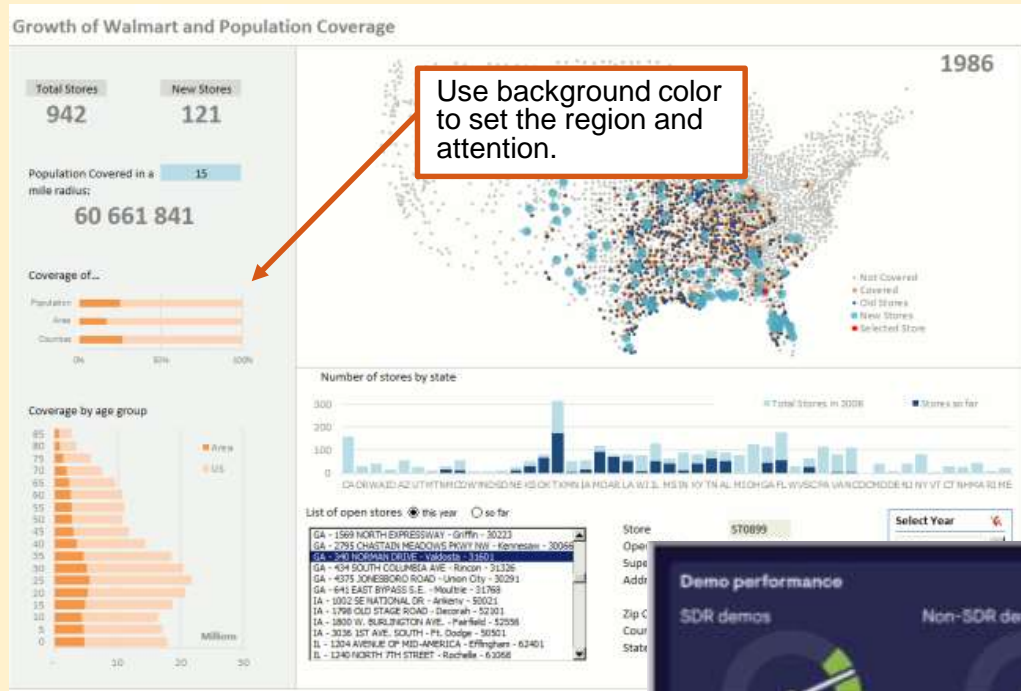
Explicitly using border
to group contents



Explicitly using border
to group contents

<https://vizzendata.com/2020/07/06/utilizing-gestalt-principles-to-improve-your-data-visualization-design/>

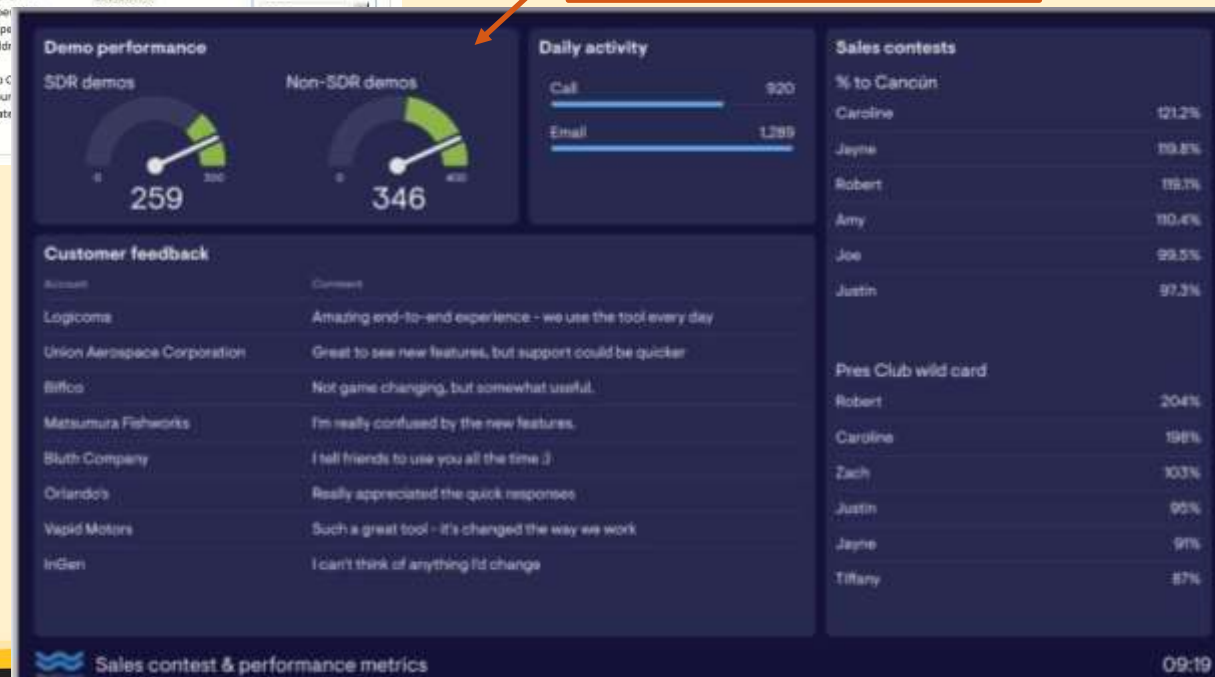
Using Background Color



<http://www.excelcharts.com/blog/excel-dashboard-catchment-area/>

Use background color to box each group.

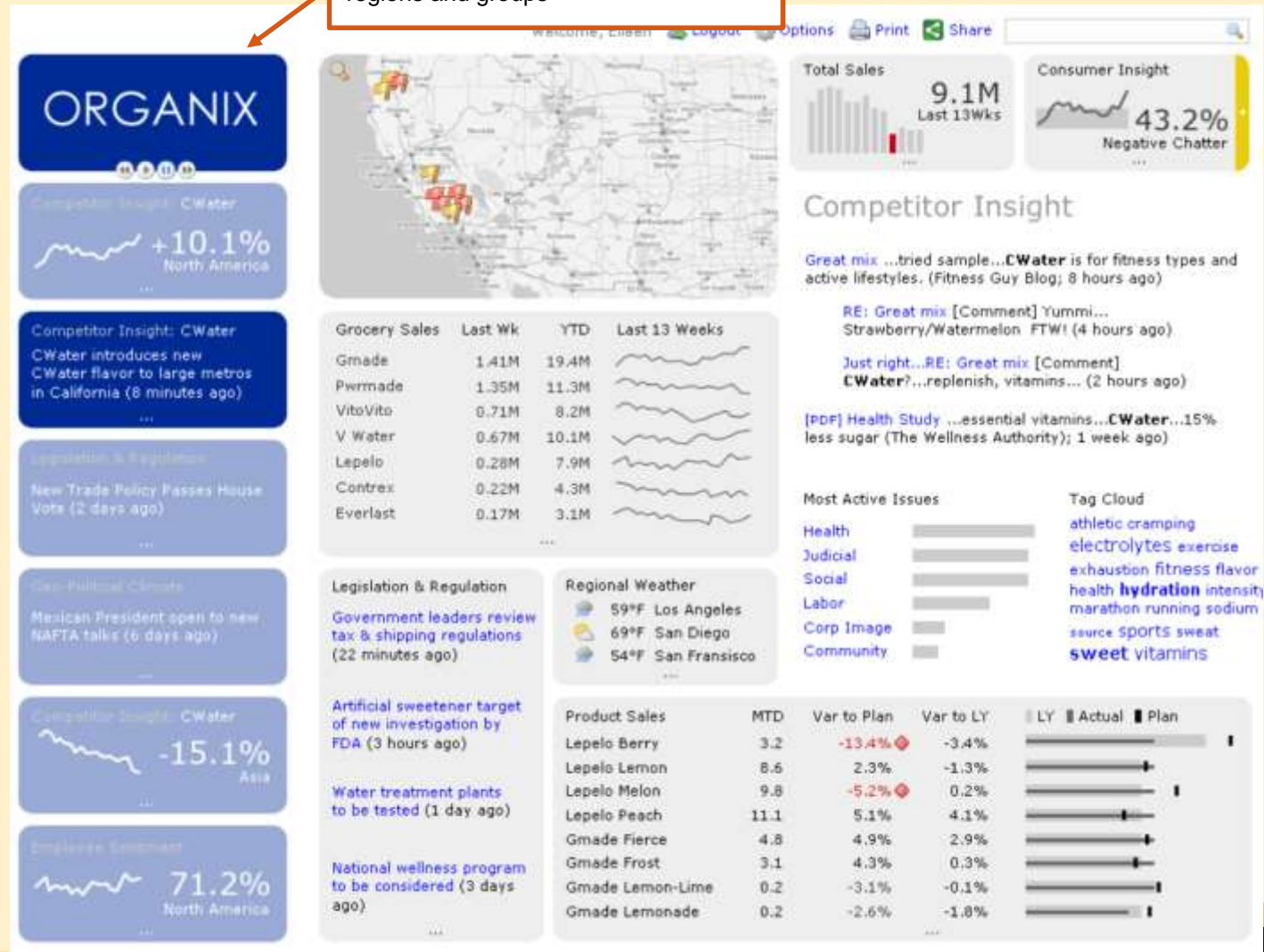
<https://www.geckoboard.com/blog/9-dashboard-design-principles-see-them-in-action-with-real-examples/#keep-it-uniform>



Using Common Background Color



Use a common or similar background color for related elements to indicate regions and groups



