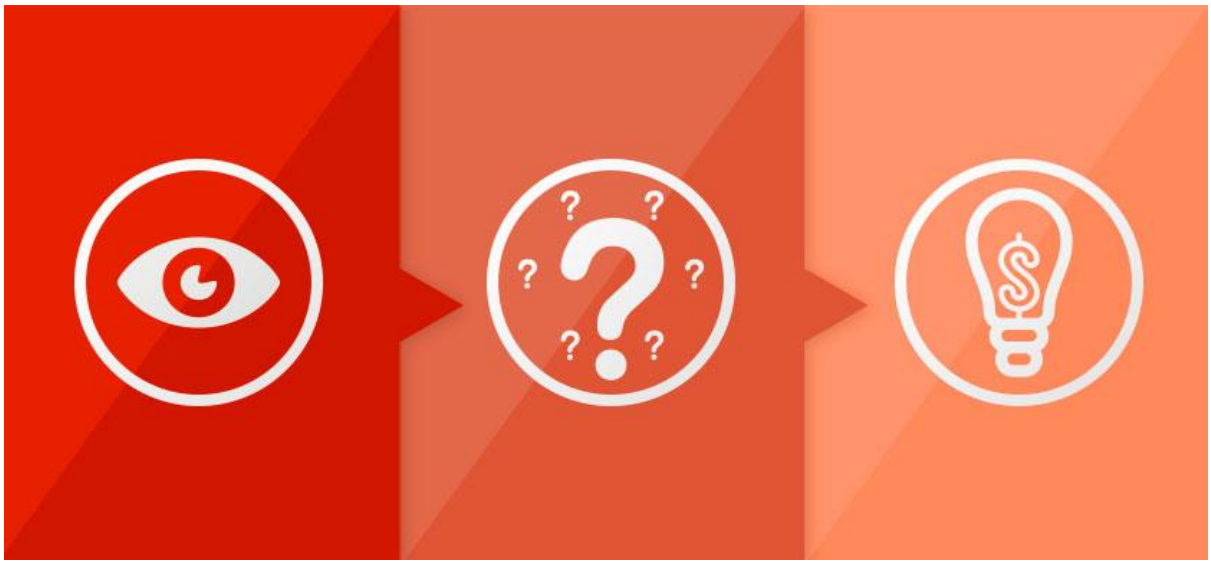
CERTIFIED DATA VISUALIZATION PROFESSIONAL

Data Visualization articles – PERFORMANCE Magazine

Data visualization – Is a picture worth a thousand words?

Written by Manuel Hila on August 15, 2014 in PERFORMANCE Magazine



In the words of the data visualization expert Edward Tufte, “Graphical excellence is that which gives to the viewer the greatest number of ideas in the shortest time, with the least ink, in the smallest space.”

On both personal and professional levels, we are surrounded by massive amounts of data, from the nutritional label of foods to departmental KPIs on a dashboard. By lacking an overview, statistical data can be sometimes overwhelming, time consuming and difficult to understand.

We use data visualization from a basic human need, to tell a non-verbal story. Data visualization is the graphical representation of information with the purpose of communicating without words, increasing the speed at which data is comprehended by others and provide aid in making a decision.

Data visualization is not something new. Communicating data and information visually has been around in various forms for hundreds and arguably thousands of years. Graphical interaction with data has known a steep increasing trend among the full spectrum of users. From executives to front line personnel, data visualization is becoming a necessity. Among corporations across the globe, the line, bar, and pie charts are some of the most commonly used. Moreover, through graphical displays of data, such as dashboards and scorecards, users are moving on from static reporting and data tables to a more interactive workspace which allows them to better comprehend and manipulate data, as well as to reach a strategic decision by viewing past, present and future trends.

Good data visualization is critical to making smarter business decisions, and it might contribute to improving performance. The need to make sense of and communicate data to others is

rapidly increasing and, thus, as time passes, new ways are created to better and more efficiently deliver information in a non-verbal matter. Information technology, software and design, combined with the principles of visualization create sophisticated images and animations to aid large data sets to be easily comprehended. Covering a growing range of areas, industries and projects, visualization tools reflect creative ways of communicating data to others, with virtually no limit to what kind of information can be translated into an image. Vision is the main key when communicating information.

In accordance with the Principles of Data Visualization, in the business environment, it follows two broad goals: explanatory and exploratory. In the first case, the viewer is directed along a defined path: he starts by having a question in mind and, after visualizing the data, he finds the answer. Therefore, the data tells the viewer a story. An exploratory visualization offers the viewer many dimensions to a data set, or benchmarks multiple data sets. Therefore, the viewer requires time to first familiarize himself with the visual aspect, identify an area of interest, and then explore the different dimensions of the image. Thus, the viewer finds the story that data is transmitting.

As users interact more actively with data, they envision and then want to explore data sets across areas. Dashboards and scorecards should allow users to take a deep look into at least one if not more levels of data and to obtain a detailed view of what occurs behind the KPIs, metrics and visual objects. Users are thus able to spot anomalies much easier and identify where performance is out of its defined thresholds. More mature and complex dashboards allow users not only to dive in data, but also to perform various types of analysis, to explore patterns or determine the root cause behind out of line metrics.

Finding the right balance that defines a good visualization, between complexity, comprehension, amount of data and simplicity can create a visualization worth a thousand good decisions.

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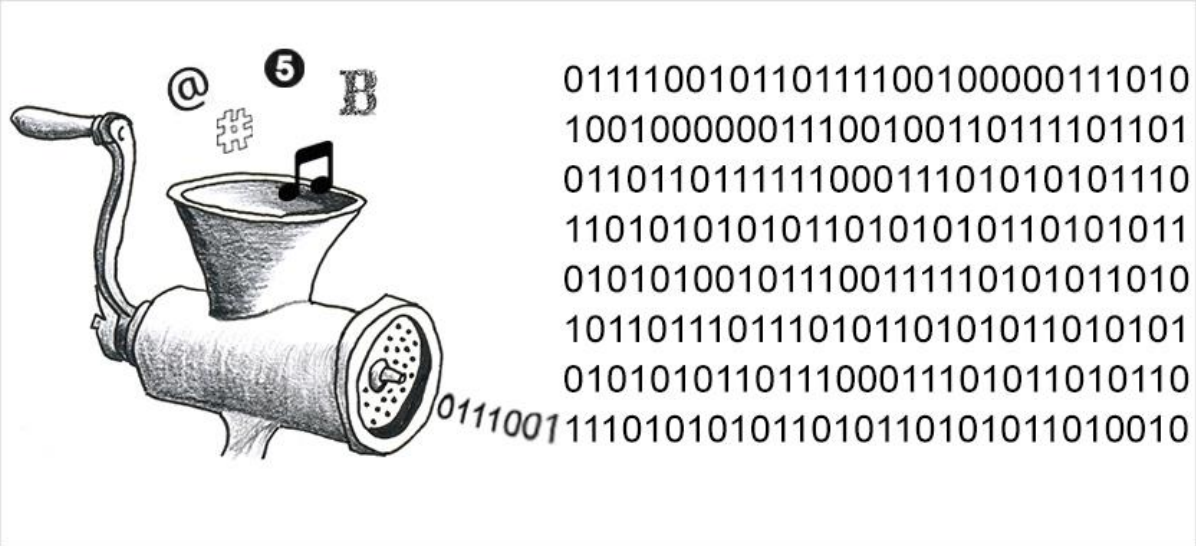
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Data visualization: Standardizing background data

Written by Manuel Hila on October 3, 2014 in PERFORMANCE Magazine



Crafting a visualization is more than simply translating a table of information into a visual display. Data visualization ought to communicate information in the most effective way, with the prime purpose of truly revealing data in a quick, accurate, powerful and long-lasting manner. Representative visuals can easily summarize and communicate data to other people, making even the largest or most complicated sets of data understandable.

