

Dashboard Evaluation Criteria

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April 2019 Version 1.0

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Introduction

This document provides categorized criteria for dashboard evaluation from a user experience perspective. Categories and specific criteria are collected from research and project experience of the VAP design team. This document can be used as a guide when a dashboard or BI application needs to be evaluated.

The Dashboard evaluated in this document is a Sales & Operations Planning app from the Qlik demo website: <https://demos.qlik.com/qliksense/SalesandOperationsPlanning?page=2>

Principle 1: Readability

In order to acquire actionable insight, the user needs to be able to read the textual and non-textual content efficiently and effectively. Accessibility guidelines need to be followed to include users with vision impairment.

Text Readability

Criteria 1: Text sufficiently contrasts background

Following the Web Content Accessibility Guidelines (WCAG) 2.0, minimum contrast ratios between text and background are:

- For regular text: 4.5:1 (Level AA)
- For large text: 3:1
- Incidental: Text or images of text that are part of an inactive user interface component, that are pure decoration, that are not visible to anyone, or that are part of a picture that contains significant other visual content, have no contrast requirement.
- Logotypes: Text that is part of a logo or brand name has no minimum contrast requirement.

Dashboard Evaluation Finding:

ACTUALS: THIS PERIOD (in \$K)

\$7,165

This example is the KPI object in the dashboard sheet of the S&OP app. The text attributes of the KPI is: 26px, regular (weight), #65D3DA. Background color is white. Contrast ratio is 1.77 which fails to comply with the guideline.

ACCESSIBLE COLORS



My text color is `#65D3DA` at `26 px` and `regular` weight

My background color is `#FFFFFF`

My design must be `AA` compliant

Fails AA

Required contrast ratio: 3

Your contrast ratio: 1.77

Lore ipsum
dolor sit amet,...

Passes AA

if you change background
color to `#6B6B6B`

New contrast ratio: 3.02

Lore ipsum
dolor sit amet,...

Passes AA

if you change text color to
`#29A4AB`

New contrast ratio: 3

Lore ipsum
dolor sit amet,...

Resources:

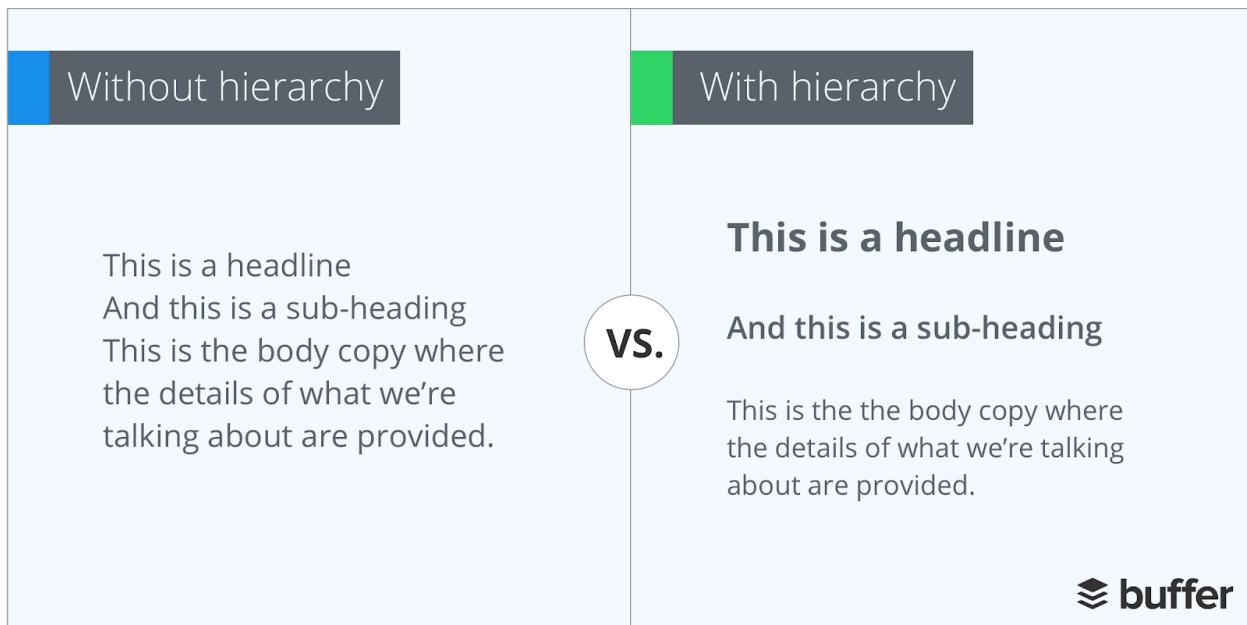
1. For detailed guidelines on contrast, visit [WCAG 2.0](#).
2. Some great resources to validate color contrast: [Contrast Checker by Mari Johannessen](#) and [Contrast Checker by WebAIM](#).
3. Browser extension [WhatFont](#) is a great tool for extracting text attributes, such as font size, weight and color.

Criteria 2: Text style is hierarchical and readable

Hierarchical text styles should be used to organize the content in a dashboard, similar to what you would see in a newspaper article:



With proper hierarchy, user can quickly glance at all the heading level content in the dashboard and understand what it's all about. Without proper hierarchy, it would take more cognitive effort to process the information.



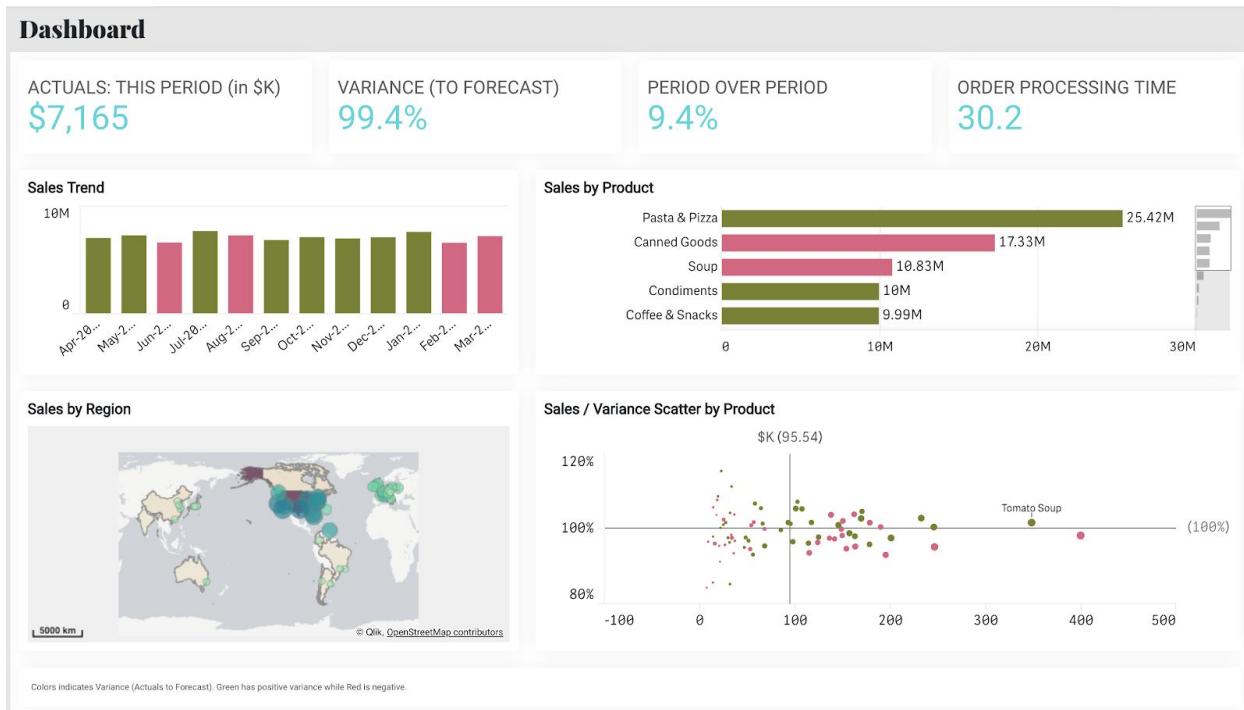
Text hierarchy example¹

Text hierarchy could be achieved by adjusting some common attributes: font weight, font size and font color. Lighter font weight, smaller size and lighter color can all give text a lower visual hierarchy. It's important to define what the lowest level text content looks like and make sure it's readable. We generally recommend that text content be no smaller than 12px.

Dashboard Evaluation Finding:

¹ <https://buffer.com/library/53-design-terms-explained-for-marketers>

The dashboard below has properly implemented hierarchical text styles. At the highest level, you can see the sheet title -- Dashboard. Then the chart titles allow you to quickly skim through the whole sheet and understand that it's mostly sales related information.



One thing worth mentioning is that the KPI labels are styled differently from other chart titles. By using regular font weight but larger size and capitalization, they stand between chart title and body text in the hierarchy. This could be a decision made to decluster the sheet. It allows the user to visually group all KPIs into one segment, and interpret the sheet as 5 total segments instead of 8.

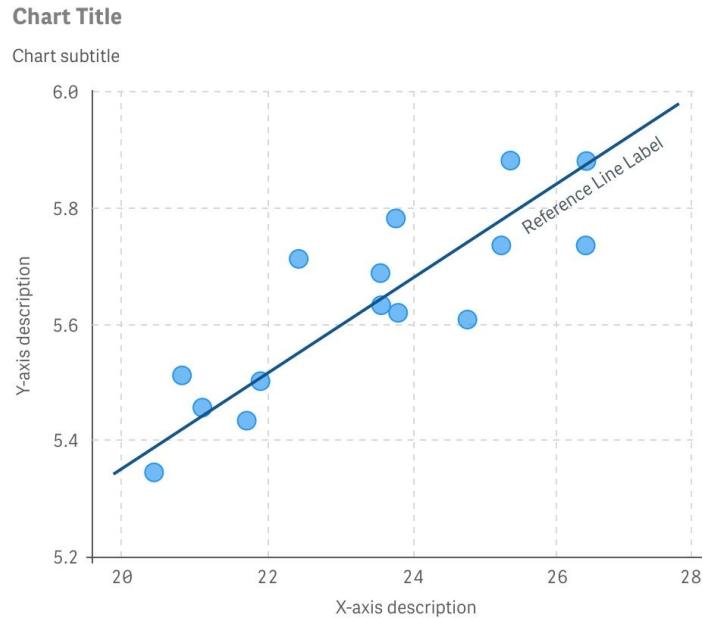
Resources:

1. Axis [Arc design system](#) documentation on Typography.

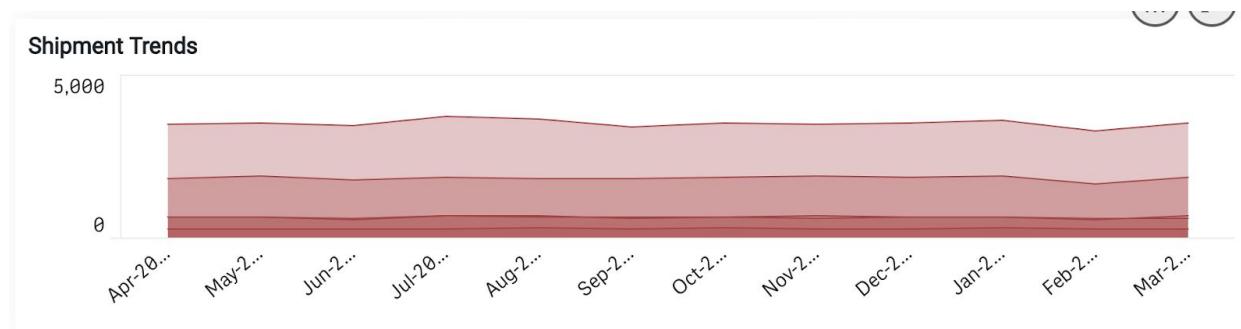
Criteria 3: Text orientation is appropriate

In English, text reads from left to right, top to bottom. Therefore, horizontal left to right is the most preferable orientation in dashboards. In some cases, we have to orient text differently for specific reasons:

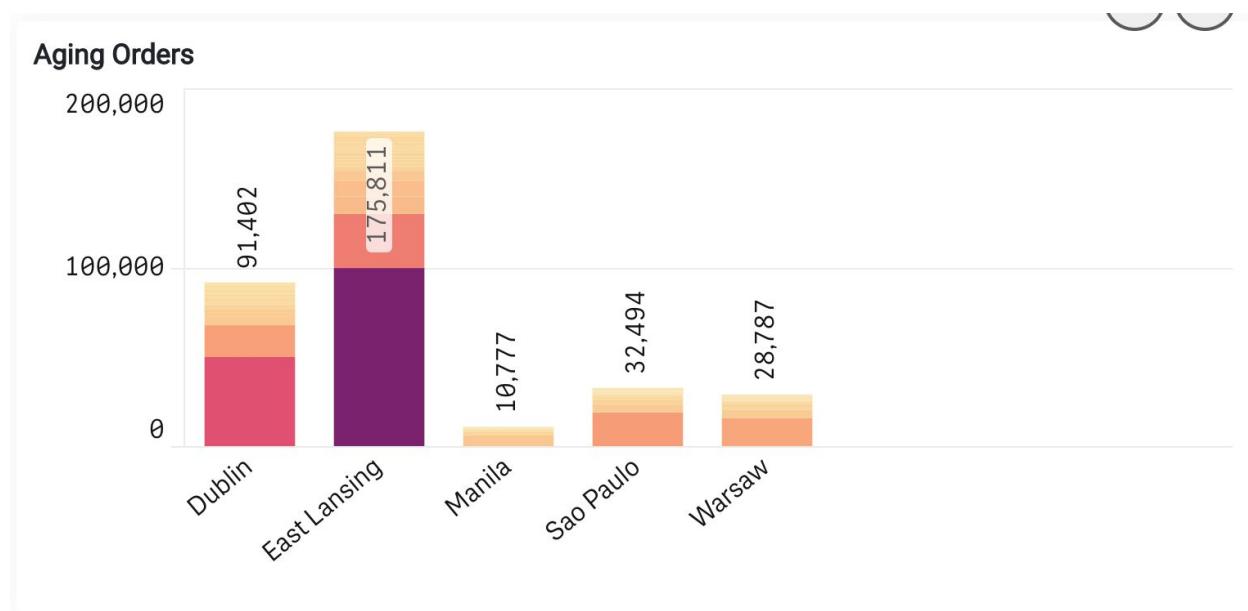
1. Y-axis description could be vertically positioned along the axis
2. Long x-axis labels could be tilted to extend the length displayed in limited space
3. Angled reference line could have an angled label along the line



Dashboard Evaluation Finding:



In this stacked area chart, x-axis labels are tilted to display more characters. However, all labels are still truncated and half of the Month-Year information is hidden. A couple alternatives could be considered: 1) shorten each label, like replacing "Nov-2018" with "11-'18", 2) show labels for every other month instead of every month.



In this stacked bar chart, the data point labels are too long to fit horizontally. However, if the use case doesn't require all the digits for accuracy, the labels could be shown in millions, like "91.4". To not repeat the letter "m" in every label, you could add "(in millions)" to the chart title.

Criteria 4: Text alignment is appropriate

In dashboards, multiple rows of numbers are typically right aligned, so that the digits and delimiters are vertically aligned for easier comparison. Text values (or numeric values treated as text, like order numbers) are usually left aligned if the dashboard is in English or other languages reading from left to right. Axes labels should be consistently aligned with tick marks or gridlines, typically center aligned. Left aligning comparable numbers is never acceptable, but right aligning text labels is, in some cases, sometimes acceptable.