Attention Shaping in Dashboards

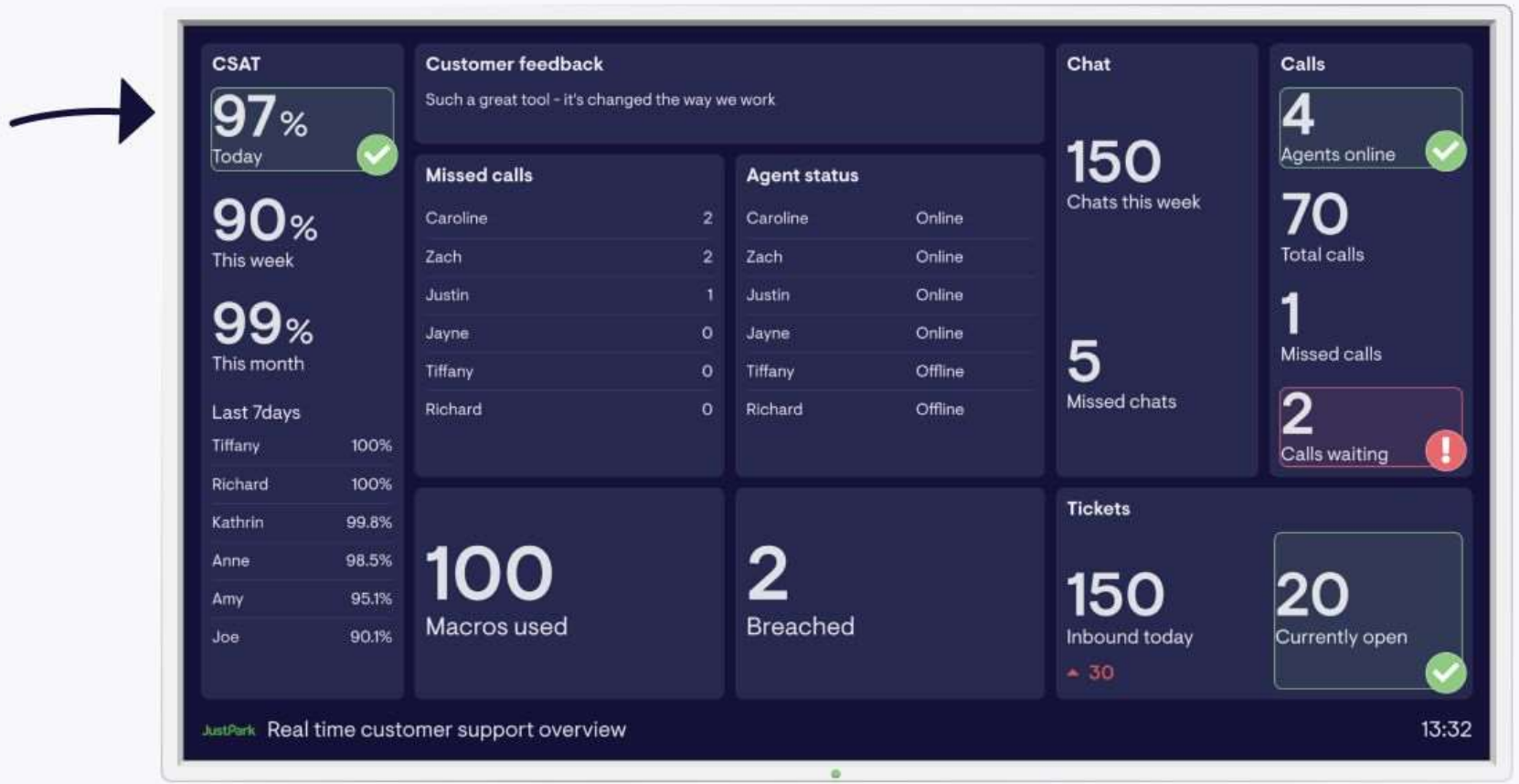


- Where to focus and where to start, when facing a full screen of charts and numbers?
 - Avoid simply stacking up charts and tables; emphasis on important information.
- Understand the concepts
 - Information flow: where the audience's eyes will start and travel next allows you to guide them through your dashboard.
 - Natural attention focus
 - Patterns and anti-patterns: Z-pattern, F-pattern, gold triangle - [3 Design Layouts: Gutenberg Diagram, Z-Pattern, And F-Pattern - Vanseo Design](#)
- Best practices
 - Use preattentive properties to shape attention that breaks the normal information flow and fixed attention
 - Prioritize dashboard elements - display a focal point that prioritizes information
 - Place the most important information towards the top of the page
- Commonly used pre-attentive attributes
 - Position, or spatial location
 - Size and Color can alter the importance of position

Position Priority: Top and Left



The most important metric goes top left



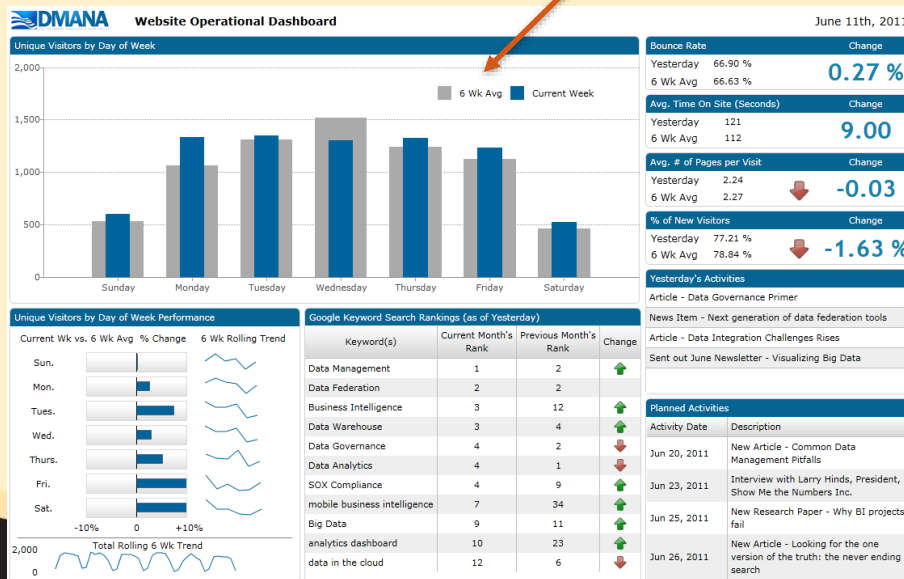
<https://www.geckoboard.com/blog/9-dashboard-design-principles-see-them-in-action-with-real-examples/#keep-it-uniform>

Size



- Use a hero chart/section which is larger than other contents
- A hero section sometimes can overpower the importance by position.
- See more hero section patterns in the second half of the lecture

Hero Section
with larger size
for attention



Simple and Clear



- Use common grid-based layout; avoid fancy magazine cover style design
- One page/screen fit; avoid scrolling, especially horizontal scrolling.
- Don't clutter
 - Limit number of items on the screens (depending on screen size?)
 - Don't cram and jam, dense but not cluttered
 - Keep visuals well spaced and separated
- What if there are more elements?
 - Prioritize and let go the less important
 - Utilize interactivity for more info (see module 10)
 - Details/extra on demand: selections/switch settings (radio button), tabbed, secondary dashboards/pages
 - If needed, design multiple related dashboards, each with a clear goal.

Consistent and Balanced



- Balance
 - Symmetry and asymmetry in dashboard: use effectively for attention shaping
 - Balance of simplicity and beauty
 - Balance of visualization and text/number
 - Balance of interactivity and direct views
- Consistency
 - Style consistency across dashboards
 - Color scheme consistency across charts
 - Chart type consistency for a group/set



Layout Styles/Patterns

- Generic layout styles

Basic Layout Styles Summary



- Most dashboards are typically designed in a rectangular area, abstractly viewed as a grid (rows and columns). Many styles are based on the utilization (combination) of rows and columns.
- Styles summary
 - Simply stacked (grid or list)
 - Plain grid
 - Row based – Z-pattern
 - Column based
 - Mixed
 - Side panels
 - F or E pattern
 - Hero focal section: top, left upper/lower, right, middle
 - Whole screen with overlays
- More
 - <http://designingwebinterfaces.com/designing-web-interfaces-12-screen-patterns>
 - <http://www.slideshare.net/theresaneil/ria-screen-layouts>
 - <http://bi-notes.com/2013/06/bi-dashboards-tips-for-starting-your-dashboard-layout/>
 - <http://www.tableausoftware.com/public/blog/2013/10/dashboard-design>

Plain Grid

- In a plain grid layout, there is no significant grouping along rows or columns. Elements are evenly placed in cells.
- Used for operational or KPI dashboard often



<https://www.idashboards.com/dashboard-examples/behavioral-health-dashboard-inpatient-admissions/>



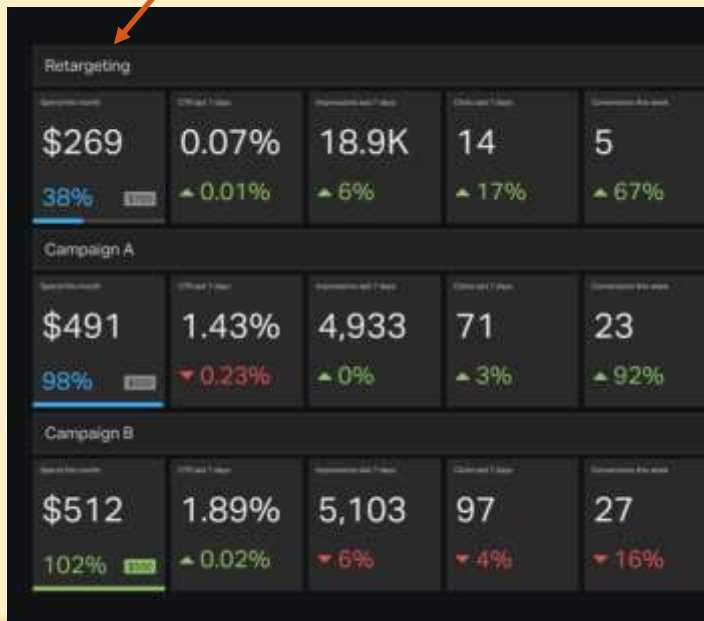
Originally from <https://www.geckoboard.com/learn/dashboard-examples/adwords-marketing-dashboard-example/>



Row Based Layout

- Contents are naturally grouped by rows.
- There may be sub-grouping within a row.
- Sub sections can be placed across columns.

