DATA VISUALIZATION WITH TABLEAU

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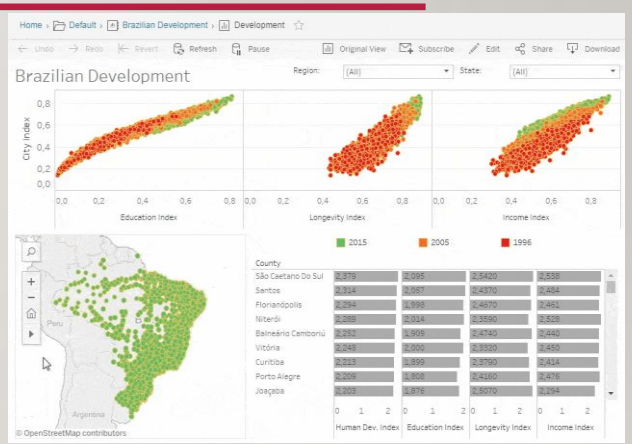
DATA VISUALIZATION

- Data visualization is the graphical representation of information and data. By using visual elements like charts, graphs, and maps, data visualization tools provide an accessible way to see and understand trends, outliers, and patterns in data.
- In the world of Big Data, data visualization tools and technologies are essential to analyze massive amounts of information and make data-driven decisions.

THE ADVANTAGES AND BENEFITS OF GOOD DATA VISUALIZATION

- Our eyes are drawn to colors and patterns.
- We can quickly identify red from blue, square from circle. Our culture is visual, including everything from art and advertisements to TV and movies.
- Data visualization is another form of visual art that grabs our interest and keeps our eyes on the message.
- When we see a chart, we quickly see trends and outliers.
- If we can see something, we internalize it quickly.
- It's storytelling with a purpose. If you've ever stared at a massive spreadsheet of data and couldn't see a trend, you know how much more effective a visualization can be.



BIG DATA IS HERE AND WE NEED TO KNOW WHAT IT SAYS

- As the “age of Big Data” kicks into high-gear, visualization is an increasingly key tool to make sense of the trillions of rows of data generated every day.
- Data visualization helps to tell stories by curating data into a form easier to understand, highlighting the trends and outliers.
- A good visualization tells a story, removing the noise from data and highlighting the useful information.
- However, it’s not simply as easy as just dressing up a graph to make it look better or slapping on the “info” part of an infographic.
- Effective data visualization is a delicate balancing act between form and function.
- The plainest graph could be too boring to catch any notice or it make tell a powerful point; the most stunning visualization could utterly fail at conveying the right message or it could speak volumes.
- The data and the visuals need to work together, and there’s an art to combining great analysis with great storytelling.

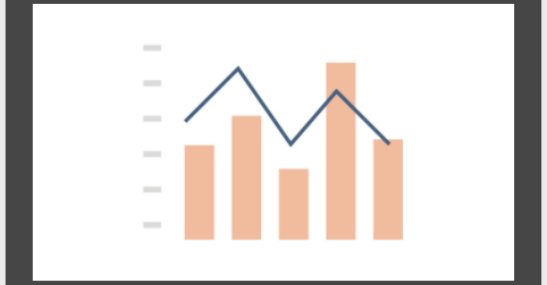
WHY DATA VISUALIZATION IS IMPORTANT FOR ANY CAREER

- It's hard to think of a professional industry that doesn't benefit from making data more understandable. Every STEM field benefits from understanding data—and so do fields in government, finance, marketing, history, consumer goods, service industries, education, sports, and so on.
- While we'll always wax poetically about data visualization (you're on the Tableau website, after all) there are practical, real-life applications that are undeniable.
- And, since visualization is so prolific, it's also one of the most useful professional skills to develop.
- The better you can convey your points visually, whether in a dashboard or a slide deck, the better you can leverage that information.

- The concept of the citizen data scientist is on the rise.
- Skill sets are changing to accommodate a data-driven world.
- It is increasingly valuable for professionals to be able to use data to make decisions and use visuals to tell stories of when data informs the who, what, when, where, and how.
- While traditional education typically draws a distinct line between creative storytelling and technical analysis, the modern professional world also values those who can cross between the two: data visualization sits right in the middle of analysis and visual storytelling.