For example:

| Sales | Sales |
|----------------------|--------------------|
| \$1,145 | \$1,145 |
| \$950 | \$950 |
| Inappropriate | Appropriate |

Dashboard Evaluation Finding:

Details (Click to Maximize)

| Product Family | Q | Products | Q | Sales | Forecast | Variance | Variance % |
|----------------|---|--------------------------|---|---------|-------------|------------|------------|
| Totals | | | | \$7,165 | \$7,211,353 | (\$46,213) | 99.4% |
| Canned Goods | | Apple Sauce | | \$148 | \$148,470 | (\$73) | 100.0% |
| Canned Goods | | Baked Beans | | \$68 | \$71,110 | (\$3,220) | 95.5% |
| Canned Goods | | Black Beans | | \$178 | \$185,672 | (\$7,622) | 95.9% |
| Canned Goods | | Black Beans Value Pack | | \$101 | \$95,445 | \$5,185 | 105.4% |
| Canned Goods | | Dorie's Best Black Beans | | \$110 | \$151,061 | (\$3,691) | 98.3% |

In tables, Qlik Sense automatically left aligns dimension values, and right aligns measures. However, when using parentheses to indicate negative values like the "Variance" column, positive and negative values are slightly misaligned. It could also cause confusion because reference numbers in Qlik Sense objects are also shown in parentheses. The decision of using parentheses instead of negative sign "-" might be justified if users of this application have a Finance background and prefer this format.

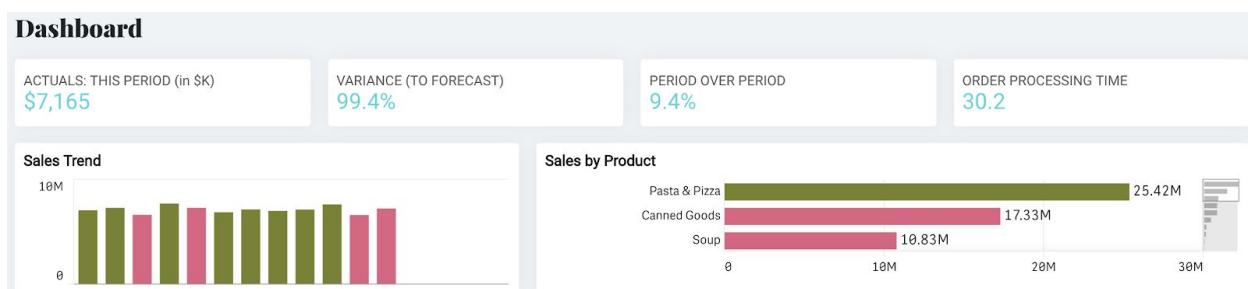
Criteria 5: Use appropriate font family

Choosing a font family with good legibility is important in dashboards. Decorative fonts, such as Display style fonts, can be used for eye-catching headlines, but should not be used to display data points or important information. Handwriting style fonts are not recommended in dashboards. Sans-serif fonts are commonly used in modern web design for its simplicity.

For example:

| Sales | Sales |
|----------------------|--------------------|
| \$1,145 | \$1,145 |
| \$950 | \$950 |
| Inappropriate | Appropriate |

Dashboard Evaluation Finding:



This dashboard uses a clean sans-serif font (Roboto) for chart titles and labels, and a relatively more expressive yet still legible font (PlayFair Display) for the title of the page. They are both appropriate choices.

Resources:

1. [Google fonts](#)
2. [Roboto](#), [Source Sans Pro](#), [Lato](#) and [Open Sans](#) are some nice clean fonts

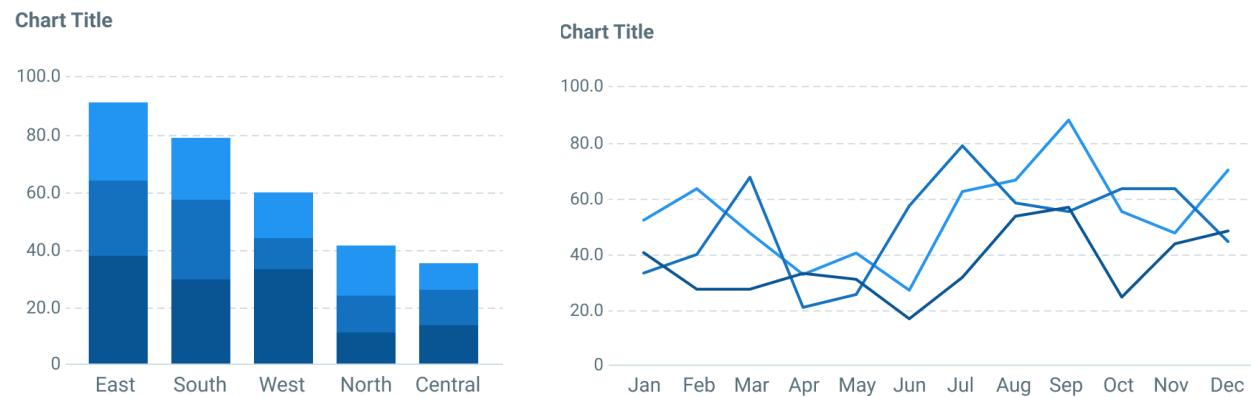
Shape Readability

In dashboards, geometric shapes such as lines, rectangles and circles often encode important information. Therefore, readability of shapes is also important.

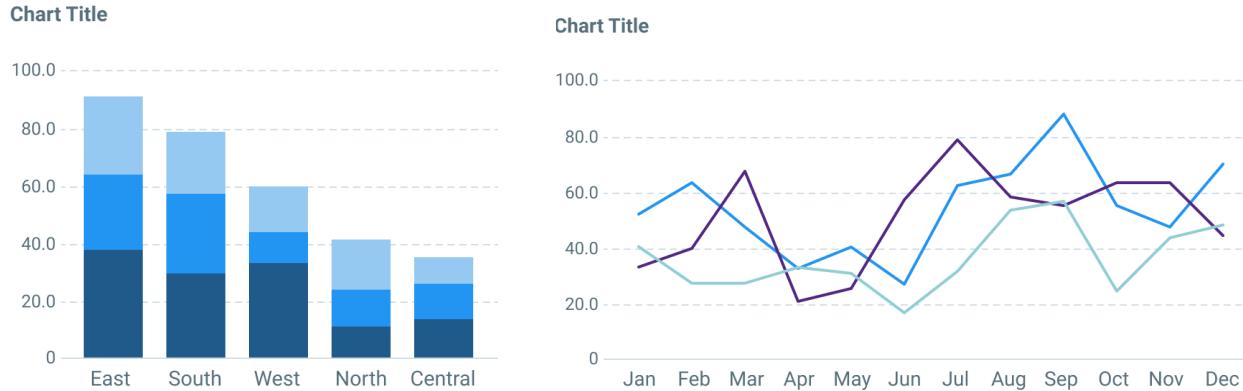
Criteria 1: Color of the shapes sufficiently contrast the background, context, or adjacent shapes

When using colors to encode data points, it is important to choose colors that are easily distinguishable from each other and the background. When the shape covers relatively small real estate, such as a thin line, the contrast needs to be emphasized even more. To make sure the color palette provides enough contrast, it is key to not use too many colors.

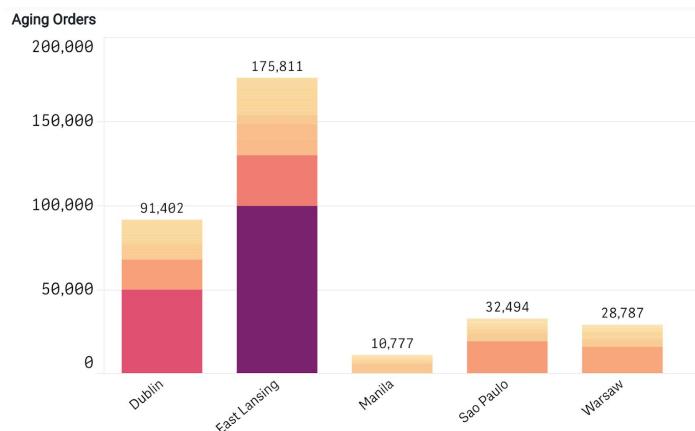
For example,



In the charts above, the three shades of blues encode three measures. The colors are somewhat distinguishable in the stacked bar chart, but not so much in the line chart. To increase readability of the charts, we recommend exaggerating the color contrast by either using a wider range of the sequential color scale, or using categorical colors:



Dashboard Evaluation Finding:



In this stacked bar chart, colors are used to encode 19 different Aging Buckets. From the baseline, the first three buckets or so are distinguishable. However, the different shades of orange become very difficult to distinguish beyond that. To make sure colors sufficiently contrast each other, we recommend having no more than 5 categories. If more than 5 categories have to be represented, we could group some categories into "Other" and enable drill down, or we could use alternative graphs like grid chart, heat map, or small multiples.

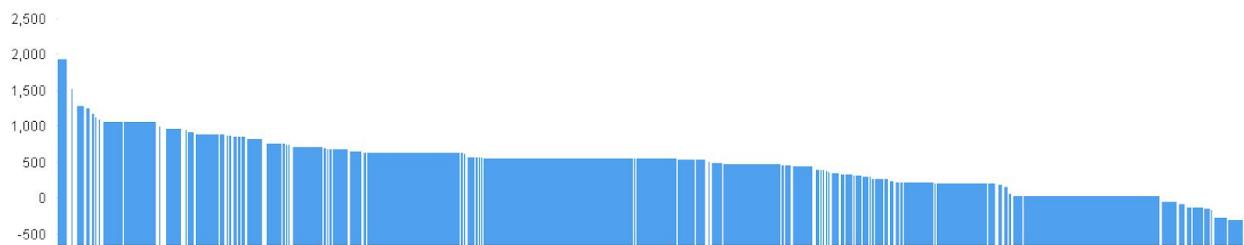


Criteria 2: Size of the shapes is aligned with the need of precision

When using size of the shape to encode measures, it is important to understand what level of precision is expected when users read it. The following examples increase in level of precision:

1. This circle is small, that one is big
2. This rectangle is about 1/5 of that one
3. This circle represents roughly \$500

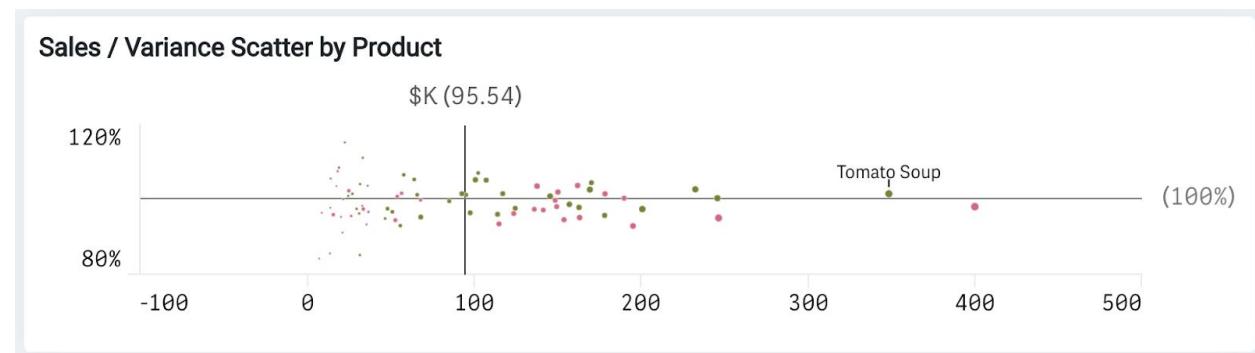
In some cases, multiple levels of precision are being mixed in one chart. For example,



In this mekko chart, the width of bar encodes a measure. The few wide bars could be compared proportionally, while the thin ones are probably interpreted as just "small values". Zooming interaction would help with this issue. Otherwise, alternatives should be explored.

Precision is also needed when interactive features are involved. If users need to hover over, click on, or touch (for touch screen devices) the shapes to see information on demand, then the size of the shapes should be large enough to enable such interaction.

Dashboard Evaluation Finding:



In this scatter plot, some dots are too small to see, while the bigger ones look relatively the same size. Using the size of dots to encode a third measure is not effective in this case.

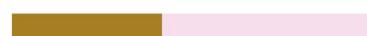
Removing the third measure and increasing the bubble size can improve readability of this chart.

Criteria 3: Colors are color blind friendly, or readability does not solely rely on colors

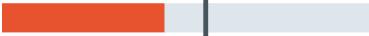
To make sure users with color blind conditions can effectively use the dashboard, it is important to choose color blind safe colors and use visual cues besides color.

For example,

Users with Deuteranopia (Red-Green confusion) cannot effectively tell good and bad performance from red/green color coding. Monochromacy is rare and is the most severe color blind condition. Users with monochromacy can only see different shades of grey.

| | | |
|---|---|---|
| Gauge | Gauge | Gauge |
|  |  |  |
| No color blindness | Deuteranopia | Monochromacy |

To enhance accessibility, the pair of red and green colors should be avoided. In addition, other visual cues, such as reference lines or up/down arrows, or explicit labels could be added to help. Red and blue works better than red and green for users with Deuteranopia and Tritanopia (Blue-Yellow confusion).

| | | |
|---|---|---|
| Gauge | Gauge | Gauge |
|  |  |  |
| Does not meet target | Does not meet target | Does not meet target |
| Gauge | Gauge | Gauge |
|  |  |  |
| Exceeds target | Exceeds target | Exceeds target |
| No color blindness | Deuteranopia | Tritanopia |

Dashboard Evaluation Finding:

| Forecast | Variance | Variance % | Forecast | Variance | Variance % |
|---------------------------|------------|------------|---------------------|------------|------------|
| \$7,211,353 | (\$46,213) | 99.4% | \$7,211,353 | (\$46,213) | 99.4% |
| \$185,672 | (\$7,622) | 95.9% | \$185,672 | (\$7,622) | 95.9% |
| \$95,445 | \$5,185 | 105.4% | \$95,445 | \$5,185 | 105.4% |
| \$151,961 | (\$2,625) | 98.3% | \$151,961 | (\$2,625) | 98.3% |
| \$162,218 | (\$8,513) | 94.8% | \$162,218 | (\$8,513) | 94.8% |
| \$128,218 | (\$4,607) | 96.4% | \$128,218 | (\$4,607) | 96.4% |
| No color blindness | | | Deuteranopia | | |

In this Details table, Variance and Variance % columns are color coded with red and green. It's not color blind safe. We recommend simplifying the color coding by highlighting only bad performance in red, and leaving the rest with clear/white background. "Colored vs not colored" is easier to read than "red vs green".

Resources:

1. [Learn more about color blindness](#)
2. Pick color blind safe colors using [ColorBrewer](#)
3. Validate colors using color blind simulator [Color Oracle](#), or [Sim Daltonism](#) (for Mac)

Flow

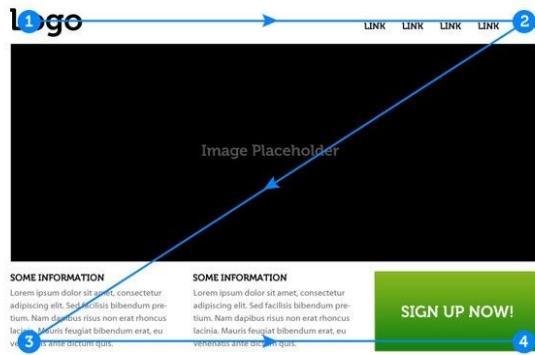
Flow determines how users will navigate through your dashboard and process information. The order of screens in the dashboard or the order of charts/other UI elements within a screen will determine your flow. Having a good flow of screens and elements within a screen is a way to guide users and help them make sense of the data easily.