Rows are defined



Two rows are defined



Z-Pattern



- Z-Pattern is frequently emphasized in row-based layout.
- We read from top left to right, then zig-zag down left and scroll right again (in a Z-pattern).
- Understanding where the audience's eyes will start and travel next allows you to guide them through your dashboard.



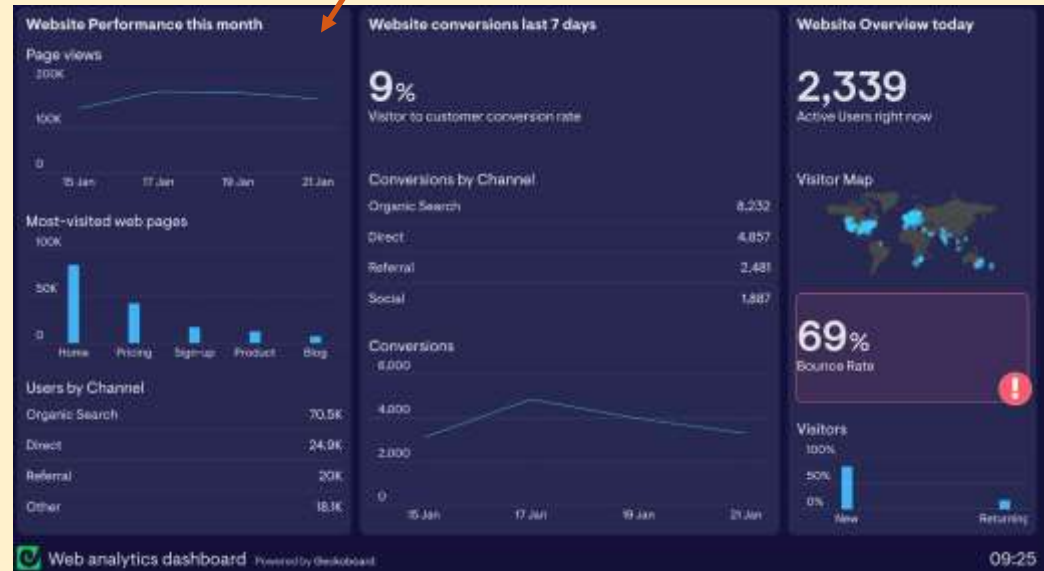
<https://www.blue-granite.com/blog/design-principles-dashboard-layout-is-crucial>

Column Based Layout

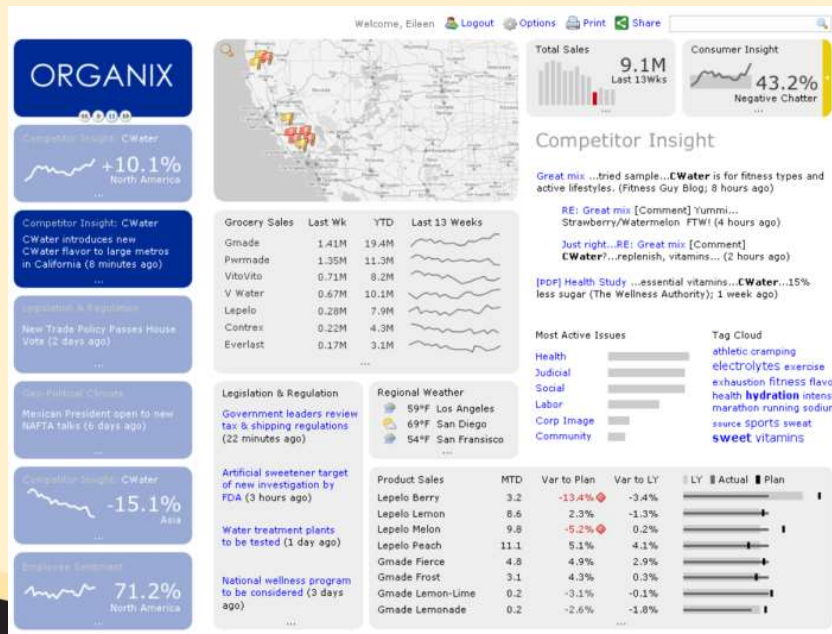
Three columns are defined



- Elements are naturally grouped by columns.
- There may be sub-grouping within a column.
- Sub sections sometimes can be placed across rows.



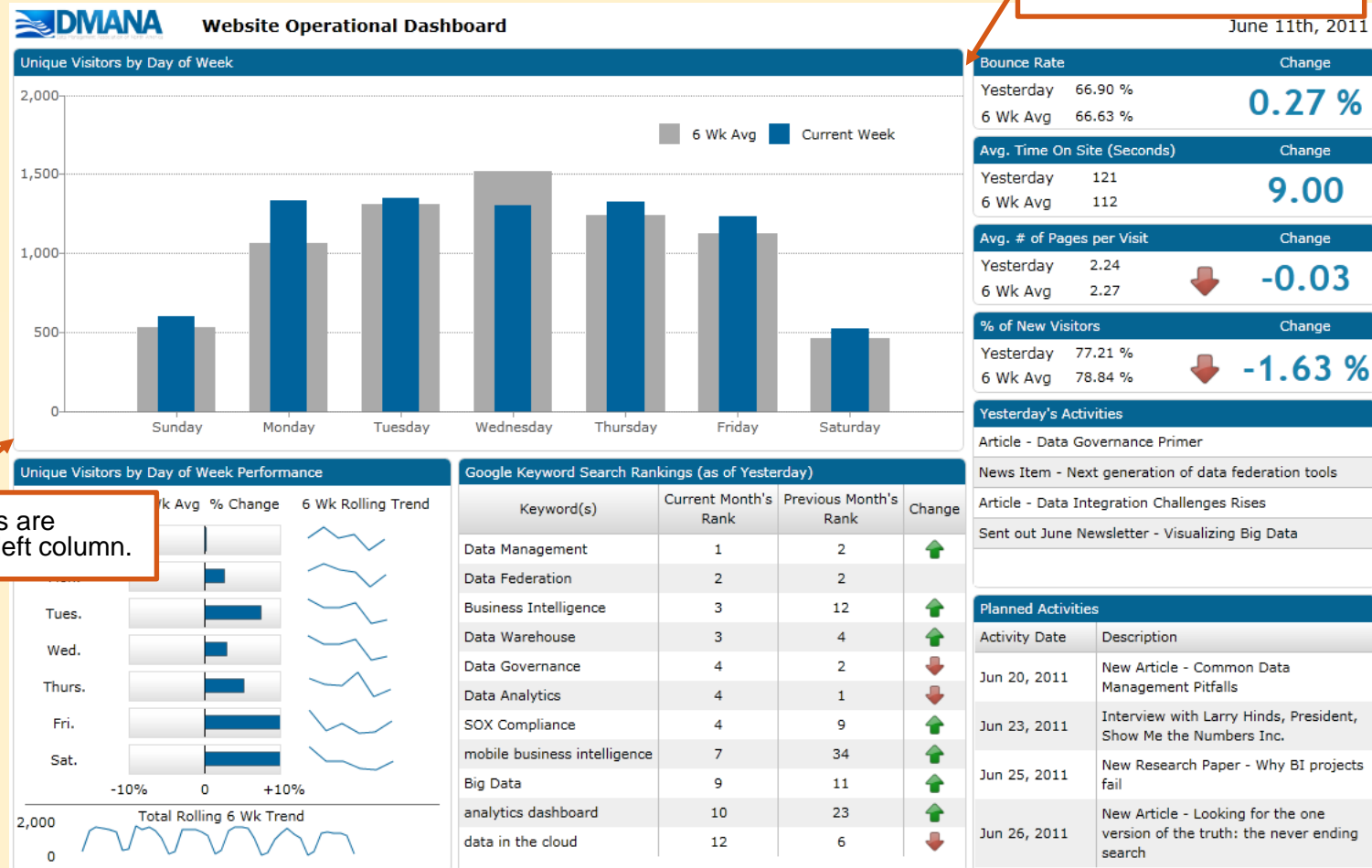
<https://www.geckoboard.com/dashboard-examples/marketing-sales/web-analytics-dashboard/>



Mixed (usually used with side panel layout)



- Main layout is column based, and then a sub-section can be row based. Or vice versa.