There are limitless ways and means of creating data visualizations, as they varies greatly depending both on the content itself and on the purpose. But regardless of what shape or form a visual takes, the most important is to maintain graphical excellence, expressed by Edward Tufte as “complex ideas communicated with clarity, precision, and efficiency”.

According to Edward Tufte’s checklist, all data visualizations should:

- Show the data;
- Be accurate (don’t distort the data);
- Make large data sets coherent;
- Serve a clear purpose;
- Reveal the data at different levels (overview versus detailed)
- Encourage the viewer to compare different pieces of data.

Continuing on Tufte’s trail of though, Ben Fry offers other guidelines that should be taken into consideration when crafting visuals:

- Acquire: Obtain the data, whether from a file on a disk or a source over a network;
- Parse: Provide some structure for the data’s meaning, and order it into categories;
- Filter: Remove all but the data of interest;
- Mine: Apply methods from statistics or data mining as a way to discern patterns or place the data in mathematical context;
- Represent: Choose a basic visual model, such as a bar graph, list or tree;
- Refine: Improve the basic representation to make it clearer and more visually engaging;
- Interact: Add visible methods for manipulating the data or controlling what features.

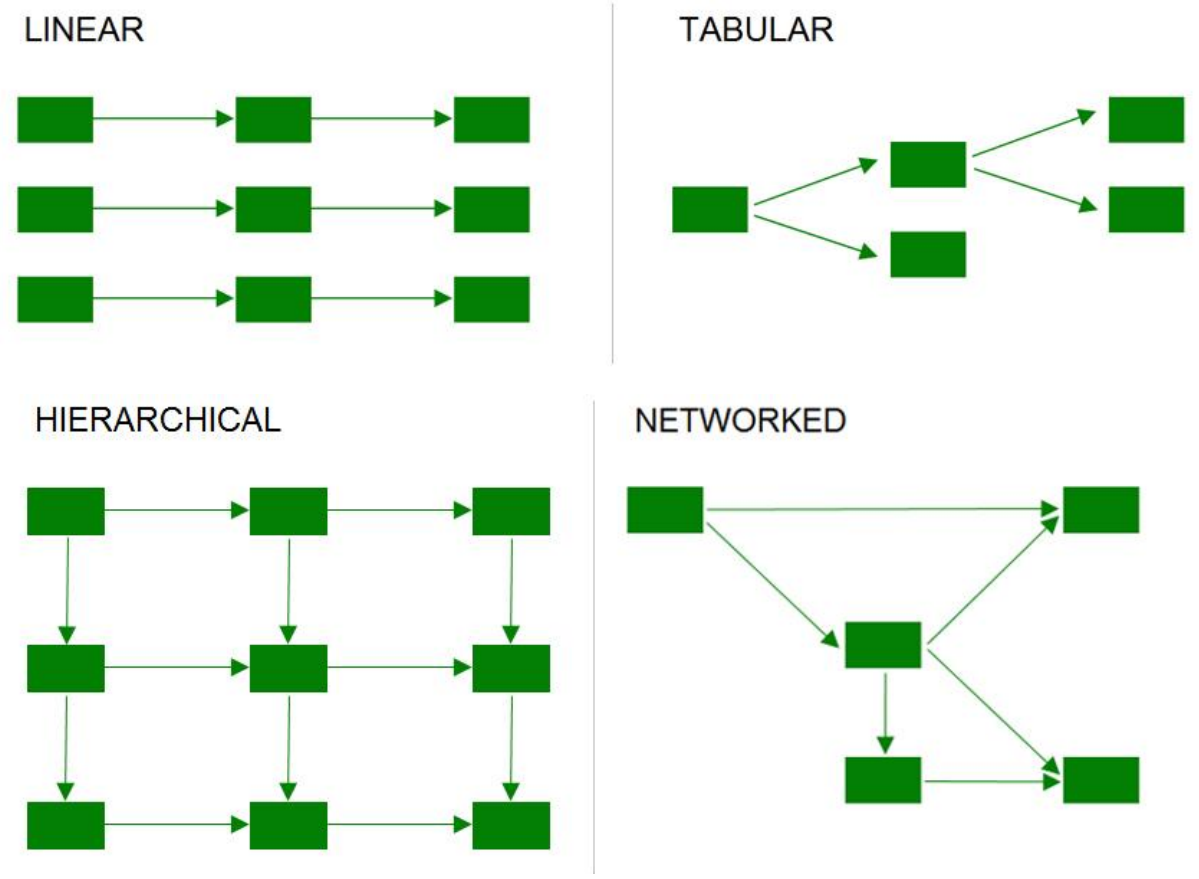
According to Ben Fry, when working with complex data sets, the collaboration of many disciplines is required in order to provide a meaningful understanding of the data. Fields such as statistics, data mining, graphic design and information visualization should be considered when handling thousands or tens of thousands of data items.

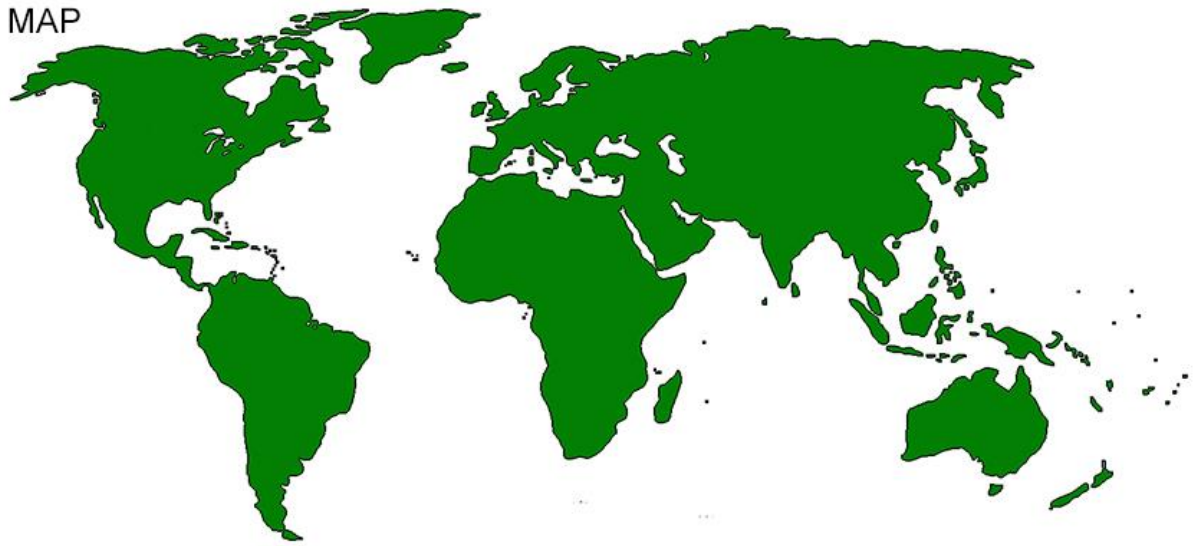
Nonetheless, regardless of its provenience, every data set can be visualized in various ways, some more efficiently than others. Therefore, the first step in forging a visualization is to understand the raw data in hand. Some basic questions one must consider answering can be:

- What does the data represent?
- Are there any relationships between the variables? Which are they?
- How is the data organized (structure, categories)?
- Which information needs to be communicated?

Answering these questions is a starting point in designing a visual and it helps in determining the form of the data visualization. One of the most important parts is understanding how the data is organized and how it relates to each other. When communicating a company's growth rate over a period of time, a simple line chart might be the most efficient, but when communicating a 250 million dollar investment in wind turbine production and installation facilities in a limited space, an infographic might be more efficient.

As stated before, there are countless possibilities of how to visualize data. The background data thus plays an important role in the outcome of the visualization. There are many design patterns which have proven their efficiency for specific types of data. Some examples are presented below.