Criteria 1: Charts and UI elements have a logical flow to them

(e.g. Overview and then details)

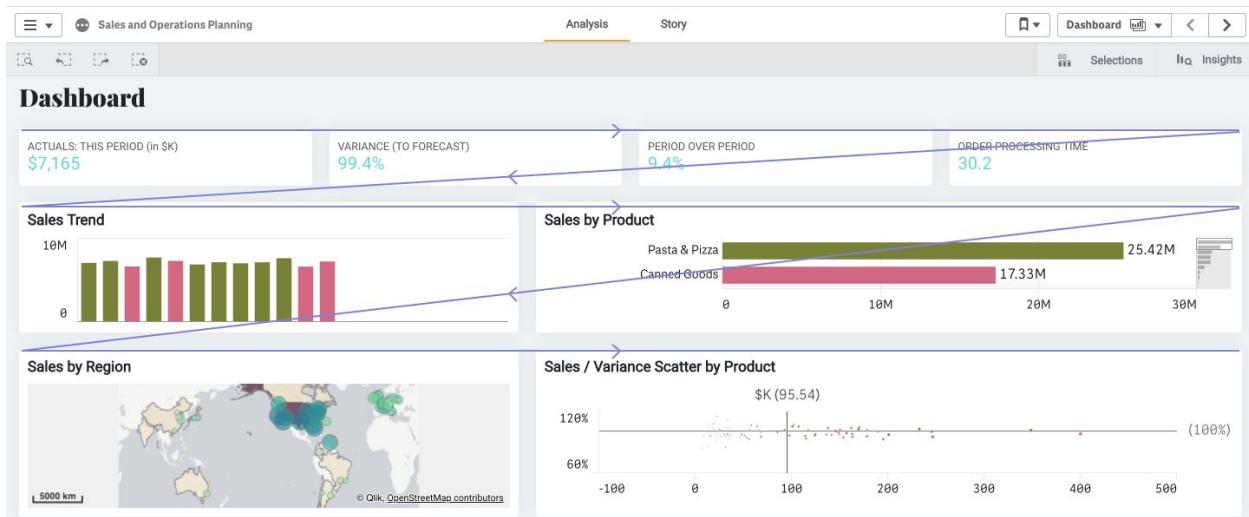
Users can be overwhelmed if we put too much information in front of them all at once. We want to guide users through the information by arranging charts and UI elements like filters, toggles etc. in a logical flow. The order in which we read also affects the flow. In English, we typically read from left to right and top to bottom forming a "z shape". You can use this "z shape" to organize information from an overview to more details.

For example:



When placing charts on the dashboard, place the most important information or the highest level information(eg:KPI's) at the top. As you go from left to right and top to bottom, the information and charts get more detailed. The most detailed information is typically at the bottom of the page (eg: detail tables). The flow can also be based on the way users will go about analyzing information and the story you're trying to tell.

Dashboard Evaluation Finding:



The KPI's are at the top with the highest level information. The 1st KPI is trying to answer "What is my sales for this period?" Then 2nd and 3rd KPI answer "Is this performance good or bad?". The 4th KPI "What is my average order processing time?" doesn't seem to follow the flow of questions here.

Moving on to the other charts, the "Sales Trend" to the left followed by the "Sales by Product" bar chart to the right makes sense because information at the product level is more detailed than an overall sales trend. "Sales by Region" seems to be at the same level of detail as "Sales by Product". The location of the scatterplot at the bottom right makes sense as it seems to be the most detailed information on the page. I would consider swapping the "Sales by Region" and

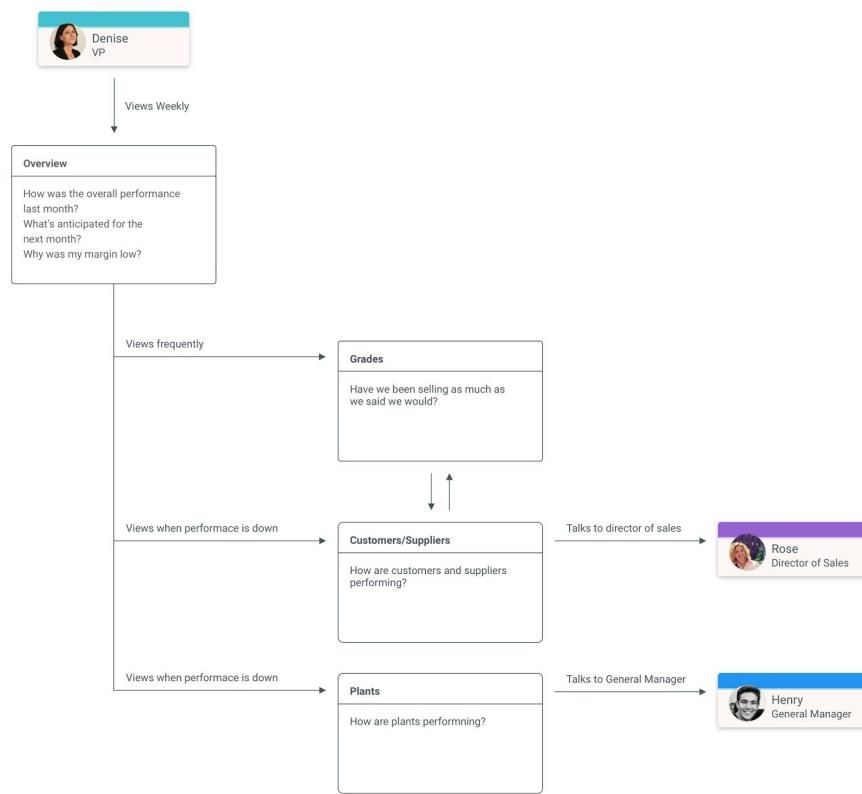
"Sales by Product charts". This could be a better transition as the user can look at the "Sales by Product" bar chart and then dig deeper in the "Sales/Variance Scatter by Product".

Criteria 2: Screens have a logical flow to them

The flow of the screens usually starts from an overview screen to more detailed screens. The order of the screens can also reflect the users workflow or the order in which they do their analysis. Think about what the user would want to explore next or what action they would take after viewing the information on the previous screen.

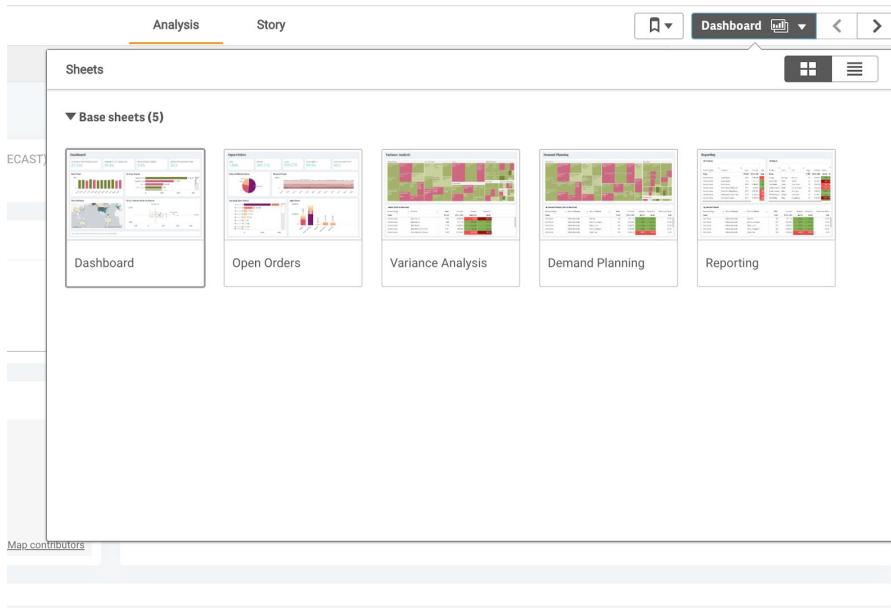
For example:

User Workflow for Denise



The user workflow above orders the screens based on the order in which Denise does her analysis and also takes into account the actions she takes.

Dashboard Evaluation Finding:



The order of the screens seems to make sense because it starts from the highest level dashboard screen and ends in a reporting screen that has detail tables. Ideally, we would follow up with the users to understand their workflow and then evaluate if the dashboard met this criteria.

Resources:

<https://www.juiceanalytics.com/writing/dashboard-design-flow>

Perceptibility

Perceptibility relies on a number of criteria that can be categorized in two main groups: understanding and representation.

Understanding

This first set of perceptibility criteria ensure that the charts can be read accurately.

Criteria 1: Enough context is provided to make sense of the charts

Context is provided in the form of comparisons, explanation of colors, legends, and axis labels. Subtitles and/or annotations provide additional information when needed.

Context is about providing enough information to allow the users to make sense of a chart. If users are not familiar with a more advanced type of chart, then you may need to provide a short description on how to read the chart. If users are unfamiliar with a metric that you're using, you can add tooltips or a description of what it means. Subtitles can help provide additional information on what the chart is about. You can even provide context for the

purpose of a chart by including the key question that it's answering. Benchmarks are also a great way to provide context as to whether a measure is good or bad. Make sure that the user always knows what the x- and y-axis measures are and that the meanings behind any colors are explained in a legend.

For example:



<http://opensrc.axisgroup.com/travel-c02/#/explore-data>

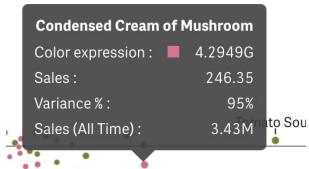
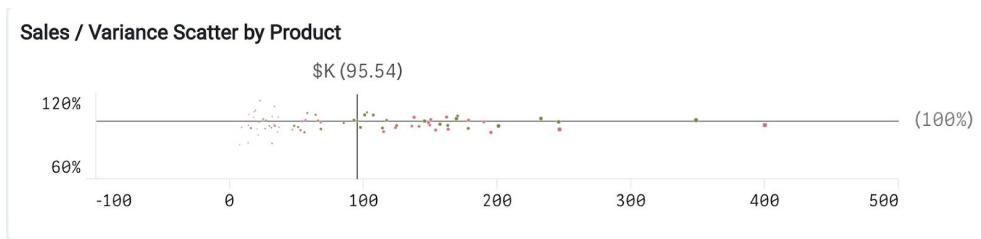
In The example above has the key question being answered with instructions on how to interact with the chart.

Dashboard Evaluation Finding:

ACTUALS: THIS PERIOD (in \$K)

\$7,165

The KPI says actuals instead of sales actuals so the user has to guess what the metric is. The term period isn't defined either. We don't know if it's this month, week, quarter etc.



The scatterplot doesn't clearly indicate what the x-axis and y-axis are showing. We also don't know what the variance measure is. It could be variance from prior month, forecast, target etc. It's also hard to tell what the colors indicate since there's no legend. The term "color expression" in the tooltip doesn't help clarify anything either.



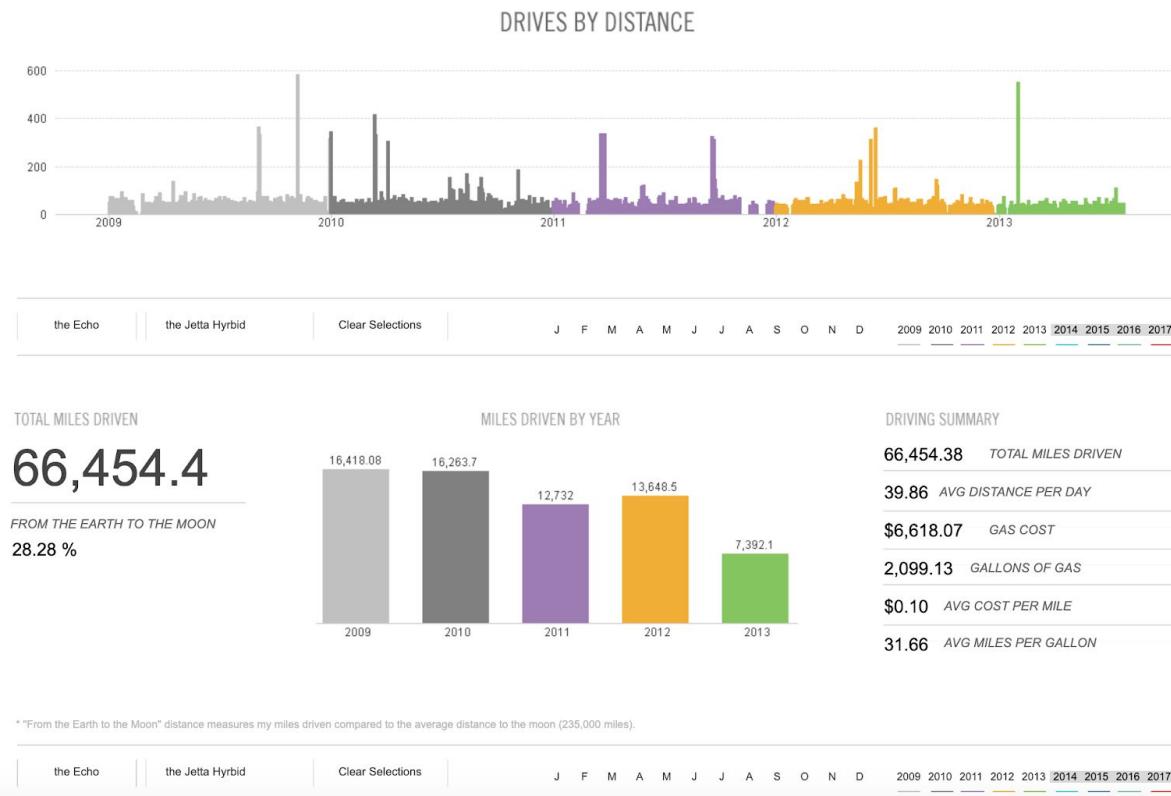
The bar chart does not show what each bar represents. When you expand the chart you see that it's months but the user shouldn't have to do that to quickly understand the chart.

Criteria 2: Current selections and applied filters, parameters are visible

(e.g. the user is aware of what portion of the dataset they're looking at)

Any type of filters or selections that are applied should be visible on the dashboard so that the user knows what they're looking at.