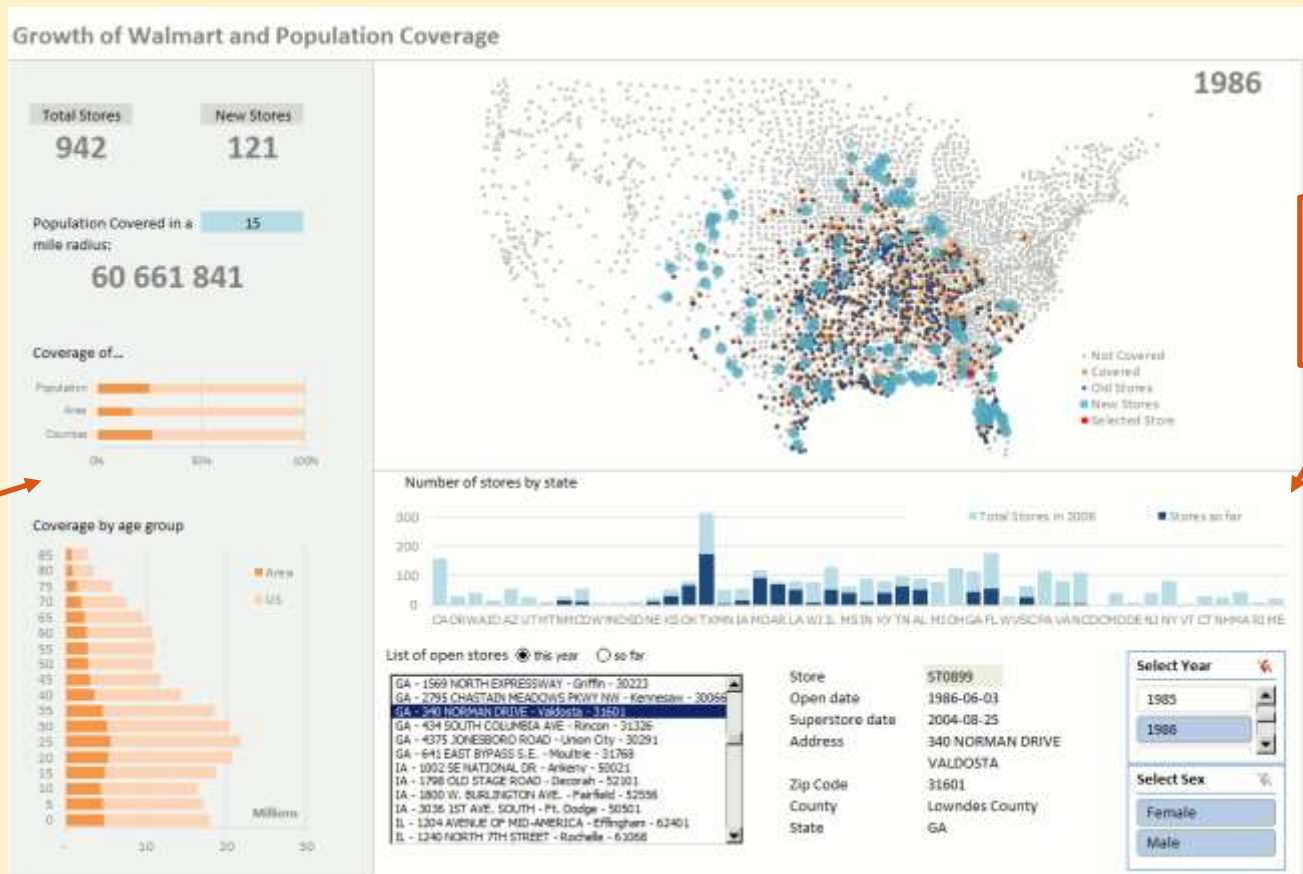
Then, two rows are defined in the left column.

Firstly, two columns are defined.

Side Panel



- One grouping region is typically much larger, with some smaller ones on the side. The larger section can have its own sub-layout.



Side panel on the left column.

The right column is further divided by rows.

F-Pattern (or E-Pattern)



- F-Pattern is frequently emphasized in a mixed grid layout.
- We read from top left to right for summary to details.
- The most important and summarized data are put in the left column. If needed, details and additional contextual data are put on the right.

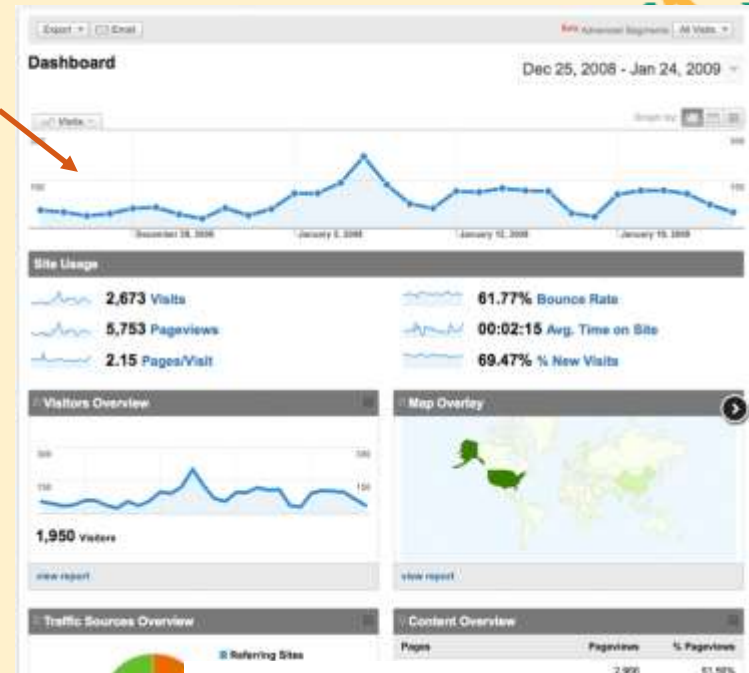


<https://towardsdatascience.com/working-on-your-dashboard-layout-9b7c38d7b61e>

Hero Section

- A hero section is one visualization that is particularly larger in size and contains more depth of information
 - It is designed to be the focal point of the dashboard.
- It is usually placed on top or left side. Or center of the screen (examples on the next slide)

Hero Section

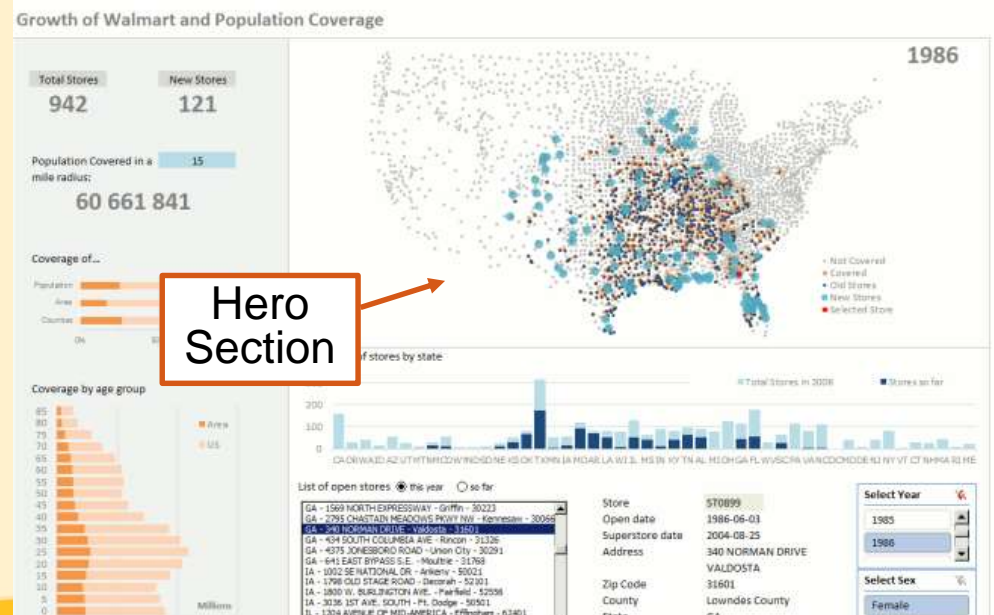


Google Analytics Dashboard



Hero Section

Originally from <https://www.geckoboard.com/learn/dashboard-examples/adwords-marketing-dashboard-example/>