Given that the interpretability of raw data rests on both the internal understanding of a person and the shared representational conventions the resulted visual embodies, a first step is to insist on a good standardization of the data. Effective data visualization is part of a broader shift in science where data is more easily available, standards and standardization tools are more widely accessible, and high-quality visual work is easy to produce and share.

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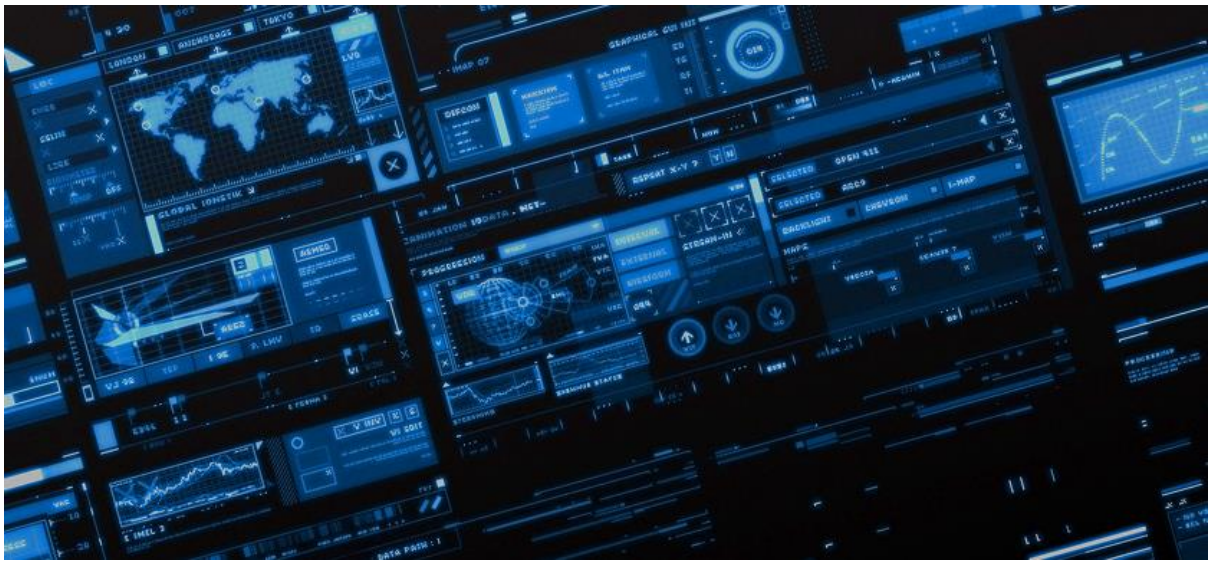
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Access the online version of the article: http://www.performancemagazine.org/data-visualization-standardizing-background-data/

How to design effective dashboards?

Written by Manuel Hila on October 10, 2014 in PERFORMANCE Magazine



Designing an individual graph may prove difficult to a certain extent. The degree of difficulty increases considerably when faced with the challenge of designing a dashboard. This is because a dashboard combines a large collection of information, often dissimilar, which can easily become cluttered.

Yet, dashboards are, by definition, a visual interface that provides at-a-glance insight into key measures that are relevant to a particular objective or business process. A dashboard has three key attributes:

- It displays data graphically;
- It only displays data that is relevant to the dashboard's purpose ;
- It contains predefined conclusions relevant to the dashboard's purpose and relieves the reader from having to perform his own analysis.

Before starting to design a dashboard, regardless of what its objective might be, a prime key step will be to collect user requirements. These user requirements include defining your audience, data sources, key performance indicators (KPIs), refreshing schedules, data governance, and so on.

As dashboards can be effective and can provide the user with the required information, the question becomes: How can you design a dashboard that works for you?

There are several best practices that need to be taken into consideration when designing a dashboard.

1. Choosing the KPIs that matter

A first consideration when designing a dashboard is to identify and choose the metrics that really matter out of the vast sea of metrics. For selecting the few metrics that have the privilege of occupying a spot on the dashboard, some questions need to be answered, such as:

- How does the metric contribute to the purpose of the dashboard?
- Can the data, either internal or external, shed light on the monitored processes?

- Can the metric be designed to measure those contributions?
- Can the metric be built as a systematic and on-going means of measurement?

2. Keep it visual

To enhance the viewer's information absorption, when displaying the information in a visual manner, rather than number-based tables or text, the dashboard could be enhanced through increasing the speed with which data is comprehended by others. It also provides an aid in making a decision.

Some of the most common visuals used in dashboards are bar graphs, line graphs, heat maps, scatterplots that have a bigger impact on the viewer, mainly because they are clear and people know how to read them.

Also when designing dashboards, emphasize on the use of colors, shapes, lines, thickness, and other precognitive attributes that our brain instantly recognizes.

3. Allow users to explore

A step further in designing an effective dashboard, provided that it already has relevant metrics and is visually engaging, is to offer the opportunity for the viewer to deep dive in the presented data. As everybody is looking at the metrics' visual representation, each person may have unique questions about what they see. Therefore, create the dashboard in a manner that allows users to interact with it and get the answers they seek.

There are numerous possibilities for this, like the option to filter views, adjust parameters or to provide historical overview.

4. Update regularly

Ensure that the metrics which deserve a spot on the dashboard are constantly and correctly updated to reflect current business results.

An effective dashboard allows viewers to make faster and smarter decisions. These decisions are based on the data presented in the dashboards which, if outdated, are no longer representative or relevant for the current situation.

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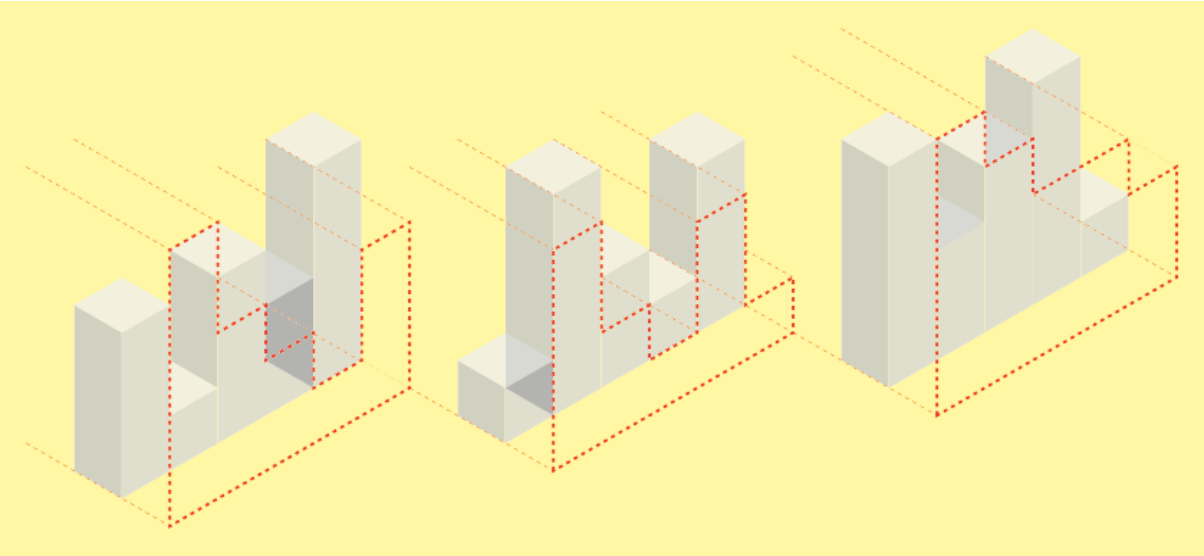
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Published on www.performancemagazine.org, The KPI Institute's online magazine dedicated to Strategy and Performance.