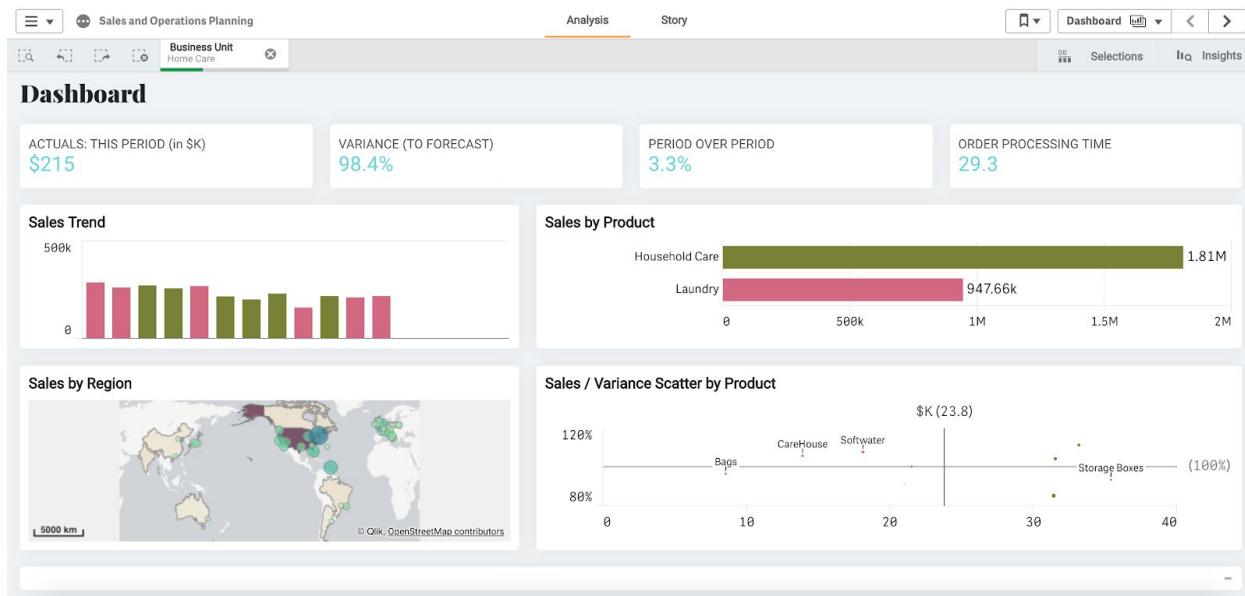
For example:



<https://us-b.demoqlik.com/QvAJAXZfc/opendoc.htm?document=qvdocs%2FMy%20Life%20in%20Data.qvw&host=demo11>

When looking at the graphs it's hard to tell that a filter has been applied even though the two sections above are filtered by "the Echo". The lines to right and left of "the Echo" are a slightly darker gray but it's hard to see. There are also two sets of identical filters ("the Echo" and "the Jetta Hybrid"). The first set is in the middle of the screen and the second set is at the bottom of the screen. I initially expected the first set of filters to only apply to the first section and the second set to only apply to the second section but that was not the case. Clicking on any one filter will apply it to all the charts in both sections but this interaction is not obvious.

Dashboard Evaluation Finding:



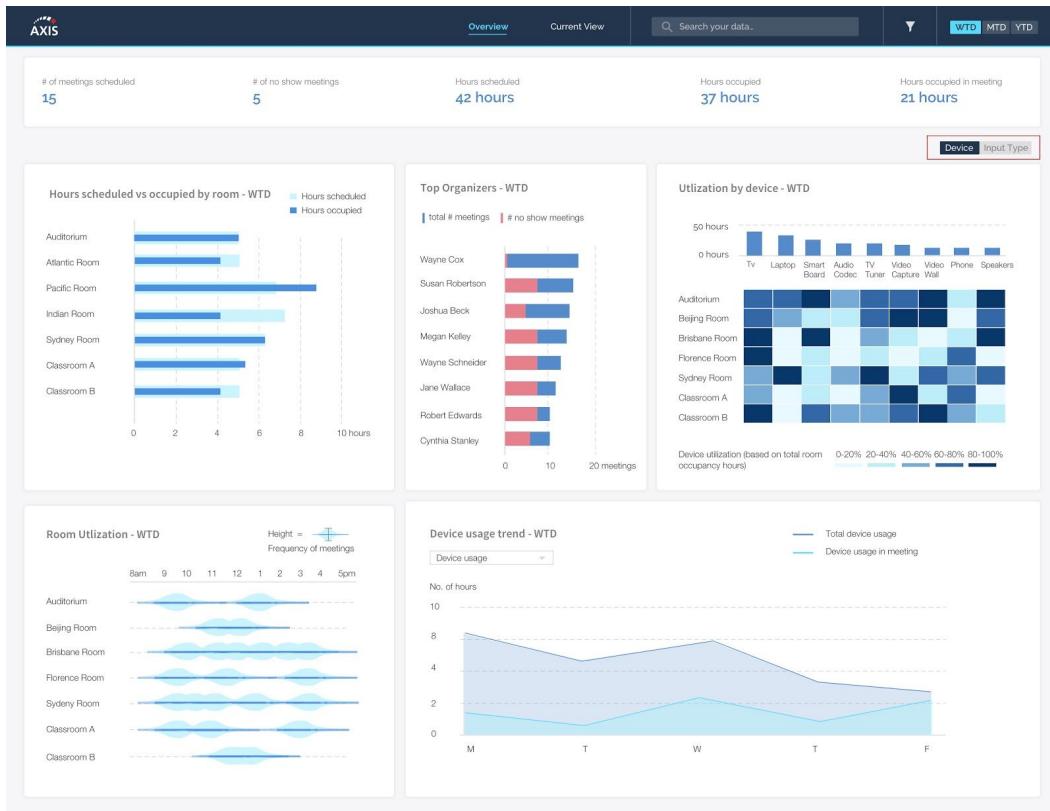
Selections being hidden in Qlik Sense is less of an issue. They usually appear on the bar that's below the sheet title.

Criteria 3: The relationship between the UI element and the charts it controls should be apparent

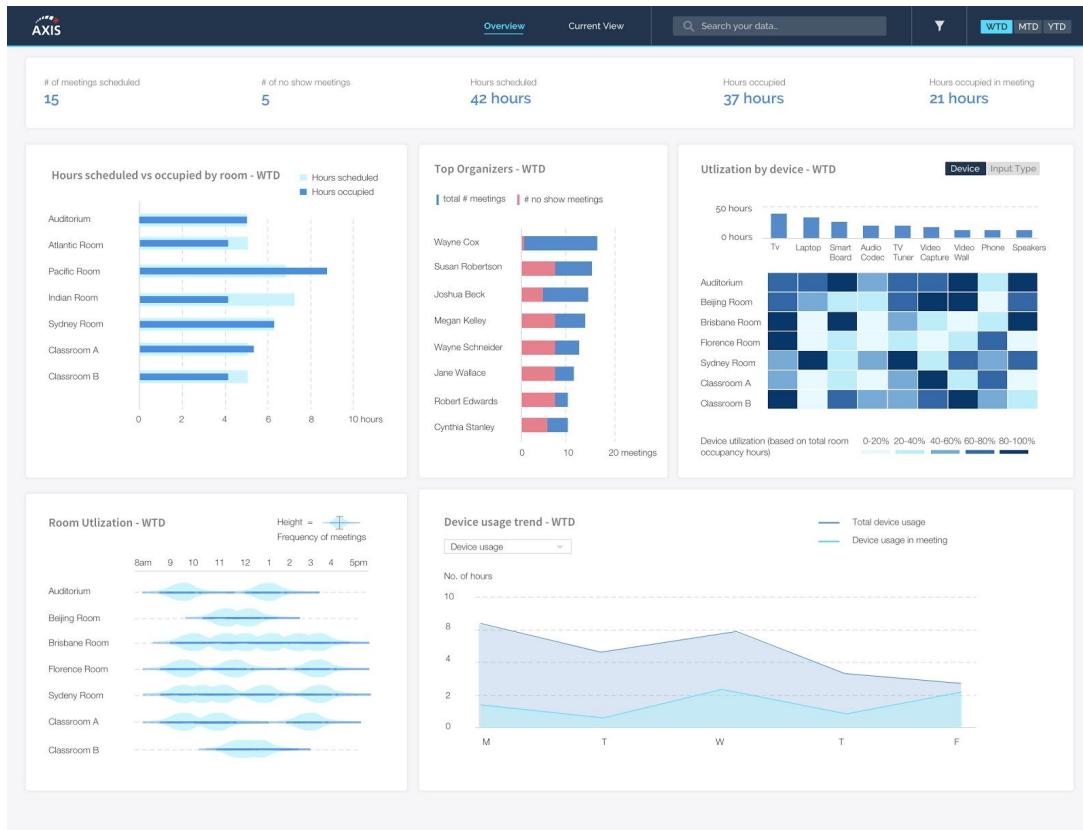
(e.g. if a control affects multiple objects on the page at the same time it should be placed in a global position)

UI Elements like toggles, dropdowns etc should be placed in a location that clearly shows which charts it controls. If they control the entire page, then they should be placed in a global position.

For example:



In the example above, notice the “Device and Input Type” toggle. The position of this toggle makes it seem like it controls all the charts below. However, it actually controls only the Utilization by device chart. A better way to position this would be just add it inside the tile.

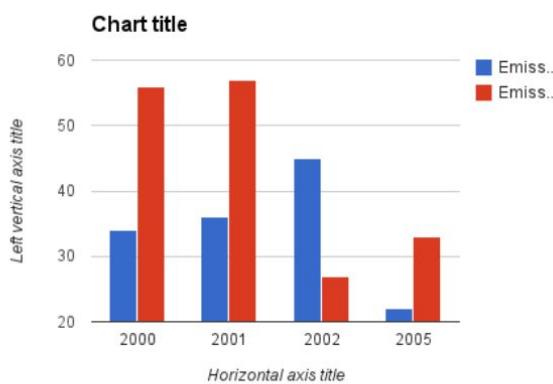


Criteria 4: Gaps in the data are not hidden

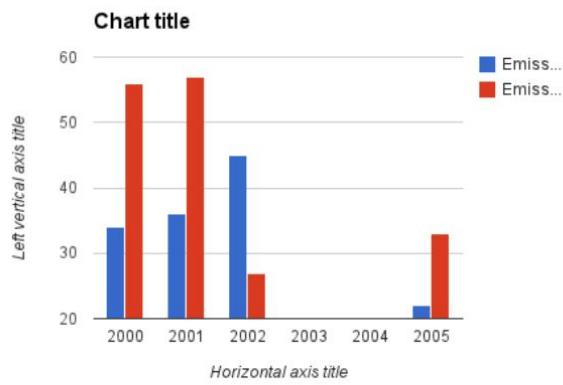
Gaps in the data like missing data points should not be hidden. Be transparent about missing data and use the full axis instead of skipping values.

For example:

Wrong



Correct



Note: Data has not been reported for 2003 and 2004.

Dashboard Evaluation Finding:

The dashboard does not seem to have any gaps in the data

Representation

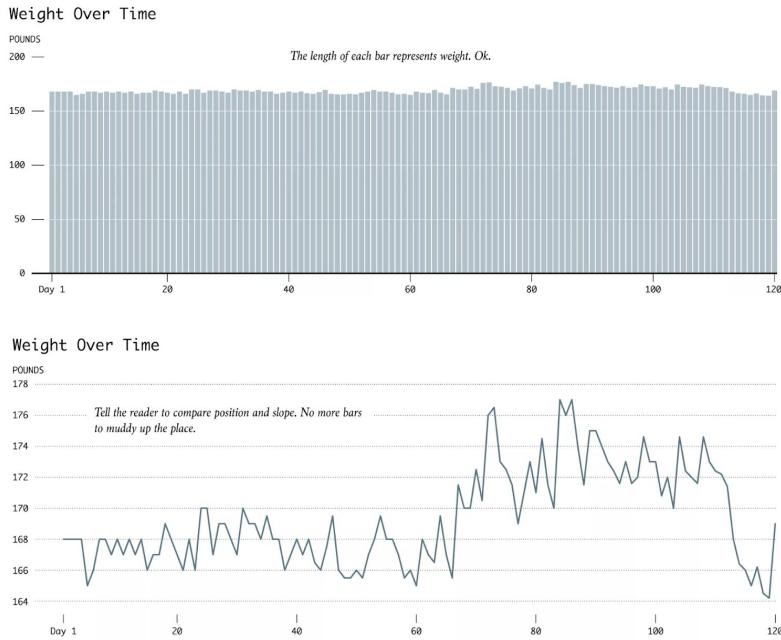
This set of criteria focuses on the representation of charts and how that affects our understanding of them.

Criteria 1: The type of graph is appropriate for the data

Different types of charts and graphs are used for different functions. Before you decide on a chart, first think about what function the chart should serve- comparison, correlation, trend, etc. The resources listed at the end of this section can help you choose the most appropriate visualization for the data you're representing.

Another factor to consider is the number of data points. For example, a multi line chart can be a great way to show trends, but if you're going to have 20 lines on one chart, it will be unreadable. In this case, you might want to split them into small multiples instead. The same would apply for a stacked bar chart.

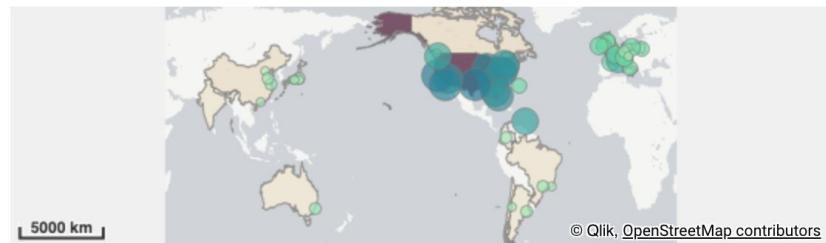
You also want to select the chart type based on how it will appear with the scale used. For example, a bar chart will always start from zero, but a dumbbell plot or line chart doesn't have to.



In the example above, the line chart is much easier to read than the bar chart. Because the bar chart's scale has to start from zero, the difference in the height of the bars is more difficult for our eyes to perceive. The line chart offers a more suitable representation of the trends in this data.

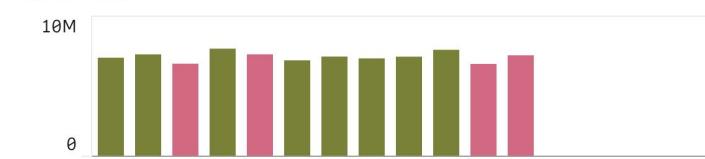
Dashboard Evaluation Finding:

Sales by Region



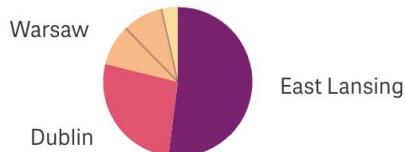
The map in the dashboard is unreadable because of all the overlapping circles. A [choropleth map](#) might have been a better option, or even just a bar chart.

Sales Trend



A line chart would have been a better way to show the monthly trend since our eyes have to connect the bars to see the trend. Similarly, the difference in the height of the bars is hard to perceive because the scale has to start from zero.

Orders Fulfilled by Factory



A horizontal bar chart would have been a better way to represent this data since comparing the length of the bars is easier than comparing the sections of a pie. You also have to hover over each slice to see what the label is; labeling is much easier in horizontal bar charts.

Resources:

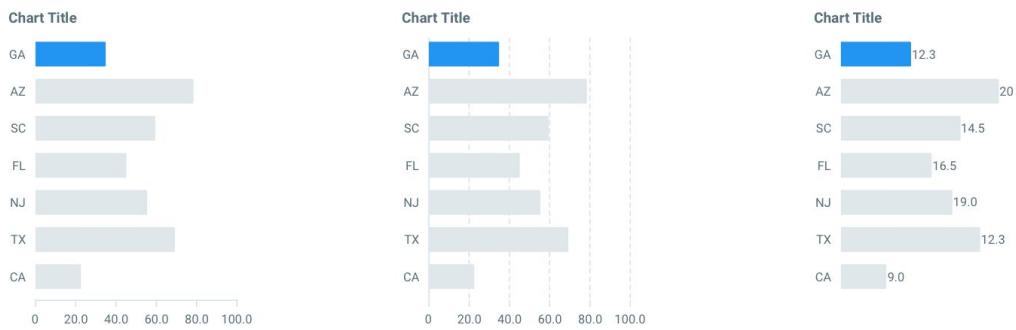
- [Data Viz Catalogue](#)
- [Financial Times Visual Vocabulary](#)
- [How to Choose the Best Charts](#)

Criteria 2: Graphs have appropriate level of precision

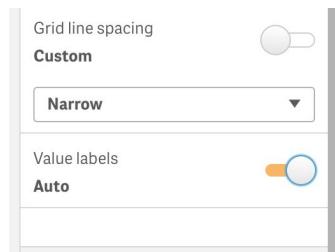
The level of precision that a chart should have ultimately depends on what's appropriate for the user. For example, having more decimal points isn't always better; if the user only cares about one decimal point, then you wouldn't want to overwhelm them with excess information and too many decimal points.