FAMILIES OF VISUALIZATIONS

Charts

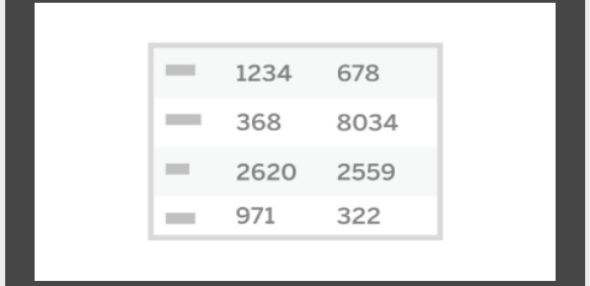


Charts include graphs, plots, and some diagrams focused on quantitative data mappable to cartesian coordinates.

Geospatial

Geospatial visualizations depict the relationship between multiple points on a map through marks, lines, and colors.

Tables



Tables or crosstabs present data in a two-axis matrix and are often represented in the form of spreadsheets.

CHOOSE THE RIGHT CHART TYPE FOR YOUR DATA

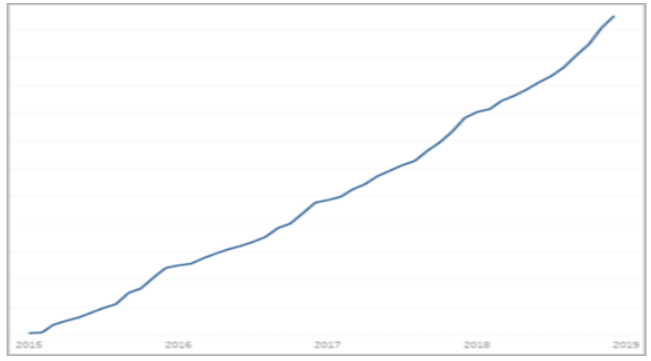
- What chart or graph works best for your data? In Tableau, form follows function. The visualization (or viz) you create depends on:
- The questions you are trying to ask
- The properties of your data
- How you want to present and communicate your insights to others
- For example, showing the growth in sales each year requires a different visualization than showing the connection between discounted items and their profitability. Knowing what you need to show will help determine how you want to show it.

CHANGE OVER TIME

- Showing a change over time for a measure is one of the fundamental categories of visualizations. There are many options for exploring change over time, including line charts, slope charts, and highlight tables.
- To show change over time, you need to know the value you expect to change, and how to work with Date fields in Tableau.

What kind of question does this chart answer?

- How has this measure changed in the past year?
- When did this measure change?
- How quickly has this measure changed?

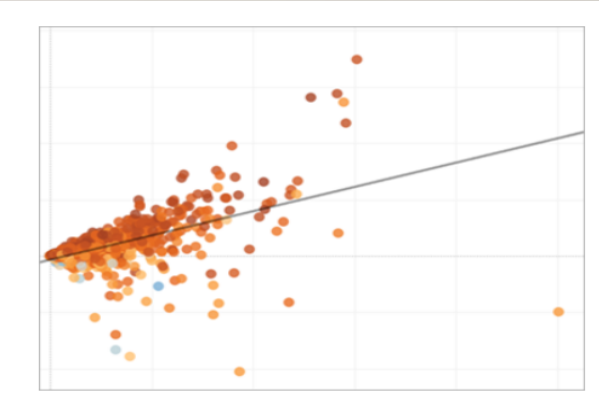


CORRELATION

- Sometimes you have two variables and are looking for the relationship between them. For example, you may be looking for the relationship between classroom size and school graduation rate, or how much lung capacity relates to endurance. (But remember, correlation does not always equal causation.)
- Correlation can be shown with scatter plots or highlight tables, and you can use Tableau's analytics objects(Link opens in a new window) to show the strength of the correlation.