Access the online version of the article: http://www.performancemagazine.org/how-to-design-effective-dashboards/

How data visualization (mis)informs

Written by Manuel Hila on August 21, 2014 in PERFORMANCE Magazine



Discussions on data visualization have rapidly increased over the last years as more executives, managers, analysts and basically everybody, wish for a better understanding of the raw data behind every day dashboards, scorecards or presidential poll results. The struggle is to bring the raw data to life in a simple and comprehensible manner.

Visualization is becoming vital for transmitting information in a non-verbal manner, but when done wrongly, it creates more confusion and ambiguity rather than provide desired answers. Visualization ideas, which at first might seem brilliant, can turn out to be puzzling for viewers, diminishing their willingness to look for answers due to the complexity or bad representation of the data.

An example of the most common mistakes in working with data visualization can be found in the article Data visualization – 5 DON'Ts.

Overcoming common mistakes when working with data visualization is not the only impediment. Taking into account the most important question, before conceiving any visual representation, "what is the story of the data", this is a question that people can misinterpret, either willingly or unwillingly to display what the developer desires the audience to perceive.

One of the easiest ways to misrepresent data in a visual rendition is by messing with the y-axis on charts, rearranging elements such as bar graphs, line graphs, or scattered plots. In most cases, the y-axis should have a range starting from 0 to a maximum that encompasses the range of the data. Unfortunately, taken to an extreme, as in the example below, this technique can create a distorted view of the data making the differences between values appear much larger than they really are. The two graphs below present the same data from two different points of view. In the first case, it gives the impression that the interest rates have skyrocketed, while in the second case the difference is slightly observable. The difference between the lowest value and the highest value is 0.014%.

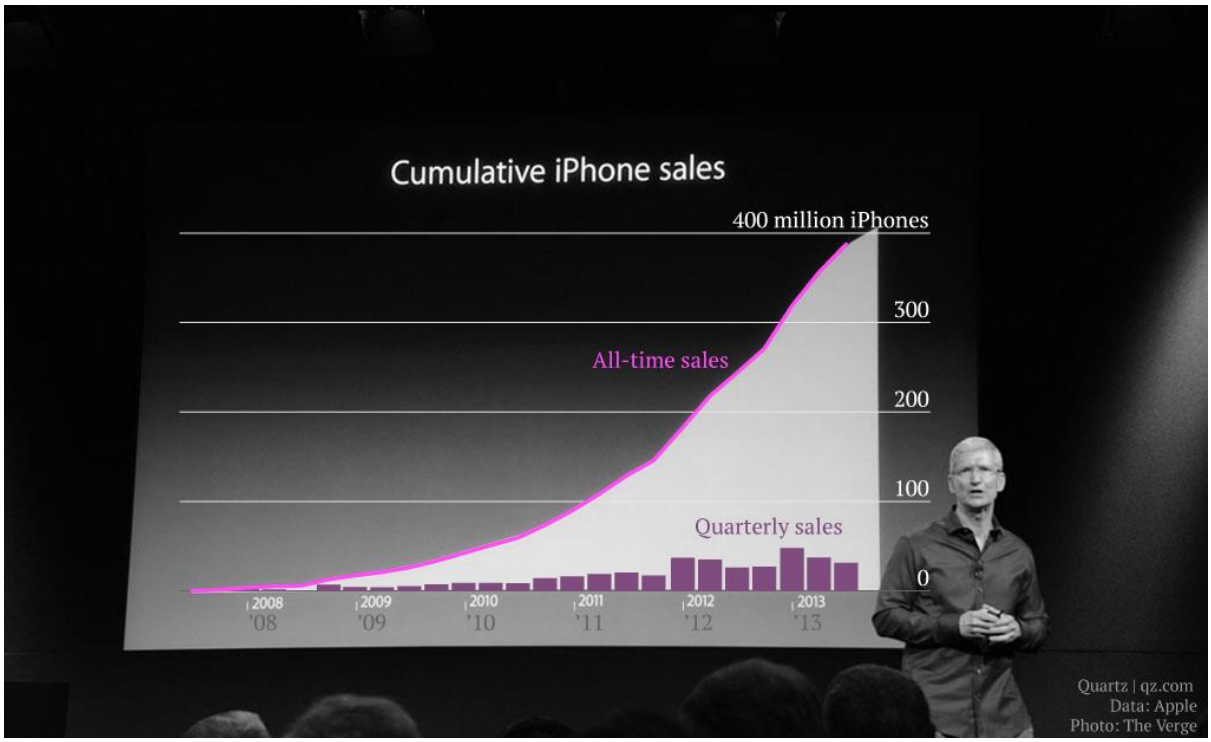


By displaying the data with a zero-baseline y-axis, the viewer has a more realistic picture of the facts, perceiving that the rates are almost static. Such examples are widely seen almost everywhere and the question on everyone's mind is "Why start at 2.14%? Why not any other value?".

Various people choose to create cumulative graphs to represent different types of data, such as: users on a website, revenue, downloads, sales or other important metrics. One very expressive example of data visualization that may create a disingenuous perception is from a chart presented by Tim Cook about iPhone sales.



The visual in this example represents the sales of iPhone by Apple for a specific period of time. But the lack of an x-axis with a scale leaves the viewer guessing what the highest and lowest values are. Moreover, here is a clear example of data misrepresentation by using the cumulative technique. This method does not take into consideration the life span of a product and continues to add data from previous periods.



Taking a look at the real data, as highlighted in a recent Quartz article, it can be seen that although the cumulative sales are above 400 million iPhones sold, the quarterly sales paint a different picture. In the last year, on the graph, quarterly sales are actually decreasing and, following the trend set in previous quarters, it will probably continue to decrease.

Therefore, before creating any visualization and thinking of its design, one should consider some key aspects and try to answer some of the following questions:

- What story will the data tell?
- What questions should be visualization arise?
- Which data needs to be highlighted?
- What is the best architecture for revealing the most important aspects of the visual?
- Who are the viewers?

As one answers some of these questions, the right design and implementation process can begin. It does not mean that the visual aspect will not require any changes along the way, but taking the right route in the design phase will simplify the work and help create a better and more understandable representation.

Providing the user with a meaningful data visualization helps spread the message behind the vast data in the background across and assist the viewer in reaching a quicker, strategic and, most importantly, correct decision.

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How do you choose the right chart or graph to tell your story?

Written by Manuel Hila on October 31, 2014 in PERFORMANCE Magazine



There is no doubt that effective data visualization shifts the balance between perception and cognition. It determines the use of the visual cortex at a higher capacity and the viewer understands the presented information much better and quicker and is able to make a better decision based on his findings.

Visual communication is one of the best ways to understand background data. The use of a visualization quickly draws attention upon key messages. Presenting the data visually makes it possible to uncover answers to pre-set questions, to find new questions in need of answers, or surprising patterns and observations that wouldn't be apparent from looking at statistical data alone.

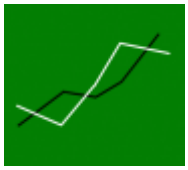
These are the two broad goals that data visualization follows: explanatory and exploratory. In the first case, the viewer is directed along a defined path: he starts by having a question in mind and, after visualizing the data, he finds the answer. Therefore, data tells the viewer a story. An exploratory visualization offers the viewer many dimensions to a data set, or benchmarks multiple data sets. Therefore, the viewer requires time to first familiarize himself with the visual aspect, identify an area of interest, and then explore the different dimensions of the image. Thus, the viewer finds the story that the data is transmitting.

Both the data collected and the questions the viewer has can be linked by creating a chart of graph. However, when communicating in a visual manner there are a multitude of ways to facilitate the story-telling of the data, to bring the information to life and give it meaning. Among this multitude of communication possibilities, choosing the right chart or graph for the type of data at hand to aid in providing the answers to questions the viewer has can prove to be difficult.