Precision can be achieved in the form of direct labeling, grid lines, or just having an axis.

Horizontal Bar chart



In the example above, the format you select would depend on how the users will be reading the chart. If they want to know the value of every single bar, then direct labeling (shown on the right) would be the best choice. If they only care about points of particular interest, then you could have values display on hover and stick to just grid lines for the default view (as shown in the second option). Qlik Sense has the option to display more or less grid lines and choose whether or not to display direct labels, as shown below:



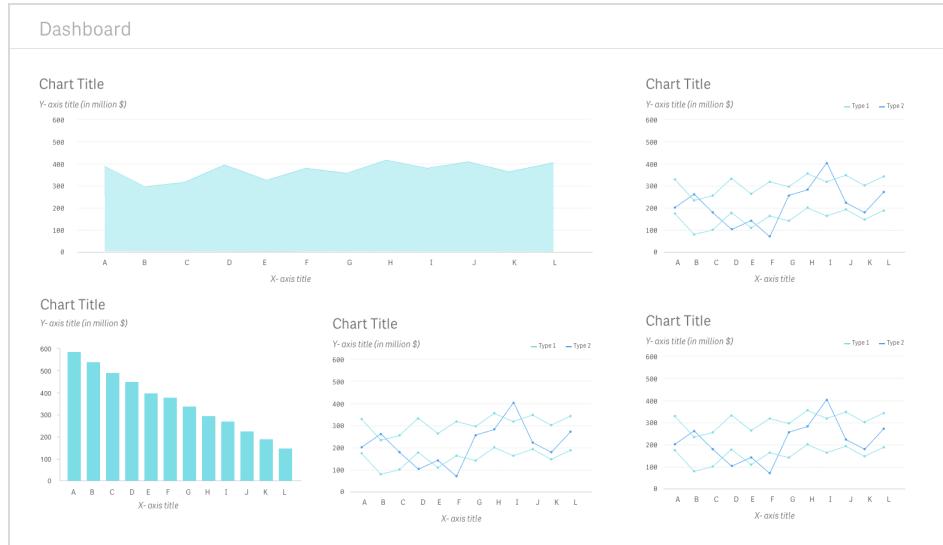
Dashboard Evaluation Finding:

It's difficult to determine if the dashboard has the right level of precision without talking to the users.

Criteria 3: The charts guide attention using visual cues

When designing a dashboard, ensure that any areas of importance are highlighted. You can draw users' attention to certain elements in your use of colors, positioning, and/or size.

Size and positioning example:



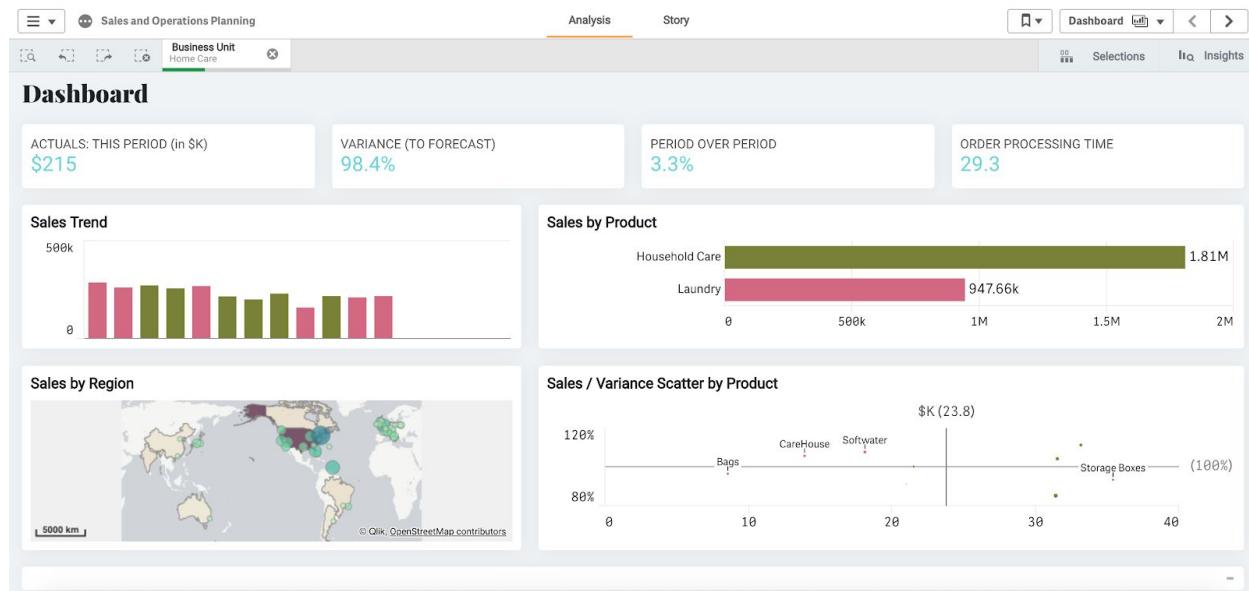
In the example above, the top left chart grabs more attention because of its size and its position in the top left corner.

Color example:



In this example, color is used to emphasize anything that meets or exceeds the target. Alternatively, you could highlight everything that does not meet the target in red instead. Highlighting works well here since all the bars below target are a muted gray color; this helps the blue marks stand out to the user. If we had used both red for bars below target and blue for bars above target, it would not have the same effect. The best solution is to choose a muted base color and use a brighter color to highlight noteworthy points.

Dashboard Evaluation Finding:

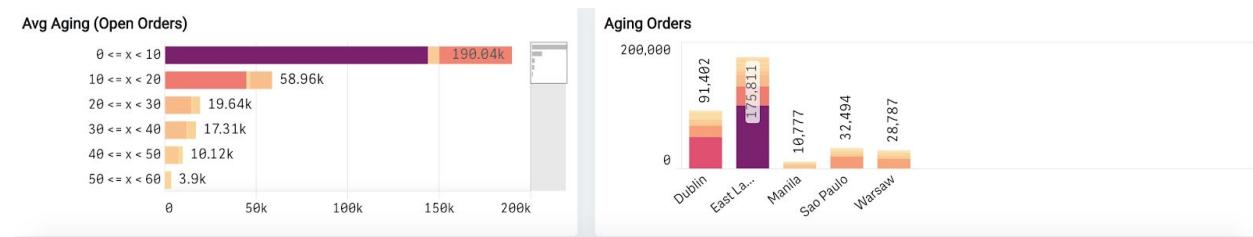


Color isn't used to guide attention in the dashboard above. Almost all the data points are either pink or green. There is some text hierarchy, so chart titles and KPI's stand out more than axis labels.

Criteria 4: Data is intentionally ordered

There are many ways to order data: ascending/descending order, alphabetically, based on rank, by importance, or based on a type of grouping.

Dashboard Evaluation Finding:

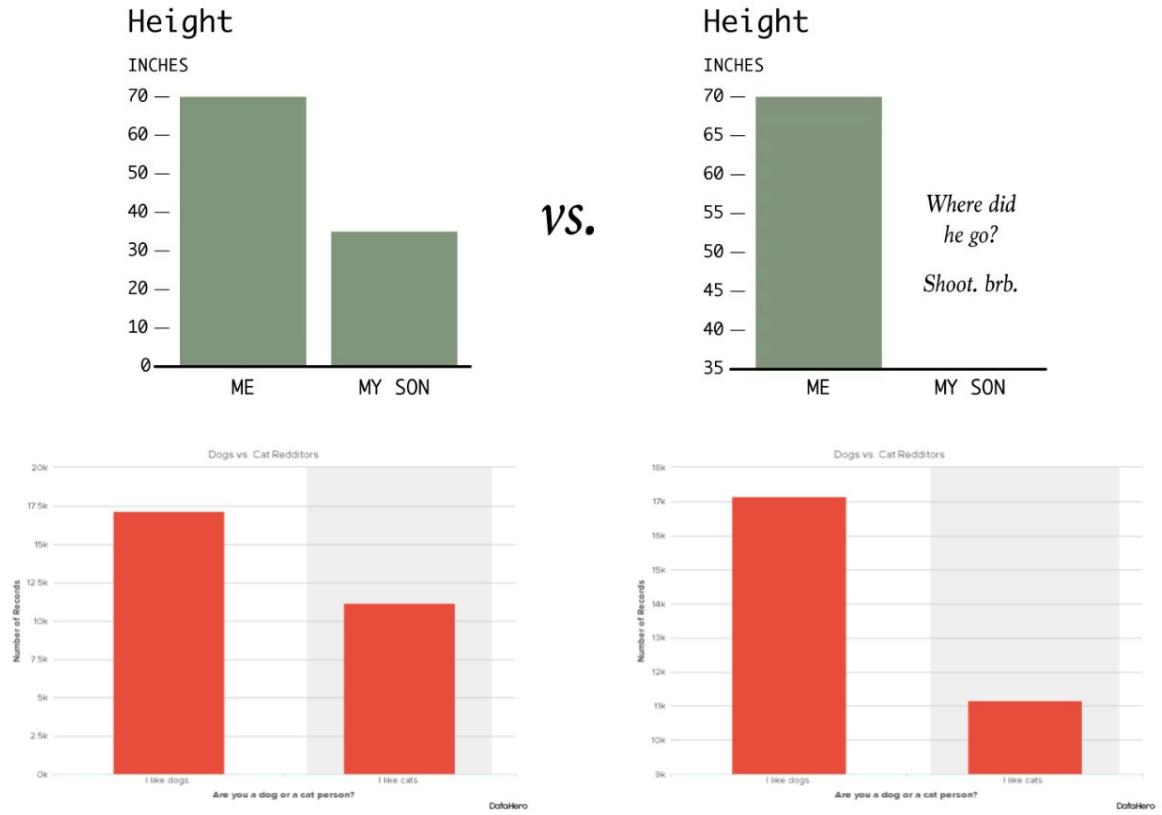


The charts appear to be ordered intentionally. The bars in the chart on the left are ordered by age buckets, and the bars in the chart on the right are ordered alphabetically.

Criteria 5: The proper scale is used

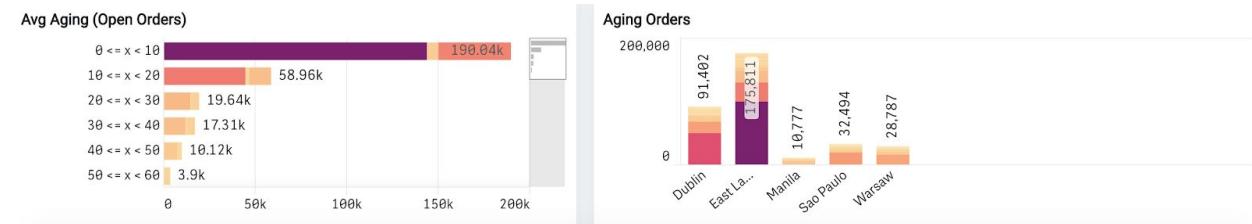
The type of chart being used will dictate the appropriate scale to use. Line charts, dot plots, distribution plots do not have to start from zero. Bar charts, on the other hand, should always start from zero since we compare the height of the bars to each other to interpret the data.

When a bar chart's axis does not start from zero, it can over emphasize the differences between bars and represents the data in a way that's misleading.



In the examples above, not having a baseline of zero exaggerates the difference between the height of the bars.

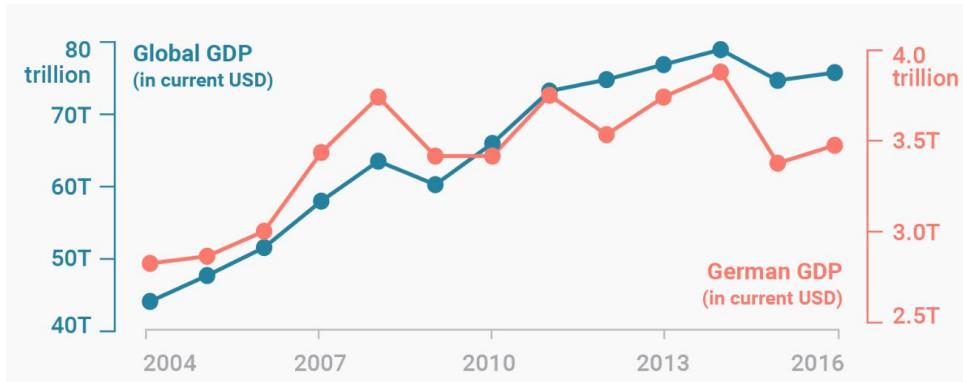
Dashboard Evaluation Finding:



The bar charts start from a zero axis in the dashboard.

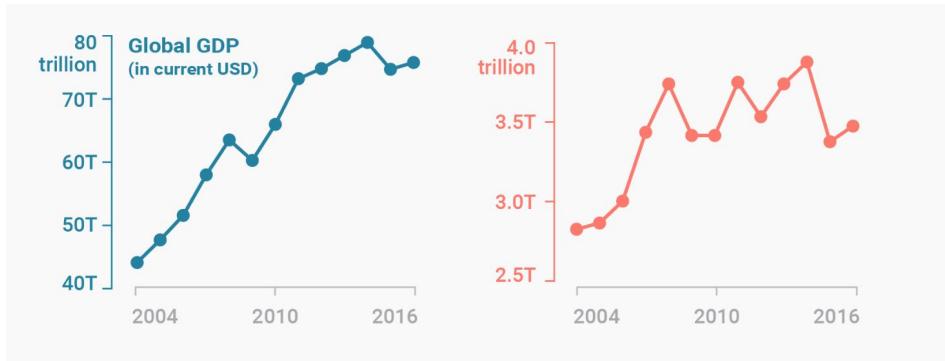
Criteria 6: Graphs do not have a dual axis

Dual axis charts can be risky and misleading. When using dual axis charts, you run the risk of visually suggesting that there is a relationship between measures which are not necessarily comparable or use different scales of measurement.

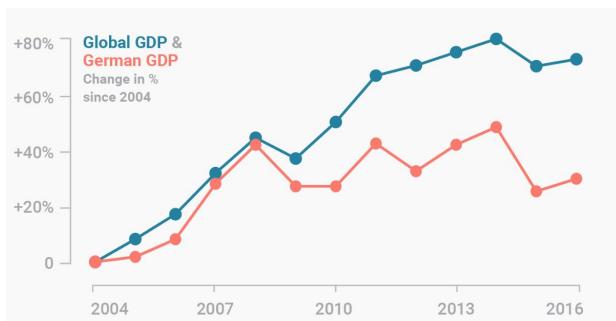


In the example above, the miscorrelation of the two y-axes could lead users to assume that German GDP exceeded Global GDP from 2004 to 2009. This chart could be more accurately represented in any of the following ways:

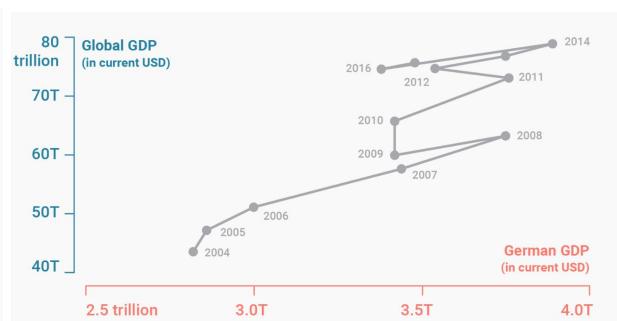
1. Two separate charts



2. Indexed chart



3. Connected scatterplot



Dashboard Evaluation Finding:

The dashboard does have any charts that use a dual axis.