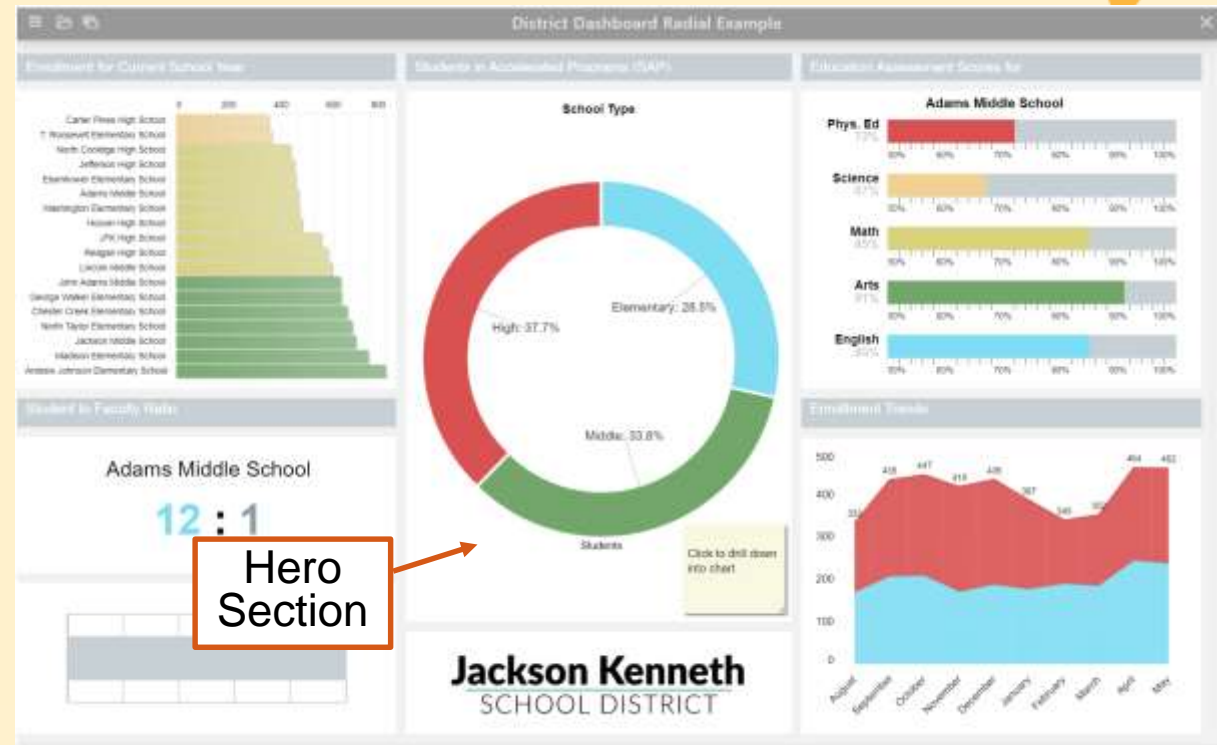


Hero Section

<http://www.excelcharts.com/blog/excel-dashboard-catchment-area/>

Hero Section in the Middle

- A hero section can overpower the influence of position



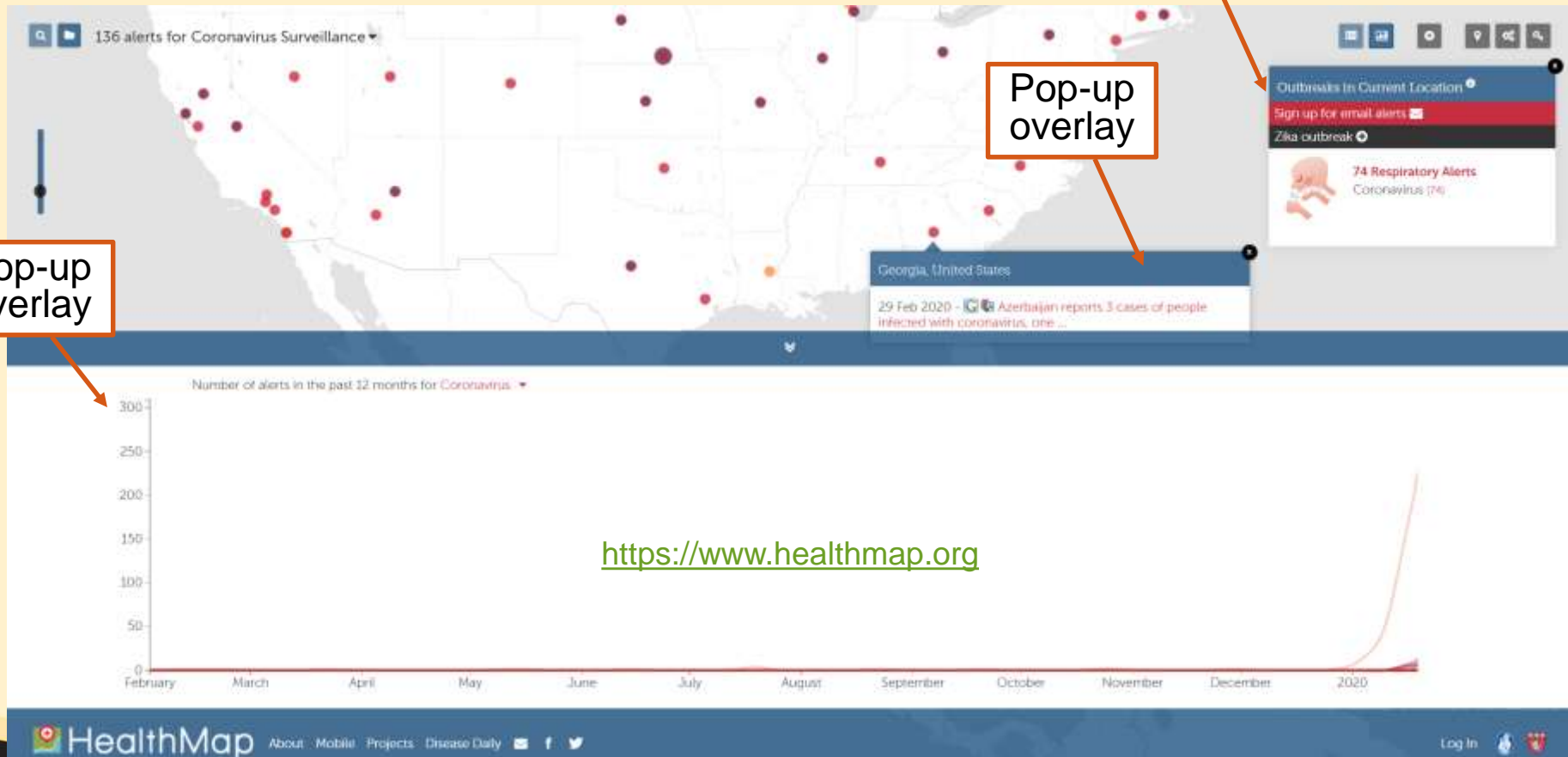
<https://www.idashboards.com/dashboard-examples/k12-dashboard-district/>



Whole Screen + Overlays



- One big visual will occupy the complete screen; other part will pop up and overlay on the big visual for more information.
 - Commonly used for data exploration and map-based dashboards
- Examples
 - <http://www.healthmap.org>
 - <https://finviz.com/map.ashx>
 - <https://www.productchart.com>





Content Organization Patterns

- Deal some specific content types and relationships

Content Organization Patterns



- Master/Index + detail
 - Index for overview and selection
 - Summary/overview chart + detail data table: Side by side, top and bottom
- Top down: key summarized metrics followed by detailed data
 - Key set of KPIs (single measures) on top row or side panel, + secondary measures
 - Key summary + contextual/dimensional comparison
 - Current snapshot + trending/history (half half): Key measures for one period (current or most recent) + history/timeline/trend charts
 - Period aggregate overview + key dimension drill down
 - Aggregate level (top) + drill down levels (bottom)
 - Google analytics: Primary measure + secondary (sliced)
 - Current selection profile info + comparison with peers or context
- Bottom up: detail data first, then summarized
 - Listing of detailed individual items + key summary at the high level
 - <http://duelingdata.blogspot.com/2019/01/5-types-of-dashboards.html>
 - Scorecard details + aggregate
- Centralized settings (slicer/filter) + result (used for analytical)
 - Setting on top/side
 - <http://gallery.idashboards.com/preview/?guestuser=webedu>

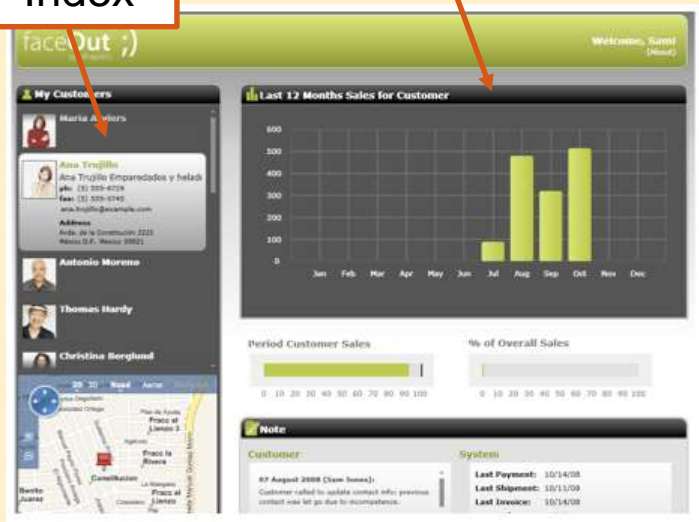
Master+Details or Index+Content



- Master/detail (or index/content) is pattern to arrange content
 - Master/index: the overview of items for selection
 - Detail/content: more details presented upon selection from an item in the master/index
 - Often used with the hero section and the side panel layout.
 - Master can be on the side or the top - <http://designingwebinterfaces.com/designing-web-interfaces-12-screen-patterns>