Below, you can find some of the most commonly used charts and graphs, as well as some of their benefits and drawbacks, in order to better understand them and be able to use these visuals both more efficiently and depending on the audiences' pre-identified needs. These include bar charts, line charts, pie charts, Gantt charts, bullet charts, scatter plots, bubble charts and maps.



Bar charts are one of the most commonly used visual representations of information. The reason is quite simple, they are easy to use, provide an easy comparison of information, by revealing highs and lows at a glance. One should consider both the use of several bar charts on a dashboard as it helps the viewer to quickly compare related information and the use of colors to add more impact on the data.



Line charts are also very widely used as they connect individual numeric data points. The resulted visualization is a simple and straightforward representation of a sequence of values. One should consider a combination of line charts with bar charts in order to provide a clearer and simple benchmark between different types of data. Also consider to fill the remaining space above or below a set of lines with relevant information or values, either all values or just the highest and lowest values.



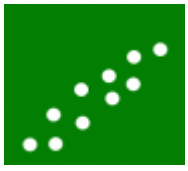
Pie charts should only be used to illustrate relative proportions. The primary strength of a pie chart is the fact that it clearly indicates a part-to-whole relationship between the values. Pie charts encode values redundantly through the use of three visual attributes: the area of each slice, the angle formed by each slice at the centre of the pie, and the length of each slice along the pie's perimeter. Even when the area, angle and perimeter of each slice is properly calculated, the drawback is the inability to accurately perceive any one of these attributes. Visual perception in humans has not evolved to support accurate decoding of areas, angles or distance along a curve. One should consider limiting the slices to a maximum of six and always provide the corresponding value of each slice. They are not useful when comparing many pieces of data with relatively close values.



Gantt charts are most commonly used in project planning as they excel at showing the start and finish point or date of the project. They provide a clear representation of what needs to happen, by when and the responsible person to ensure the success of the task. One should consider using a Gantt chart in combination with other chart types which allow filtering and data drill down to expand the insights provided. Also adding color within the Gantt chart quickly informs viewers about key aspects of the variables.



Bullet charts allow users to track progress with a specific goal. At its base, a bullet chart is a variation of a bar chart. Thus, it illustrates the performance of a metric against a goal. It also offers visual sufficiency, as it provides the viewer with a graphical display of the thresholds. A consideration for these can be to either use red, yellow and green thresholds or different shades of grey to remove the sense of a rainbow dashboard.



Scatter plots are an effective way to offer trends, concentrations and outlines that will direct the viewer's focus to areas where further investigation efforts are needed. Scatter plots are often used to find the relationships between data which are not easily visible within a table. One should consider the fact that scatter plots are only effective with two dimensional data. Another consideration is to add a trend line which provides a better correlation between the data. Adding filters also allows the viewer to drill down into different views and details which allows to quickly identify patterns in the data.



Bubble charts are similar to scatter plots. However, bubble charts display more dimensions of data by varying size (or also color, texture and so on) of the bubbles. It therefore can display multiple dimensions of data in a two dimensional display. Thus bubble charts should be used to show concentration of data along two axes by varying the size and color of data points, a bubble chart can be transformed into a rich visualization that answers many questions at once.



Maps are used when the data is related to a specific location (for example a city or country). The advantage is that their spatial representation directly relates to a real-world situation. One should consider the different types of maps available to be used, such as choropleth maps, cartograms, proportional symbol maps, pinpoint maps, connection maps, subway maps, isopleth maps, stream plots and prism maps. Maps can be used as filters for other types of charts, graphs and tables

The above-mentioned examples represent only a small number of the most popular types of visualizations. There are many advantages of using existing patterns for data visualization. They have been proven to work effectively for a specific type of dataset. Furthermore, people are familiar with reading these types of visualizations, making them easier to understand.

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Why use data visualization?

Written by Manuel Hila on August 13, 2014 in PERFORMANCE Magazine



Data visualization is, roughly, the visual representation of information. From business executives and managers to business analysts or operations/manufacturing/supply chain managers, they all use charts, tables, histograms of other types of graphics to better visualize their data. Bar charts, line charts, scatter graphs and maps are simple examples of data visualization that have been used for decades.

The process of creating a visual representation should begin and also end with finding the purpose of the data. The question of "what story is the data communicating" should be answered before creating the visual but also before transmitting it.

Among some of the benefits of an efficient visualization we can mention:

- **Action** – as it empowers the process of making a good decision;
- **Immediacy** – as it offers immediate answers to the business related questions which might appear, helps identify patterns in the data, future trends and possible connections between various variables which can be easily spotted.
- **Challenge** – as it determines the brain to generate new ideas. In other words, visuals can *"light the bulb".*
- **Insights** – as it extracts insights from previously obtained large amounts of data.

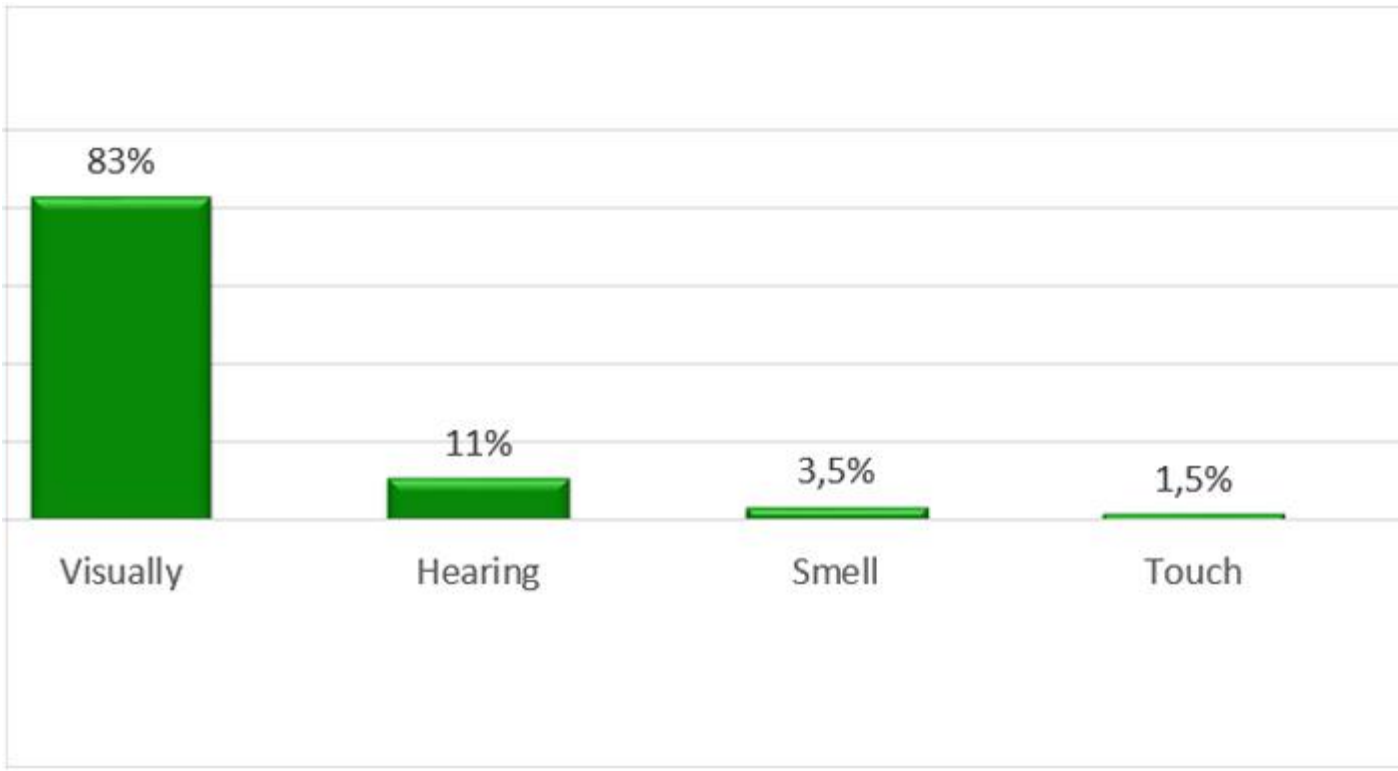


Figure 1: Memory impact by senses

It has been proven that information retention after a meeting, for example, can be boosted up to six times when that information is presented through visual and oral means, instead of spoken words only.