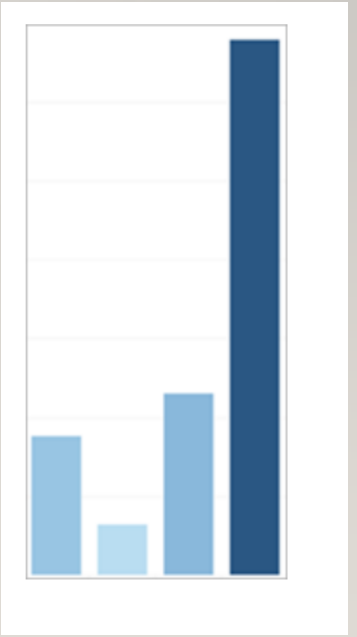
What types of question can this chart answer?

- Are these two measures related? How strongly?
- Are some measures more related than others?
- How strongly related are these measures?



MAGNITUDE

- Magnitude shows the relative size or value of two or more discrete items. If you are comparing sales for different regions, you are looking at magnitude.
- Magnitude charts include bar charts, packed bubble charts, and line charts.



What types of question can this chart answer?

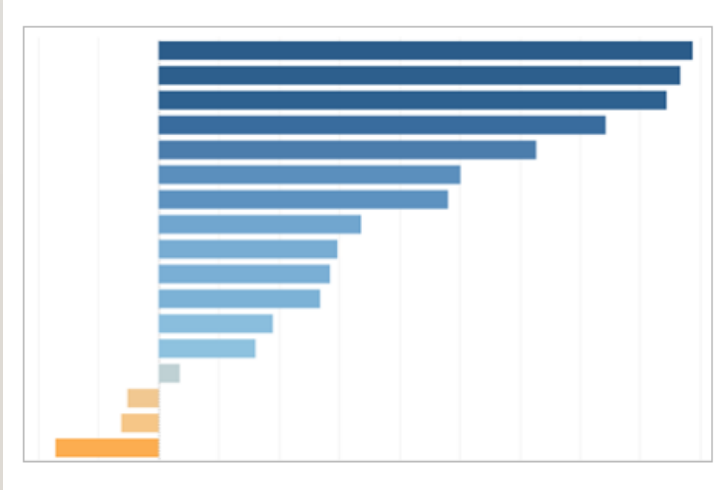
- Which of these dimension members has the highest measure?
- Are there any exceptional dimensions?
- How large of a gap is there between the lowest and highest measure between these dimensions?

DEVIATION

- Deviation charts show how far a value varies from some baseline, such as the average or median. If you wanted to know which items had unusually high or low profit margins, you would use a deviation chart.
- You can use bullet charts, bar charts, and combination charts to show deviation. You can also find the statistical significance of the deviation using a Z-score.

What types of question can this chart answer?

- How far from the norm does this measure stray?
- How important are the deviations in this measure?
- Is there a pattern to the deviations?

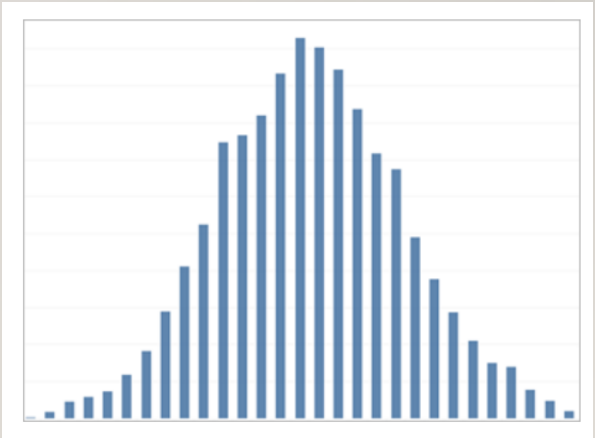


DISTRIBUTION

- When you are trying to find the frequency of events within a population, you are looking at the distribution. If you are showing the number of respondents to a survey by age, or the frequency of incoming calls by day, a distribution chart might be the best choice.
- Distribution charts include histograms, population pyramids, Pareto charts, and box plots.