Resources:

<https://blog.datawrapper.de/dualaxis/>

Consistency

"Consistency is one of the most powerful usability principles: when things always behave the same, users don't have to worry about what will happen."—Jakob Nielsen



Positioning

The position of UI elements, text, icons, and other graphic components should stay consistent across the app where possible.

Criteria 1: Components appear in the same place

Global elements used across more than one screen in the application should stay in the same position on every screen. This includes the navigation, text, icons etc. Placement consistency ensures users do not have to relearn the position of common elements on each new screen. The positioning of local text and components within each screen should stay consistent as well.

For example:

Global elements, text, icons, axes, etc.

Last Refreshed on 2/18/18

| | | | |
|---|---|--|---|
| YTD # of customers \$470K <small>8%+ PYTD</small> | YTD Avg Turnover Rate 32% <small>8%+ PYTD</small> | YTD Avg monthly billing rate \$120 <small>8%+ PYTD</small> | YTD Total amount billed \$12M <small>8%+ PYTD</small> |
|---|---|--|---|

Customer Turnover Rate

By Services - # of Customers churned vs total

Measures

- Total # of customers
- # of customers that churned

By Billing Contract - # of Customers churned vs total

Measures

- Total # of customers
- # of customers that churned

By Payment Method - # of Customers churned vs total

Measures

- Total # of customers
- # of customers that churned

By Paperless Billing

Measures

- Customers that churned
- Customers that did not churn

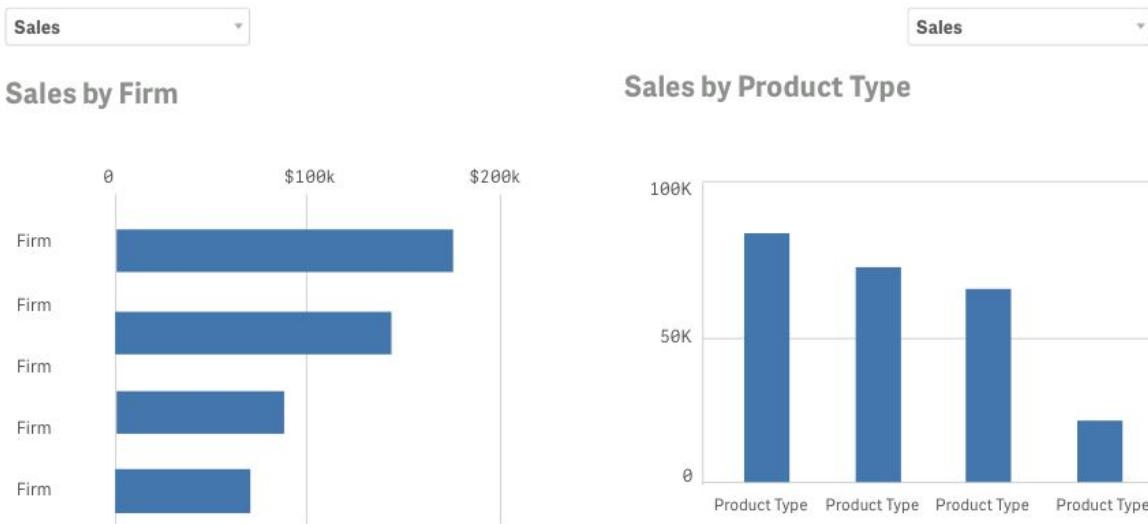
By Autopay

Measures

- Customers that churned
- Customers that did not churn

In this example, the position of the last refreshed text (in the red box) changes from screen to screen. Since this is used across multiple screens, it would be easier for the user if the placement were consistently in either the top left or top right. This prevents the user from having to relearn its position on every screen.

Position of UI controls



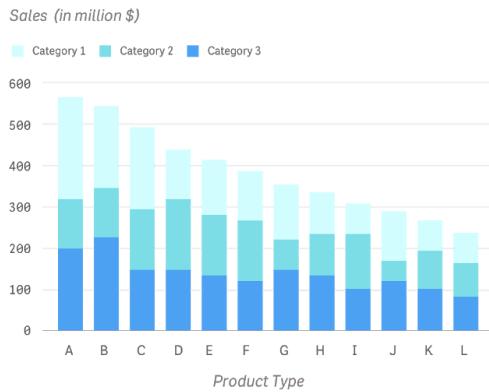
Here, the position of the sales drop down is inconsistent across the charts (in top left and then in the top right).

Legend Position

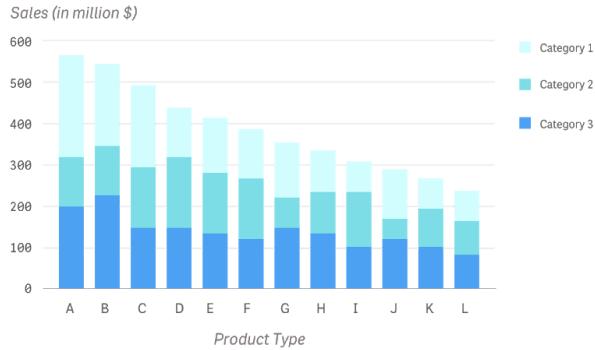


Legend positions may be situated differently depending on the chart type used. You might have to change the legend position for different chart types. In the example above, however, there is no reason to change the legend position since the same chart type is used.

Sales by Product type



Sales by Product Type



Stacked bar charts are an example of when you would change the legend position. In the chart to the right, the categories are stacked vertically. Having a vertical legend makes it easier to track the colors of bars with the legend.

Axis position

The position of chart axes should also stay consistent. For example, the y-axis of charts is always to the left.

Dashboard Evaluation Finding:

The position of items in the dashboard seems to be consistent.

Styling

Colors, typography, axis lines, etc. are consistently used across the app.

Criteria 1: Colors have the same meaning across different charts

(e.g. categorical color scales, benchmark colors, alert colors are consistent)

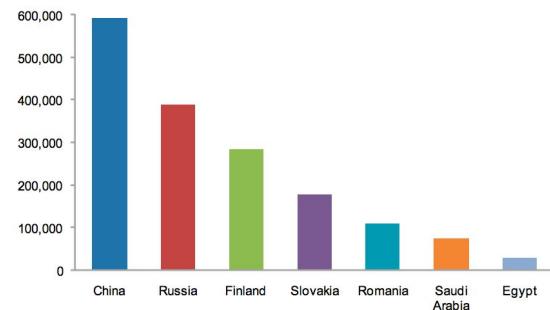
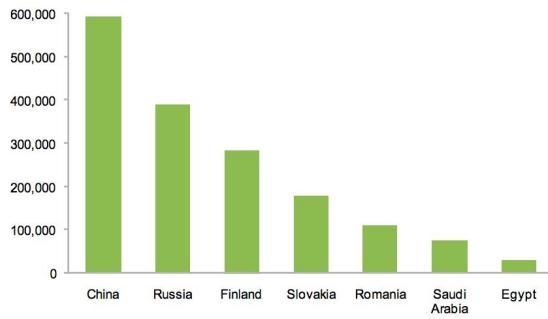
Charts should use consistent colors across the app. Other properties like the thickness of gridlines or the styling of gridlines (dotted, dashed, solid), use of borders, shadows, opacity and so on should also be consistent.

For example:

Dashboard

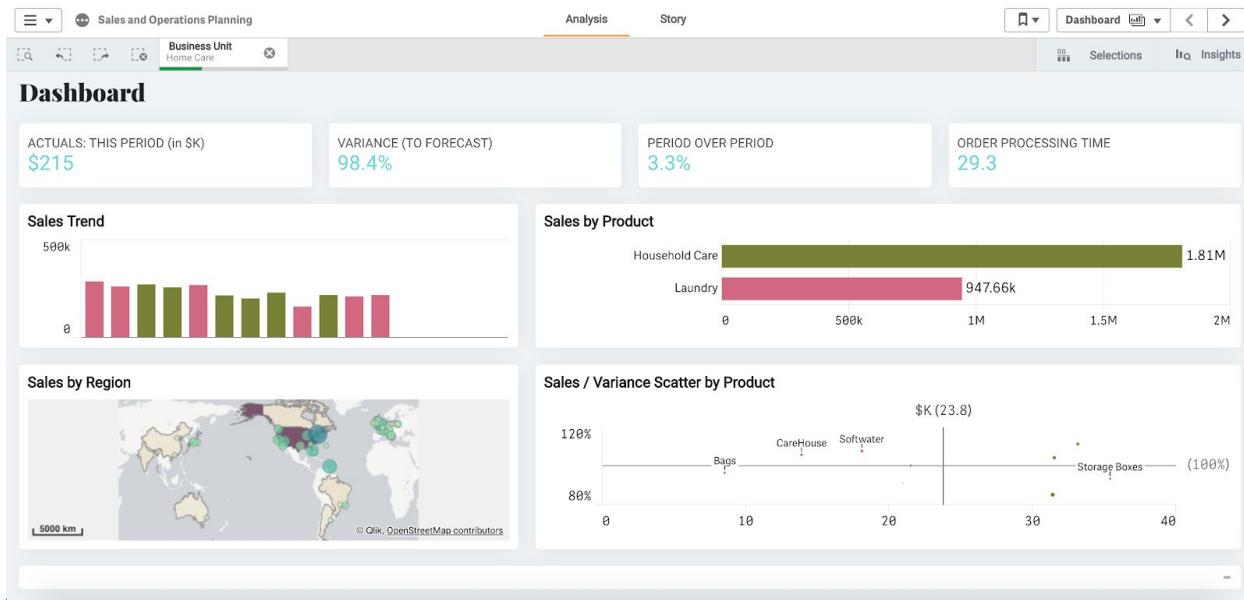
Cost of Goods

The two screens above belong to the same app but are using completely different color palettes. Colors should stay consistent across the entire app and not just on one screen. Users learn what the different colors indicate when looking at the first screen of the app (e.g., yellow is used to highlight). When users go to the next screen, they already have expectations of what the colors mean, so they shouldn't have to relearn everything.



Colors should stay consistent within each screen as well. The chart on the right is an example of having too many colors and no consistency. Making every dimension or measure a different color doesn't make the chart easier to read. Think about what purpose the color serves and if it does so effectively.

Dashboard Evaluation Finding:



Green and pink seem to be the primary colors and are consistently used across the app. However, the meaning behind these colors is unknown.

Resources:

<https://blog.hubspot.com/marketing/color-combination-data-visualization>

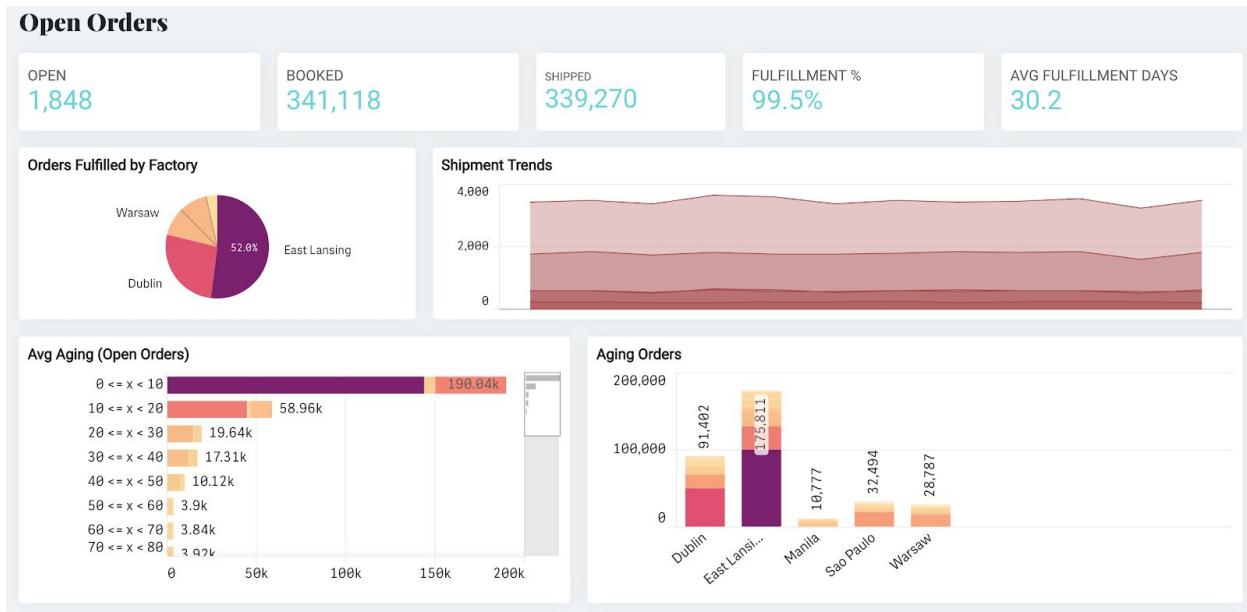
<http://opensrc.axisgroup.com/arc-design/colors>

Criteria 2: Text typography is consistent

(e.g. same font face, color, thickness is used for h1 titles)

Every dashboard will have some form of text hierarchy like screen titles, chart titles, subtitles, axis labels, and so on. All similar text (e.g. all chart titles) should be styled the same way. We recommend sticking to one font family for the main body of the dashboard and very similar font colors unless you're trying to highlight certain text. You may need to adjust the colors slightly based on the font size and weight. (e.g. a sheet title uses larger text so might need a slightly lighter shade of gray than a smaller axis label)

Dashboard Evaluation Finding:



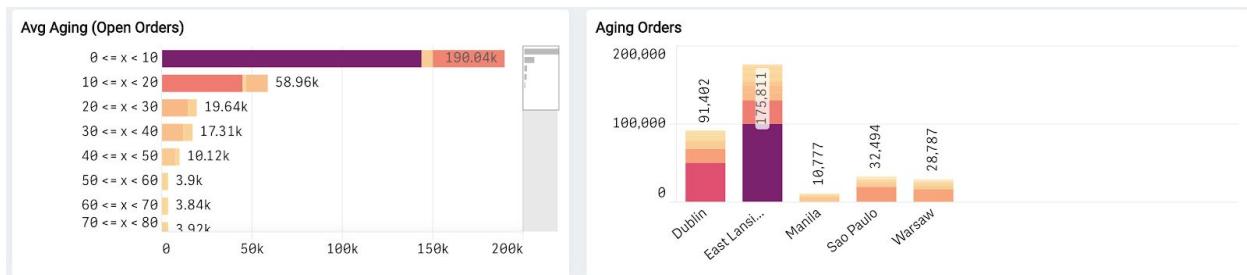
The typography used in this dashboard is consistent. All body text uses the same font family and all chart titles are styled similarly. The same goes for labels, KPIs etc. The sheet titles are a different font family that's used consistently across the app.

Criteria 3: Terminology is consistent (units, metrics, chart titles)

The terminology that you use might be different from what the user is familiar with. The dashboard is designed for end users and should use terminology that they're familiar with. For example, you may have to clarify whether the dashboard should use the term "margin" or "profit". There are different ways to express the same unit as well (millions may be expressed as m or mills). Even numbers can be represented differently. (eg: 1000 or 1K).

The language used in chart titles should also be consistent. For example, "Sales Trend" and "Sales by Month" are both suitable titles for the same chart. You can pick either one and use the same format for all charts showing trends in the dashboard.