When processing visual information there are two types of memory that play an important role:

- Long-Term memory (a vast store of knowledge and a record of prior events);
- Working memory (temporary background memory for an episodic buffer).

When using the long-term memory, one expects to see the information on a visualization on *X and Y* axes with the corresponding unit markers, or the legend graph besides it. This type of memory is formed in time by past interactions and experiences with other visualizations.

One relies on working memory to remember part of a result while solving without paper an arithmetic problem or when a number of interest on a dashboard sticks out. This type of memory splits the vast information which is visualized into smaller pieces making them much easier to remember.

But then again, sometimes it may be hard to identify a certain message of a visual representation. The cause of such situation might be due to the failure to implement best practices such as:

- Understanding the type of data used;
- Finding the relationships between different segments of the data;
- Keeping it as simple as possible;
- No pixel should be wasted.

Furthermore, because visualizations relies on data which is accurate and coordinated, it is essential to double, even triple, proof the data based on which the visualization is created. Given the case where the data is incomplete or presents faults, or the data sets vary in definition or measurement units, the final visual may lead to a deprived interpretation of the results, which may cause a misleading or faulty conclusion. Even in the case where the data is consistent, a poorly developed visual might provide no insight or highlight inappropriate facts.

Therefore, beginning and ending with the question "what is the story of the data" in combination with an understandable and simple design can result in the creation of a visual representation worth a thousand words.

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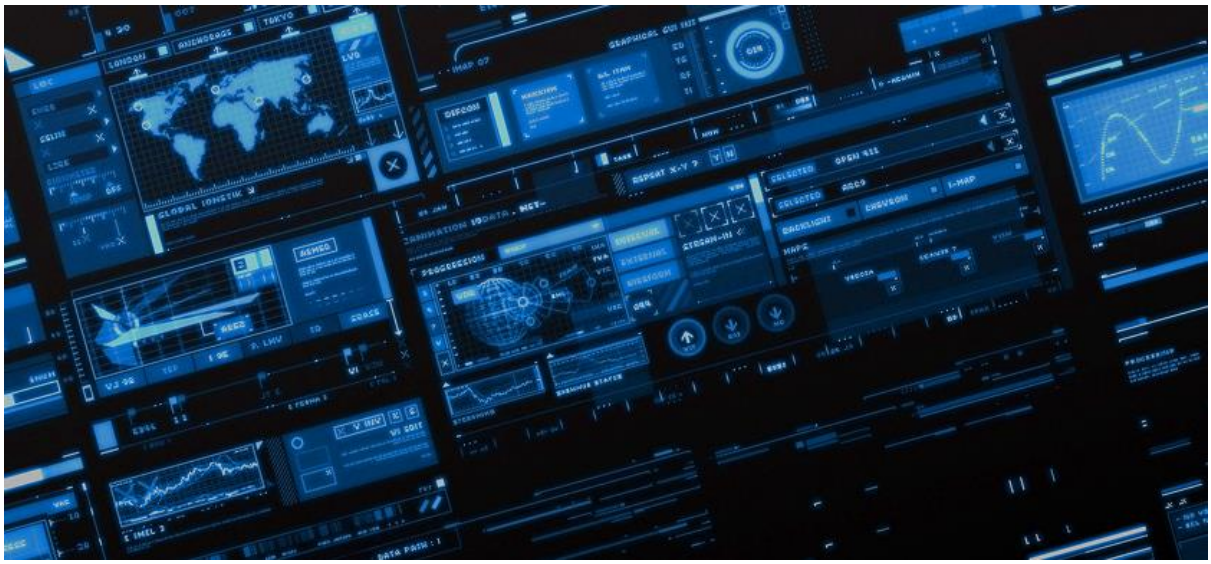
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How to design effective dashboards?

Written by Manuel Hila on October 10, 2014 in PERFORMANCE Magazine



Designing an individual graph may prove difficult to a certain extent. The degree of difficulty increases considerably when faced with the challenge of designing a dashboard. This is because a dashboard combines a large collection of information, often dissimilar, which can easily become cluttered.

Yet, dashboards are, by definition, a visual interface that provides at-a-glance insight into key measures that are relevant to a particular objective or business process. A dashboard has three key attributes:

- It displays data graphically;
- It only displays data that is relevant to the dashboard's purpose;
- It contains predefined conclusions relevant to the dashboard's purpose and relieves the reader from having to perform his own analysis.

Before starting to design a dashboard, regardless of what its objective might be, a prime key step will be to collect user requirements. These user requirements include defining your audience, data sources, key performance indicators (KPIs), refreshing schedules, data governance, and so on.

As dashboards can be effective and can provide the user with the required information, the question becomes: How can you design a dashboard that works for you?

There are several best practices that need to be taken into consideration when designing a dashboard.

1. Choosing the KPIs that matter

A first consideration when designing a dashboard is to identify and choose the metrics that really matter out of the vast sea of metrics. For selecting the few metrics that have the privilege of occupying a spot on the dashboard, some questions need to be answered, such as:

- How does the metric contribute to the purpose of the dashboard?
- Can the data, either internal or external, shed light on the monitored processes?

- Can the metric be designed to measure those contributions?
- Can the metric be built as a systematic and on-going means of measurement?

2. Keep it visual

To enhance the viewer's information absorption, when displaying the information in a visual manner, rather than number-based tables or text, the dashboard could be enhanced through increasing the speed with which data is comprehended by others. It also provides an aid in making a decision.

Some of the most common visuals used in dashboards are bar graphs, line graphs, heat maps, scatterplots that have a bigger impact on the viewer, mainly because they are clear and people know how to read them.

Also when designing dashboards, emphasize on the use of colors, shapes, lines, thickness, and other precognitive attributes that our brain instantly recognizes.

3. Allow users to explore

A step further in designing an effective dashboard, provided that it already has relevant metrics and is visually engaging, is to offer the opportunity for the viewer to deep dive in the presented data. As everybody is looking at the metrics' visual representation, each person may have unique questions about what they see. Therefore, create the dashboard in a manner that allows users to interact with it and get the answers they seek.

There are numerous possibilities for this, like the option to filter views, adjust parameters or to provide historical overview.

4. Update regularly

Ensure that the metrics which deserve a spot on the dashboard are constantly and correctly updated to reflect current business results.

An effective dashboard allows viewers to make faster and smarter decisions. These decisions are based on the data presented in the dashboards which, if outdated, are no longer representative or relevant for the current situation.