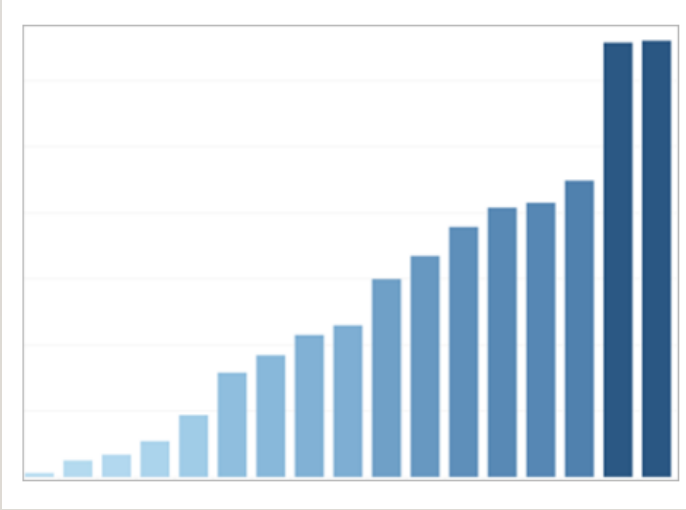
What types of question can this chart answer?

- Are events clustered around a certain probability?
- Which population group buys the most items?
- When are the busiest times in our work day?



RANKING

- Sometimes you not only want to depict the magnitude of some value, but also the relative ranking of all the members of your dimension. Showing the top ten sales people or demonstrating the under-performing states use a ranking chart.
- Ranking charts are usually bar charts that integrate rank calculations, top n sets, or key progress indicators.



What types of question can this chart answer?

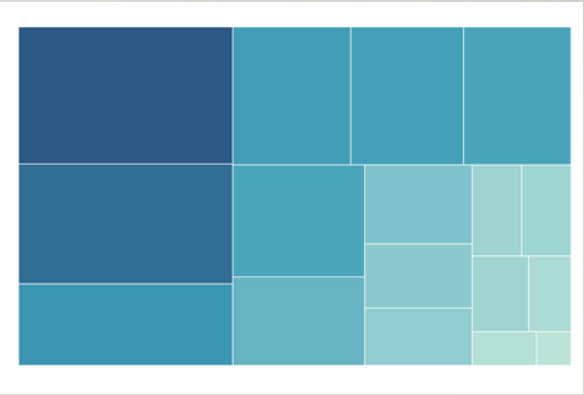
- How many people are under-performing in the company?
- How much revenue is generated by our top ten customers?
- What is the value of our ten lowest revenue properties?

PART-TO-WHOLE

- Part-to-Whole charts show how much of a whole an individual part takes up. For example, if you are showing how much each region contributes to overall sales, or how expensive each different shipping mode is for an individual product, you would use a part to whole chart.
- Part-to-Whole charts can be pie charts, area charts, stacked bar charts, or treemaps.

What types of question can this chart answer?

- How much does this value contribute to the total?
- How does the distribution of costs change each year?
- Do different items contribute different amounts to sales by region?

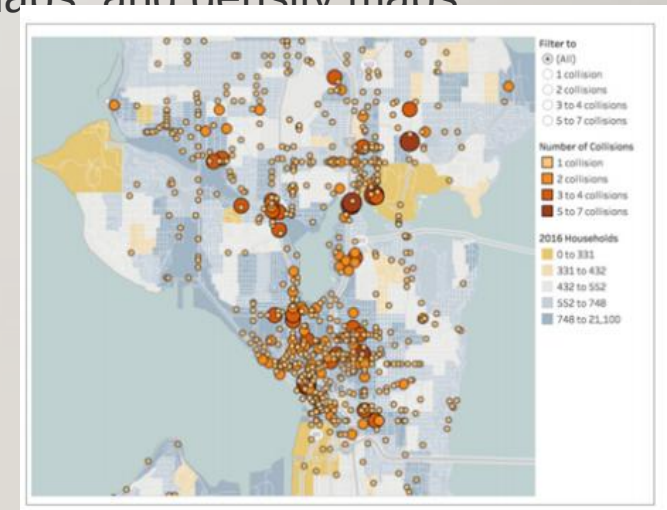


SPATIAL

- Spatial charts can precise locations and geographical patterns in your data. Showing the airport terminals with the most foot traffic or a map of all sales across the country are examples of spatial maps.
- Spatial maps include filled maps, point distribution maps, symbol maps, and density maps

What types of question can this chart answer?