Master/
Index

Details/
Content



Master/
Index

Details/
Content

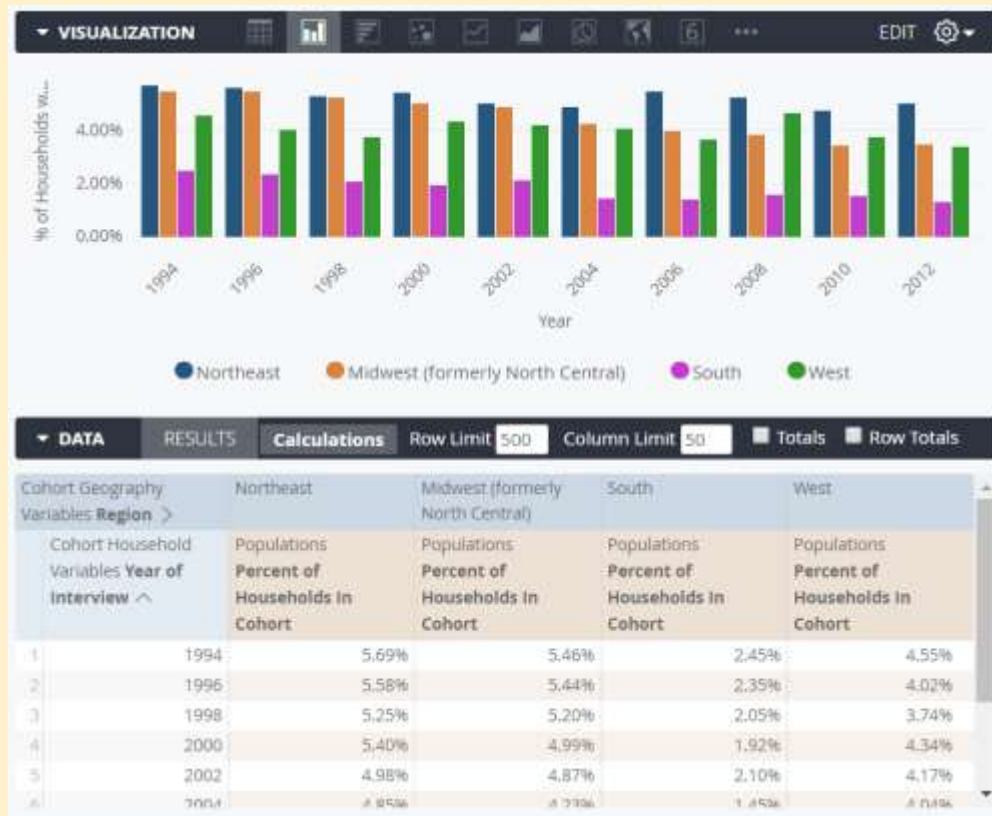


<https://www.nytimes.com/elections/2016/results/president>

Overview Chart + Details Data Table



- Big overview chart on top
- Then a table provides data details



Big overview chart on the top

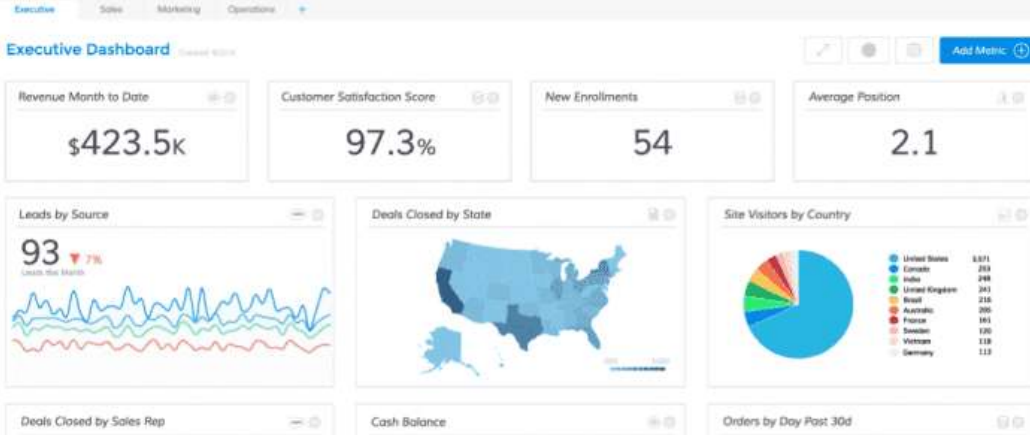
Data table with details at the bottom

https://census.looker.com/embed/explore/census/cps_with_groups?qid=KvNUdiYmIRLSkyJsXjNmxS&toggle=vis

KPIs on Top

KPIs

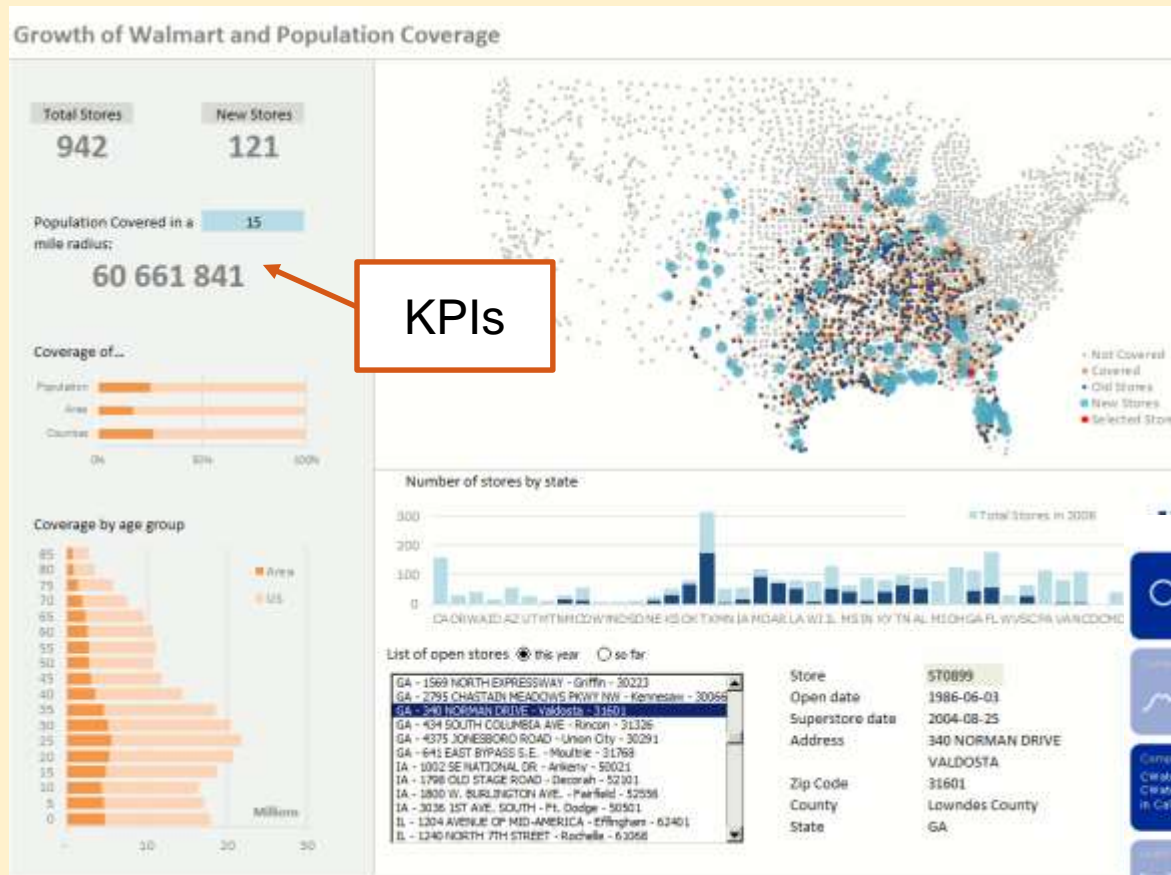
<http://www.crazybikes.com/mrc/CRAZYBIKES.I00100s>



KPIs

<https://www.patternfly.org/v3/pattern-library/dashboard/dashboard-layout/index.html>

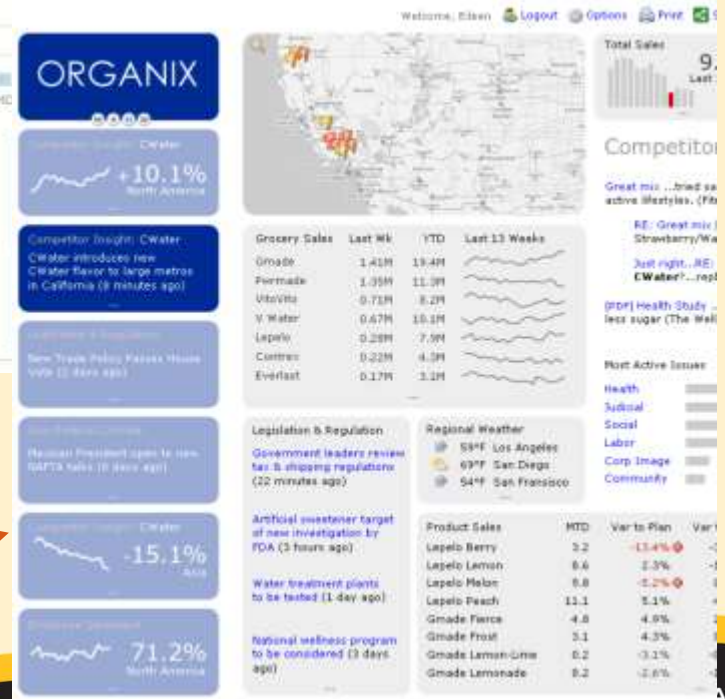
Key Data on the Side (Left)