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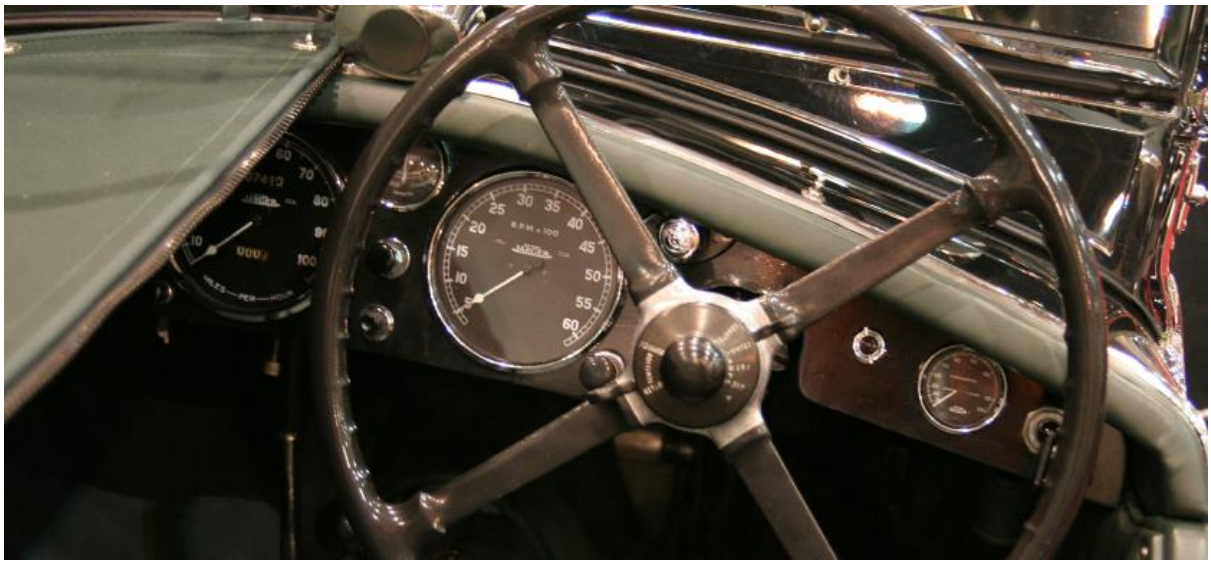
Wallpaper, available at: http://wallpoper.com/wallpaper/command-central-396457

Published on www.performancemagazine.org, The KPI Institute's online magazine dedicated to Strategy and Performance.

Access the online version of the article: http://www.performancemagazine.org/how-to-design-effective-dashboards/

Avoiding dashboard design blunders

Written by Manuel Hila on October 17, 2014 in PERFORMANCE Magazine



As the benefits of performance measurement and management become broadly known, more and more organizations have implemented frameworks that includes more than the traditional lagging measures of their financial and operational performance. But squeezing a great deal of information into a small amount of space and also designing it to result in a visual display that is easily and immediately understandable by the viewer can prove to be very challenging.

In designing an effective dashboard, the pitfalls are vast and, in most of the cases, the preoccupation with superficial and functionally distracting visual characteristics results in a poorly competent visualization that does not fulfill its objectives.

Paraphrasing one of the definitions of a dashboard offered by Stephen Few in his article "Dashboard Confusion Revisited" , a dashboard is a visual display of the most important information aiding the viewer in making a quick decision, consolidated and arranged on a single screen so the information can be monitored at a glance. Some of the most common mistakes one should avoid are identified directly from this definition, for example not displaying the most important information or displays that are not arranged on a single screen.

Besides the most obvious mistakes, according to Juice Analytics, one should always start the design process with three questions in mind:

- Who is my audience?
- What value will the dashboard bring?
- What type of dashboard needs to be created?
- So what can go wrong when designing dashboards?

1. Bearing the above mentioned questions in mind, one of the first mistakes that usually occurs, emphasized by Stephen Few in his book "Information Dashboard Design: Displaying Data for At-a-Glance Monitoring" is starting off with too much complexity. When provided with the opportunity, for the optimistic ones, or when confronted with the task of designing a dashboard, it is very easy to get exceedingly determined and aspire to a highly detailed and real-time KPI monitoring dashboard and provide the user with overwhelmingly numerous drill-down options to get to the core of the presented data.

2. According to Few, too much complexity can lead to a fragmentation of the data into separate screens. It can happen in two ways: data is separated either into screens to which one must navigate, or into different instances of a single screen that are accessed by the viewer through some form of interaction. This is not necessarily all bad – allowing the viewer to navigate to further details or to a different visual representation that best achieves its purpose by standing alone can be quite a powerful tool for a dashboard. For example, allowing the user to deep dive into a certain KPI that is influential for others and view the data split in different ways.

3. Another very common mistake, identified by the same author, is to use gadgets or widgets that lack in bringing context for the data. This usually happens with speedometers, gauges and others. These visuals of what is going on with a particular KPI rarely do a good job as a solo act, they need a good supporting cast to succeed. They do not provide a clear benchmark with other indicators, or a clear overview in time – on track/ better than in the past/ worse than forecasted.

4. In designing the dashboard, some hesitate to use the same type of visual representation of a KPI multiple times. This may be due to the desire to create a design in such a manner as not to bore the viewer. According to Stephen Few, variety is recommended, but with a certain limit. By introducing meaningless diversity of visual representations, the dashboard display may end up full of different visual designs that have nothing in common. One should select the means of display that work in favor of the information intended for representation. This should offer the viewer the information he requires in the most direct and easily understandable manner. If the information is clearly displayed it will not bore the viewer, just because it uses the same design as the previous KPIs, but it rather comes in his aid, as it enables him to quicker benchmark between different KPIs by using the same intuitive, non-cognitive reading strategy, which saves him thinking time and energy.

5. One of the most common mistakes in designing a visual representation to indicate the value of any KPI is not starting from a zero basis. This can create a distorted view of the data generating, a significant discrepancy between the real value of the KPI and the perception of the values. You can read more about this in “How data visualization (mis)informs”.

In his article “Dashboard design for rich and rapid monitoring”, Stephen Few summarizes the most relevant best practices in designing dashboards, aspects that he also took into consideration when judging the Data Visualization Competition, such as:

- Information displayed on a single screen, so people should not move between screens or scroll around on a single screen to see all of the information;
- The display media used, such as graphs, which communicate performance information directly, clearly, accurately, rapidly, and with enough context to make the visualization meaningful;
- Visual emphasis on the information that most requires the viewer’s attention;
- An arrangement of the information that is logical and in accordance with the target audience;
- Greater focus on what is currently happening rather than what happened in the past;
- An aesthetically pleasing display.

By taking these pitfalls into consideration, one should be provided with a significant aid in creating a better visual representation of the information. Designing a dashboard is harder than an individual graph, as a dashboard combines a large collection of information from

different KPIs, which can easily become cluttered. In order to craft a dashboard design that communicates information rapidly and clearly, great care and skill are required.

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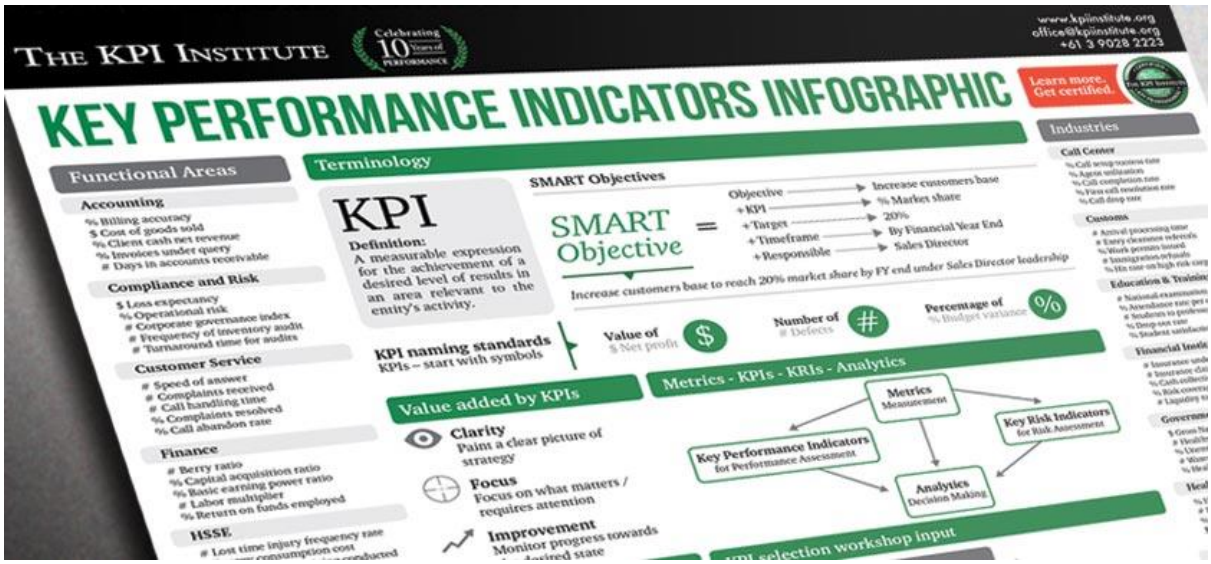
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Published on www.performancemagazine.org, The KPI Institute's online magazine dedicated to Strategy and Performance.