Dashboard Evaluation Finding:



The chart titles "Avg Aging (Open Orders)" and "Aging Orders" basically mean the same thing and are labelled inconsistently. Stacks in the first chart are product types and stacks in the

second chart indicate the age of the order. A better way to label the two charts would be “Aging Orders by Product Type” and “Aging Orders by Factory”

Criteria 4: Behaviour of interactions is consistent

Users already have expectations of how certain interactions should work, and the app should reflect that. Moving a slider to the right increases a value, and moving it to the left will decrease it. Hovering over a point brings up a tooltip and moving the mouse outside of the point gets rid of the tooltip. Clicking on a checkbox selects the option and clicking on the checkbox again deselects it.

For example:

The example on the left is how a checkbox should work. If you have a checkbox that works like a radio button (example on the right) it will confuse the user.

- | | |
|-------------------------------------|------|
| <input type="checkbox"/> | Ans1 |
| <input checked="" type="checkbox"/> | Ans2 |
| <input checked="" type="checkbox"/> | Ans3 |

Interactions also need to be consistent across the app. For example, if hovering over a bar in a chart displays a tooltip, then that interaction needs to be consistent across all bar charts in the app.

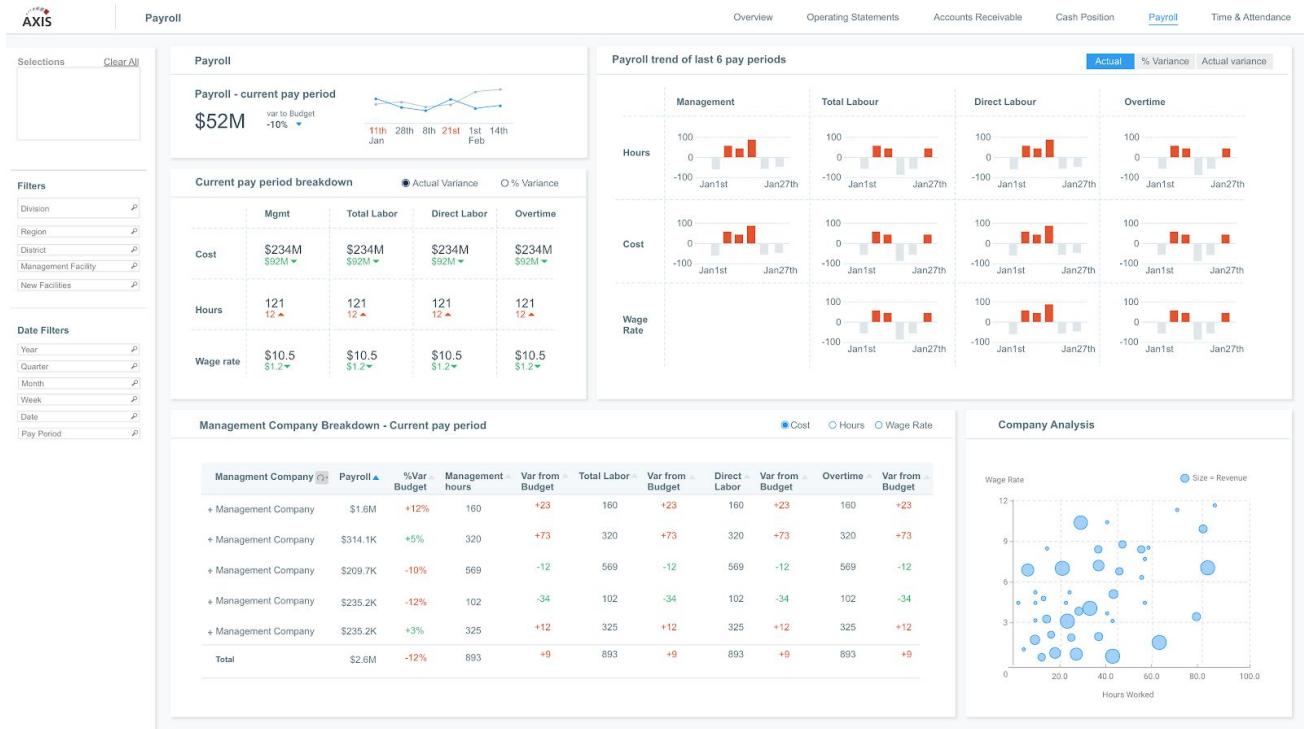
Dashboard Evaluation Finding:

The dashboard uses standard Qlik Sense interactions.

Criteria 5: UI controls have a consistent visual language

The styling of UI controls like filters, dropdowns, sliders, toggles, etc. should be consistent. This includes the shape, size, colors, and fonts used in the controls.

Spot the inconsistencies in the UI controls in the dashboard below



The radio buttons used in the dashboard have different colors. The division filter is larger than the others. Toggles are used for the top right chart and radio buttons for the bottom left.

Dashboard Evaluation Finding:

The dashboard has no UI controls apart from the default Qlik Sense controls.

Usefulness

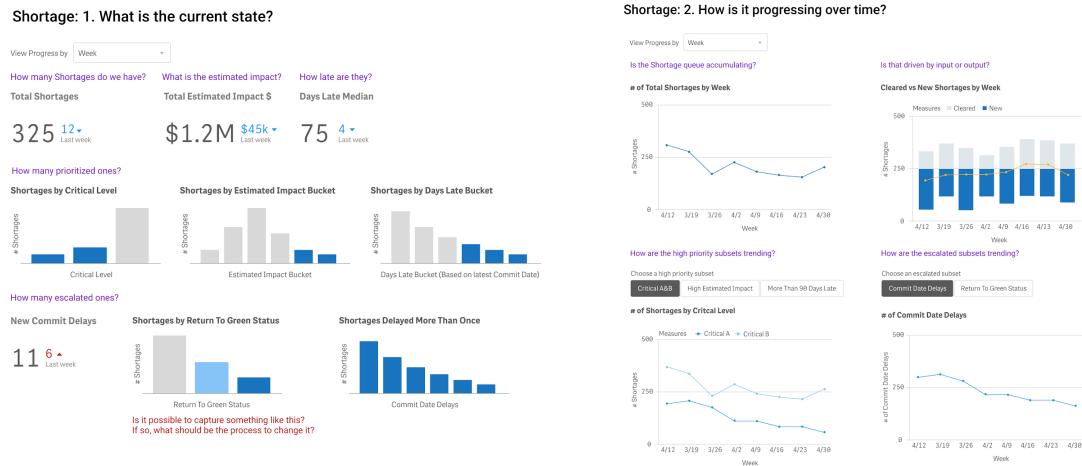
The usefulness of a dashboard is completely dependent on a user's goals and tasks. Even if all other principles have been successfully achieved, and it's a beautiful and accessible dashboard, it would mean nothing if it's not helpful to the people it was built for.

In order to evaluate the following criteria, the users' goals and tasks must first be clearly defined. This requires a research/evaluation phase, where you would interview users about their jobs and evaluate how the dashboard fits into it. Because of this, there are no "dashboard evaluation findings" for this section, because we don't have insight into the users' needs.

To understand more about how to understand users' goals and tasks, view Axis's full [design process](#).

Criteria 1: There is a clear tie between the tasks a user would perform and the data displayed

All the visualizations on the dashboard should tie back to one of the users' tasks and answer a key question that they have. This can be easily guaranteed by brainstorming visualizations that directly answer users' questions, even before they're laid out in the dashboard. The example below shows how each visualization is tied to a question, which is nested beneath an even broader question that the user has.

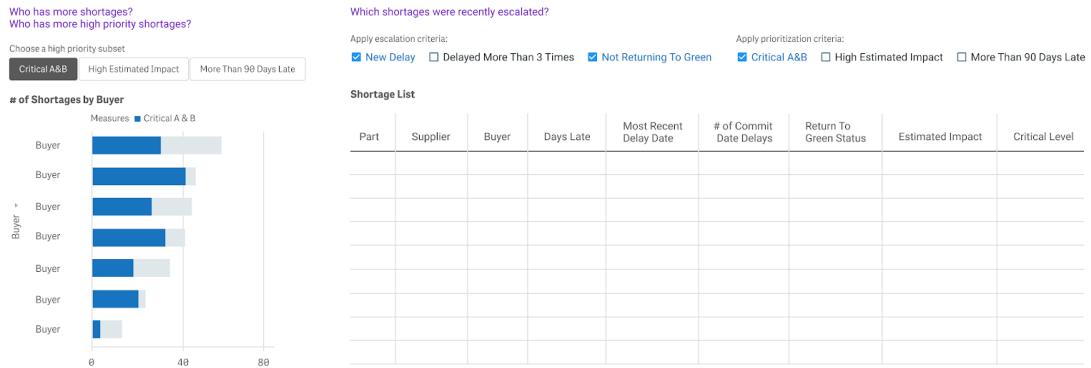


Criteria 2: Empowers users to make decisions or take action

While not every visualization may lead to action, the overall flow of the dashboard should empower the user to make a decision or take action. This is best achieved by starting at a high-level question, then slowly revealing more and more detail. The last step should encourage

action. For example, after the two questions are answered above, the user might ask, "How can I help?" Potential concepts are shown below:

Shortage: 3. How can I help?

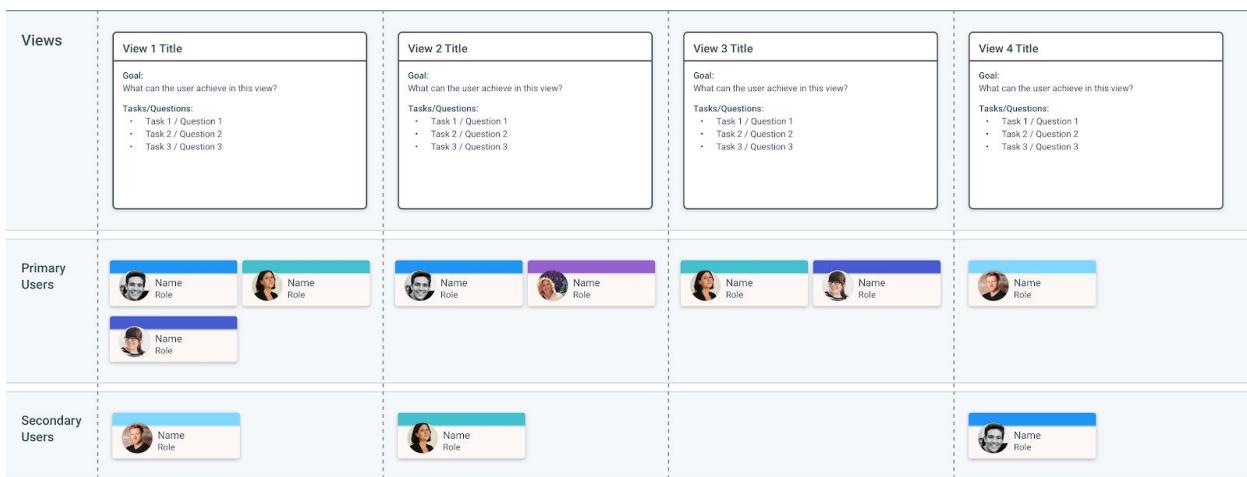


Action items can be quickly called out with elements like "top 10" lists, highlighted data, and information that points to a next step, like contact information or an external link.

Criteria 3: Dashboard can be broken into bite sized pieces - each built around a key question

The concept of "bite-sized" pieces can apply to both the screens on the dashboard as well as the sections within a screen. Screens are broken out by more high-level questions, whereas sections are answering sub-questions.

Summarizing views can help clarify what the goals and tasks are of each screen, as well as the users for each:



Within a screen, sections should also be clearly outlined, so that each visualization is categorized into its proper group, and makes sense in the larger context. Make sure to include section titles, and consider directly calling out the question that each section is designed to

answer. For example, the report below (designed for mobile) shows a daily glimpse into the main KPIs relevant for an executive. It breaks it down into 3 distinct categories, within which are metrics for the prior day, WTD, and MTD. It is certainly bite-sized enough for a user to visually and mentally segment the report.



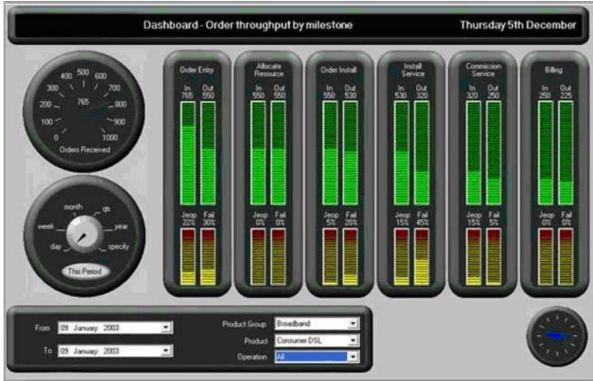
Aesthetics

"When a dashboard is unattractive—unpleasant to look at—the viewer is put in a frame of mind that is not conducive to its effective use. I'm not advocating that we add touches to make dashboards pretty, but rather that we attractively display the data itself without adding anything whatsoever." - Stephen Few

Criteria 1: Display is free from decoration

Miscellaneous decoration, such as background images and graphics that attempt to imitate physical objects, are distracting and unnecessary. Background images can decrease the accessibility of the dashboard, rendering some portions illegible or low-contrast compared to the background colors. Unnecessary decoration also requires the user to process additional visual clutter before being able to see and interpret the data.

For example, this dashboard mimics an automobile dashboard, but in doing so, confuses the dashboard's flow and obscures the information, because it's not clear where to start digesting information, what to focus on, and how to interpret it.



Dashboard Evaluation Finding:

The dashboard is free from decoration.

Criteria 2: The screen appears uncluttered

(e.g. enough white space is used, grid lines are muted, labels are not excessively used)

A dashboard requires breathing room. The user should be able to see the data elements better than other visual elements on the screen (like labels, gridlines, etc.), and these data elements should not feel like they're overcrowding each other or subtracting attention from each other. Remove anything unnecessary.

Gridlines should be used only for quantitative axes, since they don't provide any visual benefit on a quantitative scale. If direct labels are used, then there's no need to also include the quantitative axis. Gridlines should be appropriately muted and pulled to the background.