KPIs

<http://www.excelcharts.com/blog/excel-dashboard-catchment-area/>

KPIs



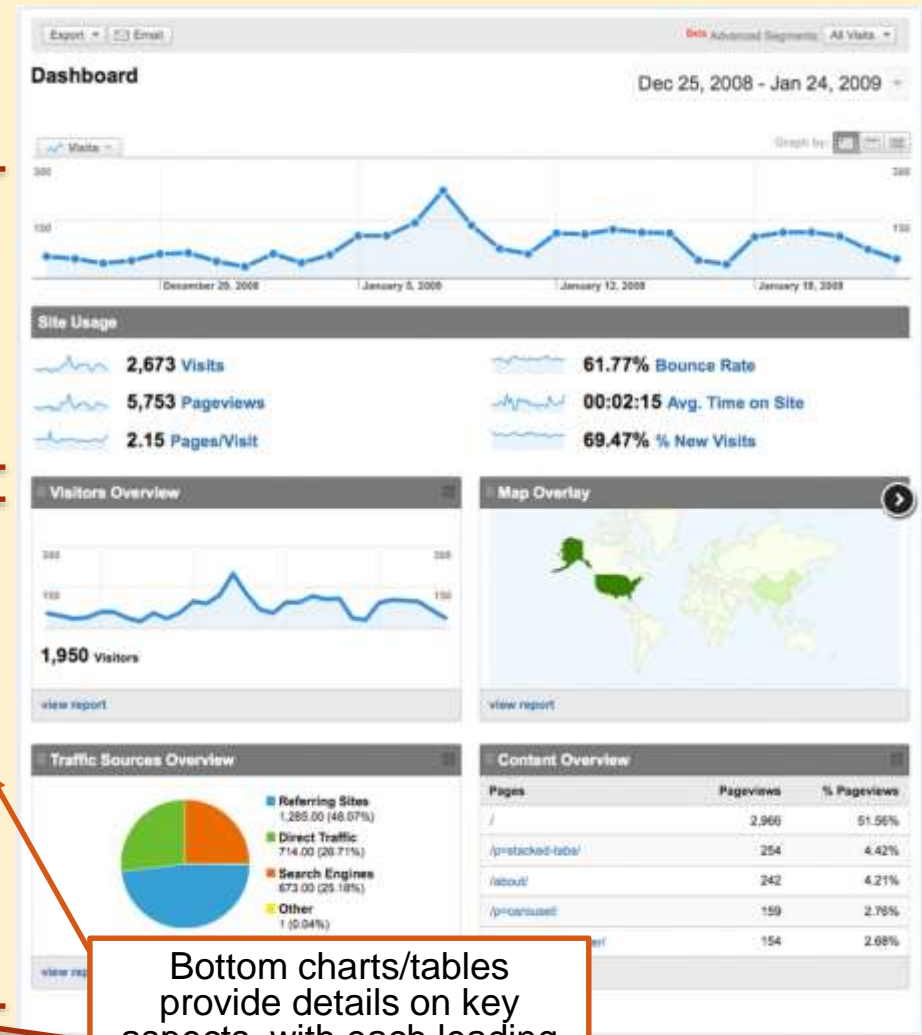
Trend + One Time Snapshot



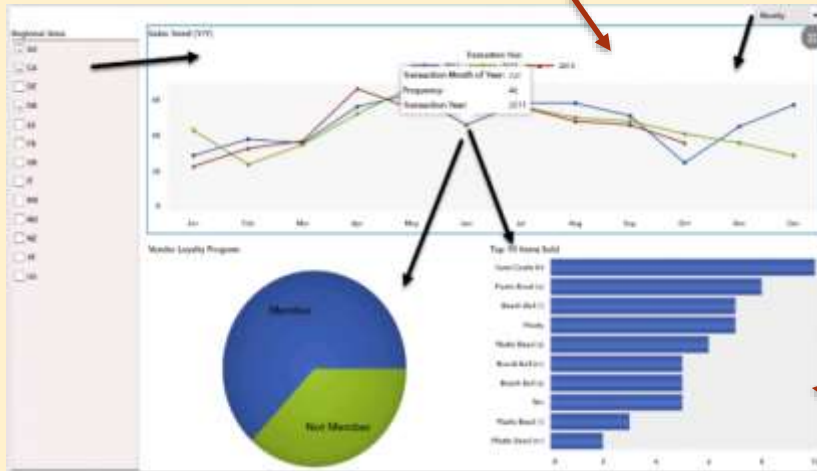
Google Analytics Dashboard

- Many times, we are working with historical data and one period data at the same time.
- Use a bigger chart for the trend data; and snapshot data for more details as smaller charts at the bottom.

The top hero chart provides history view of view counts; the second row displays KPIs.



Bottom charts/tables provide details on key aspects, with each leading to additional report/dashboard.

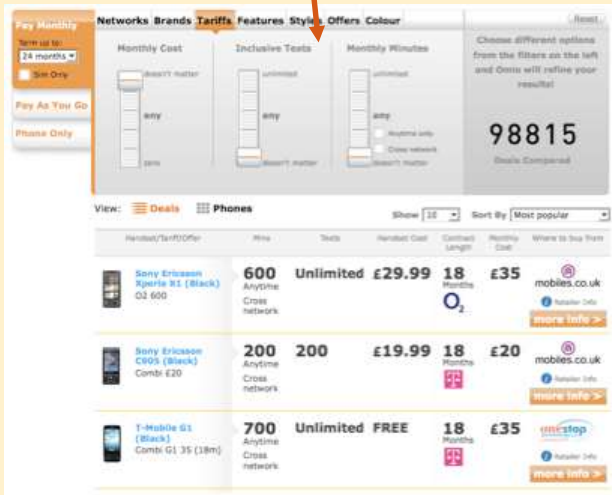


Settings + Results

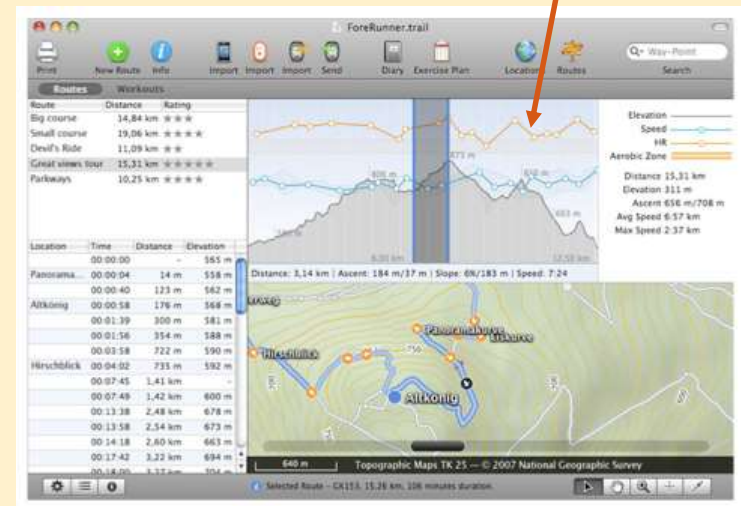


- This pattern applies to more analytical dashboards where there are many options and settings.
- Filter dataset <http://designingwebinterfaces.com/designing-web-interfaces-12-screen-patterns>

Filters/Options



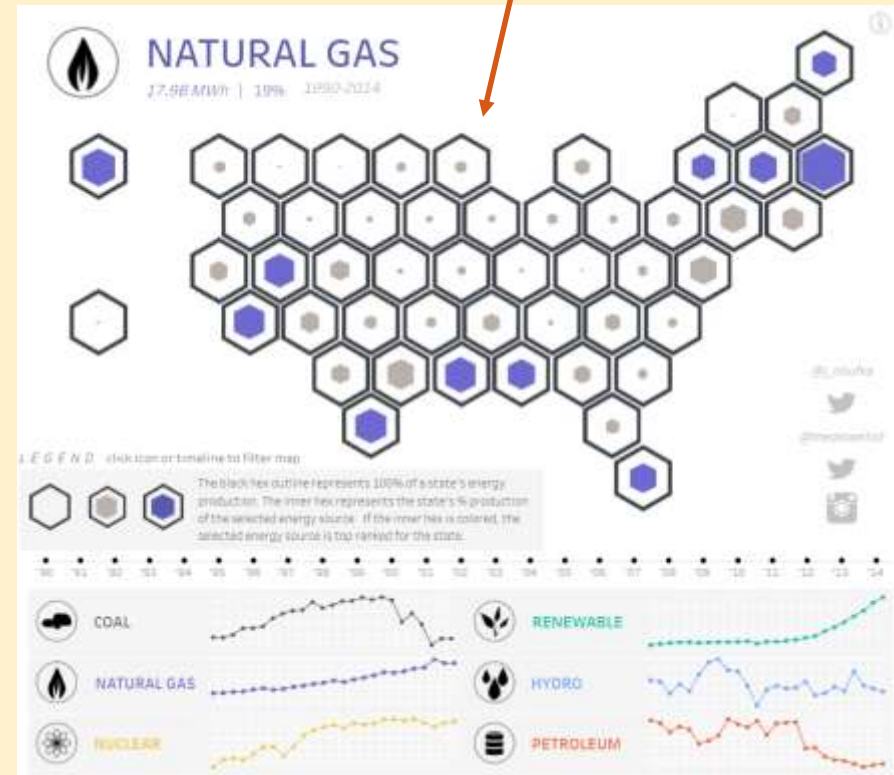
Filters/Options directly on the chart



Map in the Layout

- Maps are usually larger in size to accommodate more information
- Major patterns
 - Map as primary visual on top, and details on the bottom – the places on map can also be used as selectors or filters for the data below.
 - Map occupies the whole dashboard, and details pop up as needed (see prior slide on whole screen+overlay pattern)

The map at the top is also used as a selector.



<https://public.tableau.com/app/profile/datavizard/viz/EnergyinAmerica/Energy>

Bottom-Up



- Bottom-up design emphasize the details. It is usually used in operations monitoring, where users' attention is on details but less on summary.



Detailed data set on the left (big section)

Summary on the right

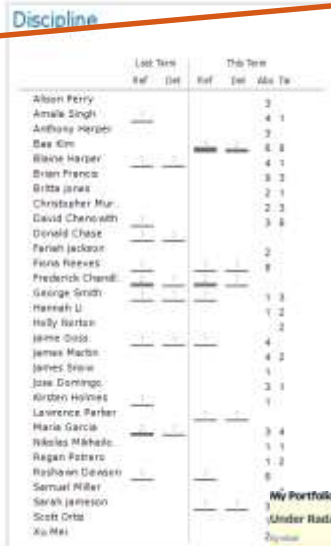
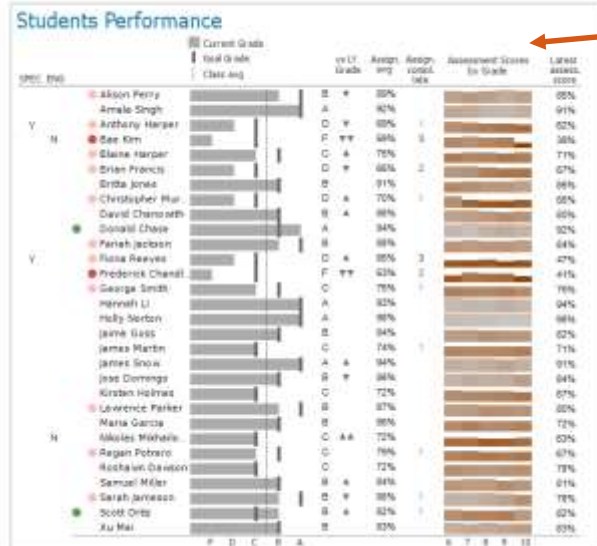
<http://duelingdata.blogspot.com/2019/01/5-types-of-dashboards.html>

More Bottom-Up Examples



Math Teacher's Dashboard

Data as of May 1, 2012 (Tuesday)



Student details on top.



Market index (summary) at bottom; stock details on top.

Screen Size Considerations in Layout Design



- Design the layout to fit one screen?
- What about smaller screens?
 - Screen adaptation: responsive?
 - Use sub dashboards?
 - Add interactivity?
 - Extra on demand?
 - Panning
 - Overview + detail
 - Scrolling
 - Paging
- Bigger wall screens? <http://www.finereport.com/en/features/tv-dashboard>
- Touch screens?
- 3D VR/AR screens/spaces?

We do not cover the designing for these types of screens in this class.