- Which city has the highest sales?
- How far from distribution centers are our customers?
- How many people arrive at which gate?



FLOW CHARTS

- Flow charts can be maps that convey movement over time, such as Sankey diagrams. Flow maps include path over time and path between origin and destination charts.

What types of question can this chart answer?

- What is the longest shipping route?
- How long are people lingering around gates?
- What are the bottlenecks to traffic in the city?

VISUAL BEST PRACTICES

- Visual best practices are key to developing informative visualizations that drive your audience to act.
- A dashboard is successful when people can easily use it to derive answers.
- Even a beautiful dashboard with an interesting data source could be rendered useless if your audience can’t use it to discover insights.
- Think not just as an analyst but also as a designer and consumer.
- Dashboards should have interactive elements that are discoverable and predictable, follow a sensible, logical layout, and have a simplified design that makes complex decisions easier.
- It is important not to assume that people automatically know what it takes to clearly and effectively communicate with data.

AUDIENCE

- The best visualizations have a clear purpose and work for their intended audience.
- It’s important to know what you are trying to say and who you are saying it to.
- Does your audience know this subject matter extremely well or will it be new to them?
- What kind of cues will they need?
- Thinking about these questions before you begin designing will help you create a successful dashboard.
- For example, you would present aggregated, summary-level data and KPIs to an executive audience rather than row-level transactions.

CONTEXT

- Make sure your views include context. Titles, captions, units, and commentary all help your audience to better understand your data view. Always strive to tell stories with your data and your visuals. Understand that good stories involve more than just data, and consider the following:
- Mind your aesthetics and know that what is effective is often affective. In other words, an effective view can create an emotional response and a genuine communication to your audience.
- Style is also important. Make sure that your views are consistent and pleasing to the eye. Your views are representative of who you are and what you care about.
- Dashboards that people can interact with are very engaging. Interactive elements allow your audience to manipulate the data, ask and answer questions, and arrive at findings on their own. This helps to foster trust in your data.
- Make your views vivid and memorable. Pay attention to structure and context

LAYOUT

- How your audience “reads” your dashboard is not a trivial consideration. Your dashboard’s purpose is to help guide the reader’s eye through multiple views in coordination and tell the story of each insight. Your dashboard needs a sensible “flow” and a logical layout of different pieces of information. The more you employ better dashboard design, your users will discover what’s happening, why, and what’s most important. Consider how you’re guiding their eyes across the dashboard. Are you showing the user where to look next?
- Design theory gives us plenty of advice on how best to succeed. Layout is a key component of any successful dashboard design, here are a few concepts you want to think about when building visualizations:
- Newspaper or Z-layout — The most important content is put either at the top or the left of a visualization, as users move right and down for more specific content.
- White space — Using negative space (blank spots) and padding to delineate sections of your visualization – don’t use thick “grid lines” as you would see in a table.
- Size — More important pieces of content (KPIs, summary visualizations, etc.) should be larger than other items.
- Device type — With device-specific dashboards you can create the optimum viewing experience on desktop, laptop, tablet, and phone.

COLOR

- Color is one of the most powerful aesthetic features because it's an attention-grabber. It's the first thing we notice, and it can immediately highlight specific insights or identify outliers, but it is not an unlimited design resource.
- Using color effectively is critical for producing quality data visualizations – color types (alerting vs highlighting), creating custom color palettes, and consistency—are key aspects to build into your standards.
- The correct use of color is critical for producing coherent and impactful data stories. The key factors that should be taken in to consideration for any successful dashboard are:

- **Managing color choices** — The primary color(s) that make up most of your design should be a neutral color. Using techniques like grayscale, you maximize the possibility for contrast and visibility of your data driven points. Your extended colors—accents, emphasis, and alerts—should reflect the brand. Any extended color should be used sparingly to draw attention to key messages within the data.
- **Color types** — Understand when to use sequential, diverging, categorical, highlighting, or alerting color motifs.
- **Custom color palettes** — Build your own company palettes to bring a sense of uniformity and provide guiderails for new users.
- **Consistency** — Double-check your visualizations to make sure a color (e.g. red) does not mean three different things. Similar and repeated colors can imply a relation where one doesn't exist.
- **Accessibility** — Remember to account for color blindness in the design process

TITLES & SUBTITLES

- Titles are an easy way to make your dashboard more digestible for your audience.
- You add more context with subtitles that describe how to interact with the worksheet or dashboard.
- This is a powerful and simple way to make dashboards easier to navigate.

TOOLTIPS

- Tooltips guide the audience by highlighting important information.
- We add important and related dimensions and measures in the tooltip.
- This helps save space and declutter the dashboard so our viewers can focus on gleaning insights instead of interpreting the visualization

FONTS

- Typography is important.
- It can be tempting to use many font types and sizes in a dashboard.
- Don’t do that; instead, define a clear hierarchy for your typography.

- Make sure that font selection is done to reinforce a visual hierarchy within your visualization through size, boldness, color and type.
- **Size** — Larger elements convey importance as they catch the eye. Save your largest fonts for KPIs, titles, etc.
- **Boldness** — Bolder elements convey importance as they catch the eye. You can vary boldness throughout your visualization in conjunction with size. For example, your title and KPIs could both be 24pt font, but making your KPIs bold will “pop” them, allowing your audience to focus there first.
- **Color** — Generally it’s good to stick with gray and black hues in your titles, text, and KPIs. You can “pop” your KPIs by giving them a color treatment, but you have to balance this with the other colors used in your visualization. Darker colors will draw the eye, so it’s wise to lighten your titles so they don’t compete for visual attention.

DESIGNING FOR PERFORMANCE

- When we talk about performance, we mean the speed with which you can work in Tableau. That might mean the speed of data analysis—for example, if you work in Tableau Desktop on a large corporate database that takes forever in real time when you access it remotely. Or it might mean simply the speed of loading views or dashboards that you access on your desktop or from Tableau Server or Tableau Online.
- Performance and efficiency should be treated as part of the design process—not as an afterthought. Responsiveness is an important success factor for end users when viewing reports and dashboards, so making your workbooks run as quickly as possible makes for happier users.
- There are several factors that make a workbook “efficient”. Some of these factors are technical and some more user-focused but in general an efficient workbook is:

- **Simple** — Is it easy to create the workbook and will it be easy to maintain in the future? Does it take advantage of the principles of visual analysis to clearly communicate the message of the author and the data?
- **Flexible** — Can the workbook answer multiple questions the users want to ask, or just one? Does it engage the user in an interactive experience or is it simply a static report?
- **Fast** — Does the workbook respond quickly enough for the users? This may mean time to open, time to refresh, or time to respond to interaction. This is a subjective measure, but in general we want workbooks to provide an initial display of information and to respond to user interactions within seconds.

THE PERFORMANCE OF A DASHBOARD IS IMPACTED BY THE FOLLOWING

- The visual design at both the dashboard and worksheet levels, e.g. how many elements, how many data points, use of filters and actions, etc.
- The calculations, e.g. what kind of calculation, where the calculation is performed, etc.
- The queries, e.g. how much data is returned, impact of custom SQL, etc.
- The data connections and underlying data sources.
- Some differences between Tableau Desktop and Tableau Server or Tableau Online.
- Other environmental factors, such as hardware configuration and capacity for Tableau Server.

ACCESSIBILITY

- To make your views accessible to as many people as possible—or if you work in an environment that is subject to US Section 508 requirements or other accessibility-related laws and regulations—you can use Tableau to build data views that conform to the Web Content Accessibility guidelines (WCAG 2.0 AA). This includes building views that are accessible to users who use screen readers, braille keyboards, keyboard-only navigation, and so on.

THANK YOU