No

Chart Title



Yes

Chart Title

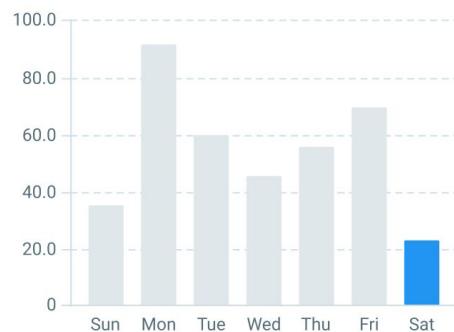


Chart Title

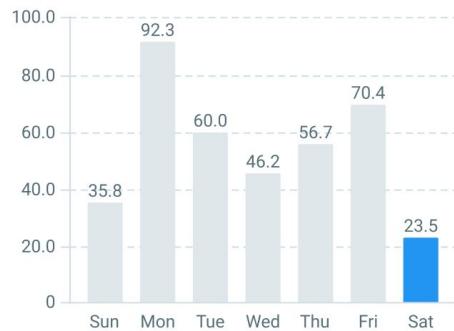
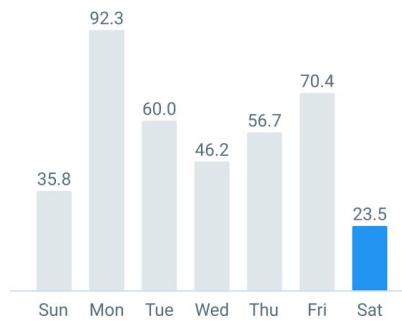


Chart Title



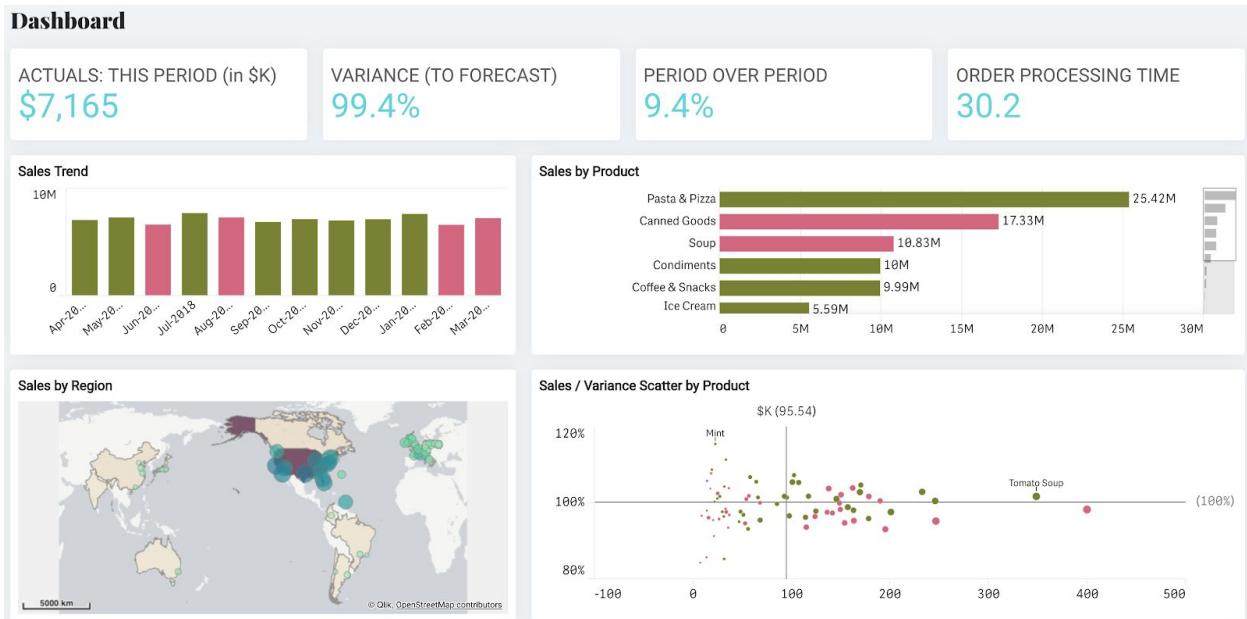
White space (or negative space) should be intentionally used to both establish content structure as well as visually separate components. It should be used to separate UI components and visualizations from each other, so that objects aren't so close together that it's difficult to distinguish where different sections begin and end, and how to navigate through the dashboard.

Without adequate white space:

With adequate white space:



Dashboard Evaluation Finding:



The negative space between tiles works well to segment the screen into its different sections. More padding could have been included around the edges of the tiles, to provide cleaner boundaries around the visualizations and chart titles.

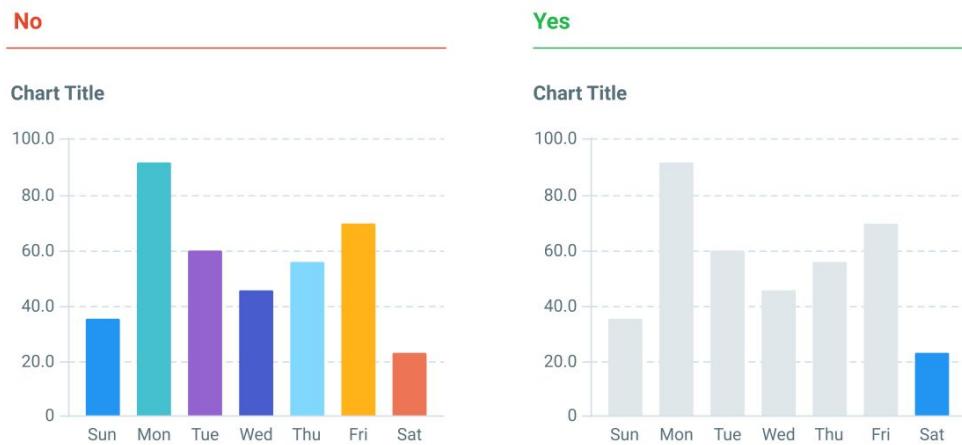
Resources:

- <http://www.storytellingwithdata.com/blog/2017/3/29/declutter-this-graph>
- <https://playfairdata.com/dashboard-element-5-white-space/>

Criteria 3: Color scheme is intentional

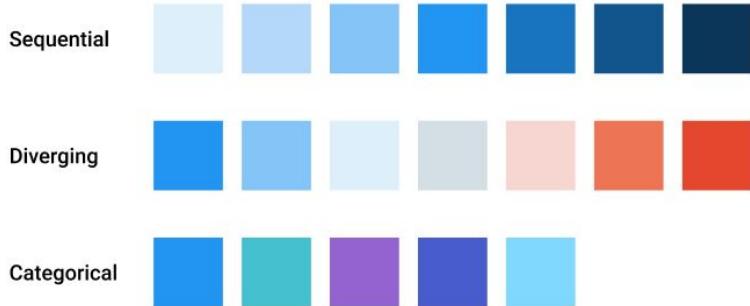
Color can be used to draw attention to what's important, provide meaning to the dashboard, indicate relationship, and encode dimensions or measures. In the below example, there's no

reason to color the bars in the chart on the left, as it doesn't convey any additional meaning. The chart on the right, however, intentionally uses color to draw attention to the shortest bar.

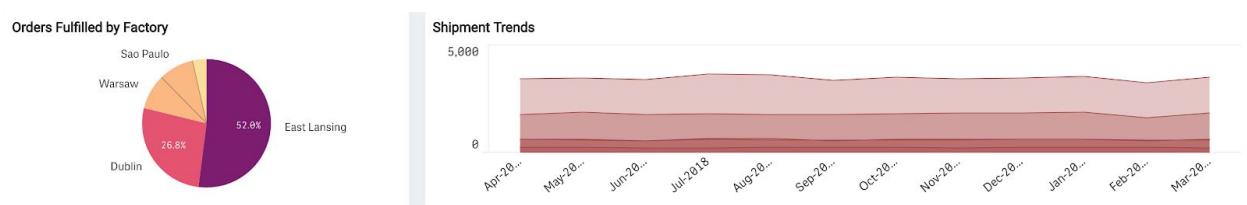


Sequential, diverging, and categorical scales should be used consistently across the dashboard, and the colors used within those scales should have sufficient contrast.

Sequential scales should be used for ordering values from low to high. Divergent scales are used when the values are ordered around a midpoint, like zero or an average, and can be interpreted with positive/negative meaning. Categorical colors are used for distinct groups of data, all of which have equal weight.



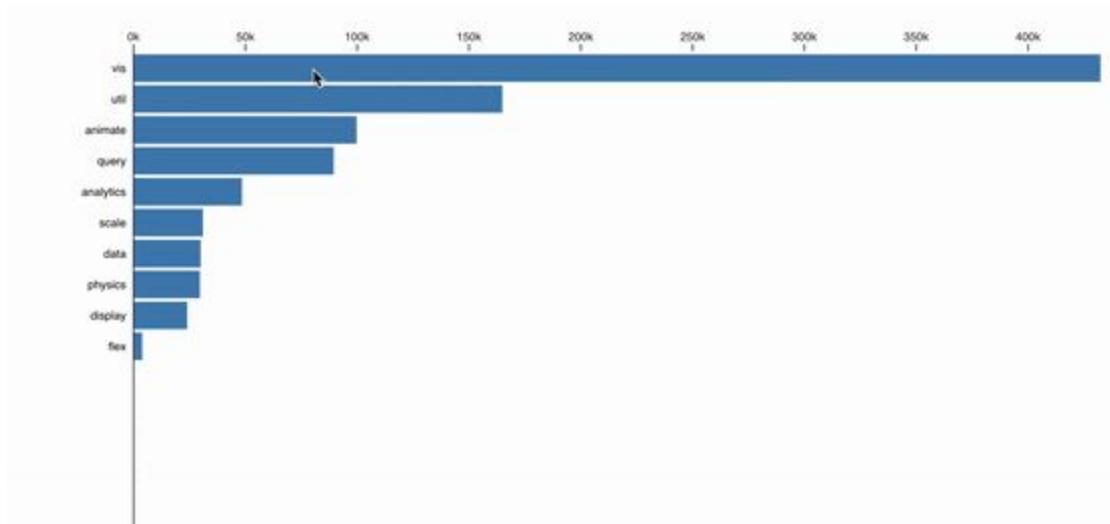
Dashboard Evaluation Finding:



The categorical colors in the pie chart do not provide enough contrast, as two of the oranges look almost identical. Using red in the area chart is also a poor choice, since it unintentionally communicates alarm or alert. Colors like red and green should also be used with intention, since they can also convey meaning of good or bad.

Criteria 4: Animations if present are intentional and do not distract from the analysis

Animations should be reserved for showing transitions from one state to another, so as to help the user trace the consequence of their clicks and hovers. For example, in the chart below, clicking on a bar drills down into that category. The animation aids in that transition by first segmenting the bar into its individual parts, vertically dropping them into their spot on the y-axis, then animating the final bar chart into place with a simple easing motion.



Dashboard Evaluation Finding:

Since animations can't be customized in QlikSense, this criteria does not need to be evaluated.

Resources

<https://observablehq.com/@d3/hierarchical-bar-chart>

Flexibility

Criteria 1: Users can manipulate the chart/views when needed

(e.g. applying filters, conditional coloring based on a parameter, setting thresholds etc.)

Users should be able to modify views and change what's displayed on the dashboard so that it suits their needs. The degree of flexibility needed depends on the users and what they need to

accomplish on the dashboard. Four different methods of chart/view manipulation are 1. filters, 2. alternate states, 3. chart-specific interactivity, and 4. highlight controls.

Filtering enables the user to limit the amount of data visible for a given chart, section, or screen. Filters that allow the user to select multiple fields to filter by can take the form of a filter pane, checkbox, or slider (for limiting to a range of quantitative values), while filters that require the user to choose only one field can take the form of a toggle, switch, radio buttons, or dropdown.

Only include filters that are needed and will be used, rather than providing every filter possible. For example, if there are region-specific managers, it would make sense for a “region” filter. Or, if it’s important to view the performance of a single product line, that’d indicate the need for a “product line” filter. But if the user needs a simple dashboard that immediately displays all the information and has very limited flexibility, that’s also perfectly fine.

Alternate states use the same real estate to show either the same information presented in different ways (like a bar chart vs. a line chart), different information presented in the same way (like analysis by region vs. analysis by customer, both using a scatterplot), or the same category of information presented in different ways.

UI components like tabs, buttons, and toggles allow the user to switch between these alternate states. The default view should be the most relevant and accessible to all users.

Presenting the same information in different ways can be helpful for catering to different users’ preferences for how they’d want to view the data, as well as their varying degrees of data literacy. However, if there’s clearly one single best way to present the information, there’s no need to clutter the dashboard by providing the option for alternate states.

Presenting different information in the same way lends itself to more consistency, since the user can apply the same set of analytical methods across different categories. The default view should be the most relevant or important category (like analysis by region vs. customer), but if the different categories have equal weight to the user, make sure that no urgent or significant information is lost because it’s hidden at first.

The same principle applies for presenting the same category of information in different ways, such as showing a project’s risks by impact/liability, then by risk category. It usually makes sense to show both analyses at the same time, but in the case of limited real estate, having alternate states can be useful.

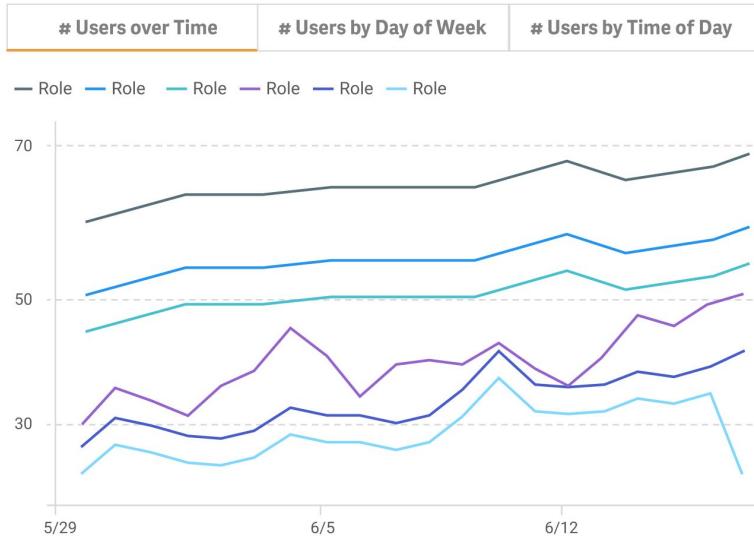


Chart-specific interactivity allows the detail to be revealed based on user input, like hovering or clicking. This is a great way to initially declutter a dashboard and show only the most important user, then to reveal more detail once the user needs it. Hovering over parts of a chart can reveal direct labels and precise values, and clicking on a part of a chart (like a bar in a bar chart) could filter the page or drill down in the hierarchy.



Highlight controls allow users to change the conditions for what's highlighted on the dashboard, whether it's changing the values of a certain threshold, the parameters for conditional coloring, or the condition of highlighting a value because it's above vs. below the target. This can be used when agreement doesn't exist over certain thresholds, and highlight preferences vary amongst users.

Highlight where

Performance is unfavorable

Performance is favorable

● Unfavorable to LY ● Unfavorable to Company Avg

| Department | MTD Sales \$ | % of Total Sales | Sales TY vs. LY | Company Avg Sales TY vs. LY | Avg Inv TY vs. LY | Company Avg Inv TY vs. LY | Turnover TY |
|------------------|--------------|---|--|-----------------------------|---|---|--|
| Home & Kitchen | \$279,487 | 16.1% | 8.9% | 4.4% | 10.8% | 2.3% | 3.7 ● |
| Electronics | \$266,935 | 15.4% | 6.3% | 0.8% | -7.2% ● ● | -0.1% | 5.2 ● |
| Kids & Toys | \$216,795 | 12.5% | 0.3% ● | 0.9% | 9.3% | -6.0% | 2.3 |
| Clothing | \$201,718 | 11.6% | -1.4% ● ● | 4.8% | -2.5% ● | -5.7% | 3.5 ● |
| Health & Beauty | \$153,948 | 8.9% | 2.2% | 0.6% | 3.0% ● | -7.1% | 2.6 ● |
| Outdoor & Sports | \$153,124 | 8.8% | -10.1% ● ● | -5.5% | -9.8% ● ● | 6.1% ● | |
| Pets | \$122,405 | 7.0% | -2.7% ● | -5.7% | 3.3% | -7.1% | 2.4 ● |
| Office Space | \$119,789 | 6.9% | -0.8% ● ● | 5.8% | -8.2% ● | -8.3% | 6.8 ● |
| Travel | \$101,130 | 5.8% | -11.2% ● ● | -4.4% | 3.6% | -7.3% | 5.7 |

Dashboard Evaluation Finding:

The dashboard has no UI controls (apart from the default Qlik Sense controls) that would provide flexibility, but it's impossible to know whether this decision was appropriate or not without speaking to users.