Layout Design Case Study 1



<http://logianalytics.com/dashboarddesignguide/dashboard-design-fundamentals/>



Before – don't do this

Before – what are the issues?



After – cleaner and more organized

After – what are changed?
What patterns or best practices are applied?

- Look for examples here

– <https://www.pinterest.com/ruth77rn/ui-patterns-dashboards/>

Layout Design Case Study 2

- <https://www.gpug.com/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=0353499e-a6bc-1361-1774-98fc310cf369>

Before –
what are the
issues?



Job Details

Construction Project Management



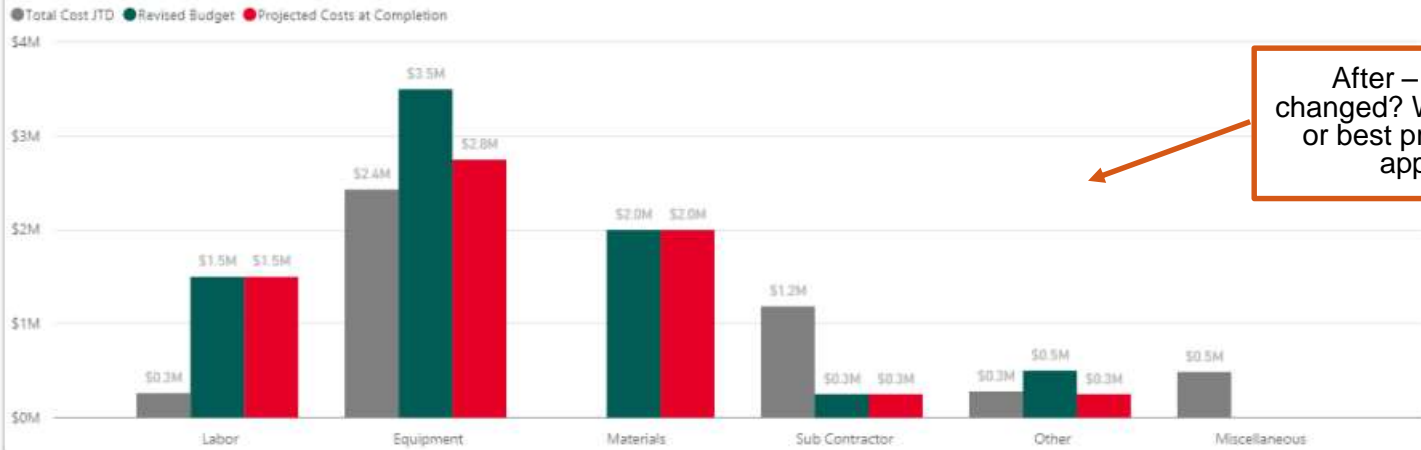
Project ID
70001-02

Year

- ☐ (Blank)
- ☐ 2014
- ☐ 2015
- ☐ 2016

Month

- ☐ (Blank)
- ☐ January
- ☐ February
- ☐ March
- ☐ April
- ☐ May
- ☐ June
- ☐ July
- ☐ August
- ☐ September
- ☐ October
- ☐ November
- ☐ December



After – what are
changed? What patterns
or best practices are
applied?

Cost Type	Revised Budget	Total Cost JTD	Commitment	% Complete	Projected Costs to Complete	Projected Costs at Completion
Materials	\$2,000,000				\$2,000,000	\$2,000,000
Labor	\$1,500,000	\$260,400	\$1,179,750	17.36 %	\$1,239,600	\$1,500,000
Equipment	\$3,500,000	\$2,431,402	\$4,712,748	69.47 %	\$318,598	\$2,750,000
Other	\$500,000	\$278,453	\$511,029	55.69 %	(\$28,453)	\$250,000
Miscellaneous		\$487,506	\$4,346,175	100.00 %	(\$487,506)	
Sub Contractor	\$250,000	\$1,185,800		100.00 %	(\$935,800)	\$250,000
Total	\$7,750,000	\$4,643,561	\$231,521.9...	59.92 %	\$2,106,439	\$6,750,000

Total Contract Amount

\$10,000,000

\$2,250,000.00

Budgeted Margin

22.50 %

Budgeted Margin %

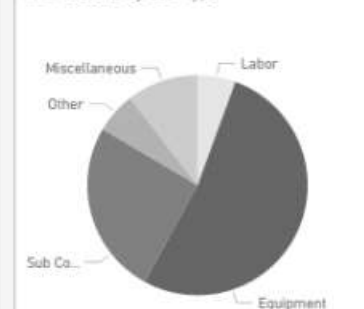
\$3,250,000

Projected Margin

32.50 %

Projected Margin %

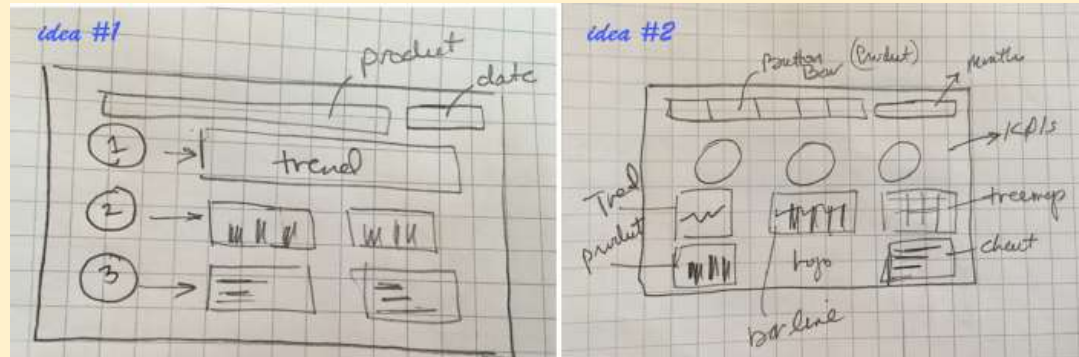
Total Cost JTD by Cost Type



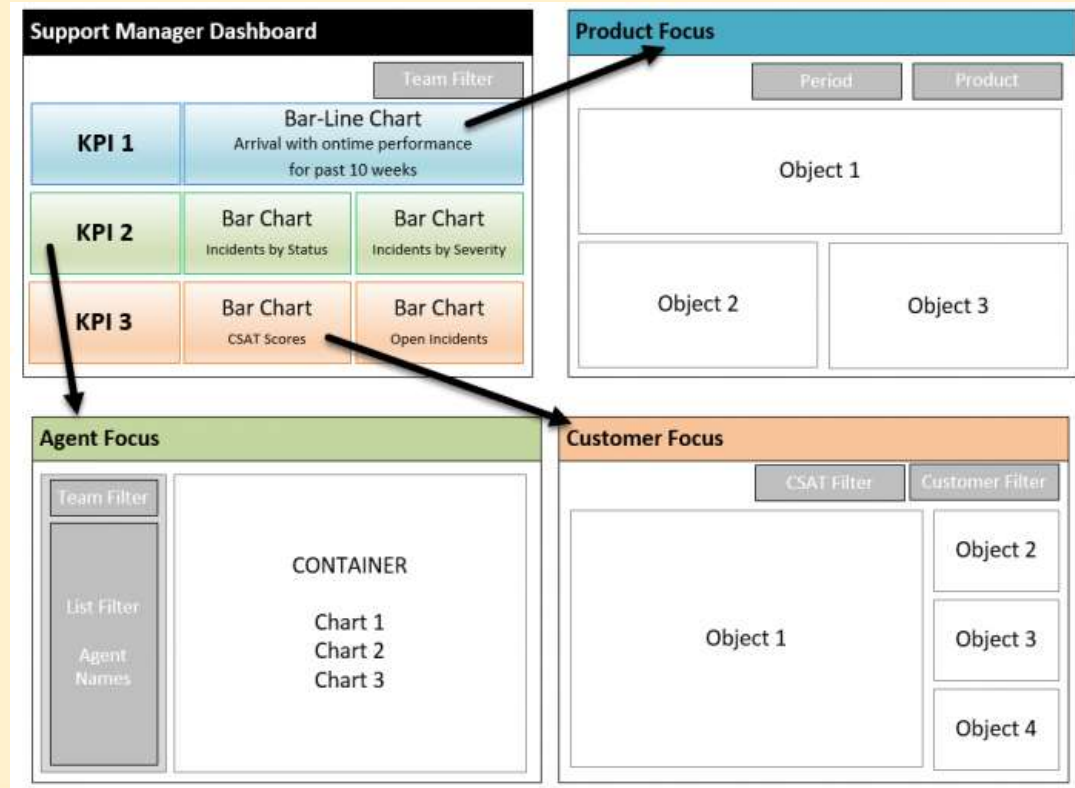
Layout Sketch, Wireframes, and Mockups



- Sketch: use pen and paper to quickly brainstorm ideas
- After sketching, use a software tool for better design, communication, and changes.
- Eventually finalize the design with a mockup.



<https://towardsdatascience.com/working-on-your-dashboard-layout-9b7c38d7b61e>



Good Readings



- 3 Design Layouts: Gutenberg Diagram, Z-Pattern, And F-Pattern - Vanseo Design
 - <https://vanseodesign.com/web-design/3-design-layouts/>
- Dashboard Design Essentials: Dashboard Layout & Formatting
 - <https://www.phdata.io/blog/dashboard-design-essentials-dashboard-layout-formatting/>
- <http://vizcandy.blogspot.com/2013/11/tableau-designs.html>
- <https://towardsdatascience.com/working-on-your-dashboard-layout-9b7c38d7b61e>
- <https://dataschool.com/how-to-design-a-dashboard/arranging-your-charts-as-a-dashboard/>
- Common Failures in Dashboard Formatting and Layout
 - https://www.perceptualedge.com/articles/Whitepapers/Formatting_and_Layout_Matter.pdf