Access the online version of the article: http://www.performancemagazine.org/avoiding-dashboard-design-bunders/

Which are the best practices in designing infographics?

Written by Manuel Hila on November 19, 2014 in PERFORMANCE Magazine



Humans are highly visual creatures. This allows for a higher understanding of data and enables managers, for example, to make quicker, smarter decisions. Looking back thousands of years, cavemen used visuals to, for instance, track time, record celebrations and other such activities.

With the passing of time, civilizations have created hieroglyphics and symbols such as letters and numbers to better organize and facilitate communication. Some visuals help bridge cultural differences. For example, they come to the aid of travelers, on any continent, assisting them in easily identifying pharmacies, hospitals, restrooms and so on.

An infographic is a visual representation of information or data with the use of charts, diagrams, colors and other visual means. They can be highly useful, even beautiful, but only when the story transmitted is well represented. We are currently in a vast sea of information and people are striving to transmit as much information, in the quickest and most condensed manner possible.

When designing infographics, one should consider some guidelines and design recommendations for structure and form, content, color and visual elements. These guidelines enable the infographic's creator to better transmit his story and allow the user to better understand the data presented:

- **Make it visual**

The first golden rule of infographics is to show the data and not tell it. The foundation of any good infographic is data visualization. Regardless whether the information was collected or received, the infographic creator is responsible for turning the information into a visually stimulating, cohesive design that tells the story and does not miss any opportunity to visualize the data.

- **Simplify**

The best use of an infographic is to explain complex ideas by reducing them, down to their simplest form. The visuals used should show trends and demonstrate the relationships

between data by using easily understandable visual elements. These should be designed in a way that, as mentioned above, bridges gaps between cultures and thus are recognizable and understood by people around the globe. Also, any elements that do not directly contribute to the understanding of the story should be eliminated.

- **Logics**

As Arabic people, for instance, read from right to left, an infographic should follow a logical flow of information, as they are not simply information plus graphics, spread randomly on a piece of paper. Instead, the design of an infographic is a narrative process that involves representation and interpretation to develop and convey an idea. Effective infographic design should primarily focus on visual elements and structure, instead of text, to convey the story told and the messages transmitted. The visual elements used in an infographic should not be of a decorative nature, but rather used to visually communicate vital content, drafted out of the transmitted story. It is thus suggested to allocate considerable time on the design and evaluation of the visual elements created, to ensure they accurately convey the original message to the targeted audience.

- **Keep it concise**

The amount of information designated to be transposed should not influence the size of the end resulted infographic. An effective infographic should stick to the equivalent of 1-2 pages, they are not multi-page handouts or brochures.

All elements of an effective infographic should be inter-related, should contribute to the delivery of the message and should have clear title, focus and purpose.

Image Source:

- *The KPI Institute (2014) Key Performance Indicators Infographic, available at: http://store.kpiinstitute.org/key-performance-indicators-infographic.html*

Published on www.performancemagazine.org, The KPI Institute's online magazine dedicated to Strategy and Performance.

Access the online version of the article: http://www.performancemagazine.org/which-are-the-best-practices-in-designing-infographics/

Linking big data visualization to the value of KPIs

Written by Manuel Hila on October 17, 2014 in PERFORMANCE Magazine



Given that we live in a time of data and information overload, we really need to have better mechanisms to make sense of it all. Data visualization supports the transfer of information to knowledge by illustrating hidden issues and opportunities in big data sets. Big data is creating unrivaled opportunities for businesses, aiding them to achieve faster and deeper insights that can strengthen the decision making process, improve customer experience, accelerate the speed of innovation and gain a competitive advantage.

A significant amount of the human brain is dedicated to visual processing, resulting in our sight having a sharpness of perception far surpassing our other senses. Effective data visualization shifts the balance between perception and cognition. The visual cortex is used at a higher capacity and the viewer understands the presented information much quicker, better and is able to make a superior decision based on the findings.

Businesses are increasingly turning to data visualization to discover the overwhelming amount and variety of data cascading into their operations, and to eliminate the struggle of just storing the data and focus on how to analyze, interpret and present it in a meaningful way. The trend towards data visualization is worth delving into by any business seeking to derive more value from big data.

The IBM framework for tackling big data focuses on “the four “V’s” (volume, velocity, variety and veracity), but does not emphasize enough another “V” that requires attention, namely visualization. Even with the use of business intelligence tools and the incredible exponential increase in computer power, the need to consume information in a meaningful manner exceeds the ability to process it. Visualization plays a key role starting from the raw input of the big data, where structures and underlying patterns that may be held within the data can be observed or formed, to the end result of a visual representation that presents valuable key insights in a fast, efficient and clever manner.

Crafting a visualization is more than simply translating a table of data in a visual display. Data visualization ought to communicate information in the most effective way, with the prime purpose of truly revealing data in a quick, accurate, powerful and long-lasting manner. The main problem with big data involves complexity. Information and data is growing exponentially

with time, as an increasing amount of data is made available on the internet. Furthermore, the number of insights, opportunities or hypotheses hidden in a dataset is exponential to the size of the datasets.

In achieving efficiency and ensuring the comprehensibility of visual representation resulted from big data, KPIs can be used, as to attain the goal of graphical excellence and to add value to the end result. Big data visualization requires skills that are not intuitive and the entire process relies on principles that must be learned. Each big data visualization created should follow a clear path to success, namely: attain, define, structure, extract, load, display, refine the data and interact with it.

Key performance indicators add value to the entire process by ensuring clarity in developing the strategy of the project, focus on what matters and requires attention, as well as improvement by monitoring the progress towards the desired state.

When developing a project of big data visualization, the process should follow a cursive and pre-defined flow in accordance with the project needs and the requirements of the end-user. These recommended stages are:

1. Acquiring the data: this is usually how the process starts, unrelated with the platform which provides the data. In the process of big data collection, there is also the issue of data selection. Instead of “just throwing it all in”, one should focus on selecting high quality data, which is relevant to the project’s objective and does not add noise to the end result. The noisier the data is, the more problematic it will be to see the important trends. It is suggested to have a clear strategy for the data sources required, as well as for the subsets of data relevant to the questions the project wants to answer to.

2. The next phase in the process refers to structuring of the acquired data. This includes the process of organizing the data to align it to one standard. The data store might be comprised of a combination of structured, semi-structured and unstructured data. At this stage, it is easier to identify the common aspects in each sets of data and to find relationships between the data at hand. This includes translating system specific data coding to meaningful and usable data (the platform where the data will be aggregated does not know that the set of data labeled “Customer No.” is the same as “# Customer” or “ID-Customer”).

3. After cleaning the data, filtering through enormous amounts of data and replicating the application logic to make the data self-describing, the process continues with loading the data in the preferred platform and choosing the visual mode of representation. In this stage, it can be noted if the background data is very noisy or high quality, as the emerging visual representation will be either hard to read or irrelevant to the strategic objective of the project, or clear and visually engaging.

By implementing key performance indicators along the project and linking them to the project objectives, the increased value will be added in the form of:

- Better quality of the visual representations;
- Fewer project delays;
- Less rework along the way;
- Improved productivity;
- Greater contribution to the visuals’ value;
- Enhanced growth and innovation of the visual representation;
- Easier project assessment.

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Choosing the right map type to communicate information

Written by Manuel Hila on February 4, 2015 in PERFORMANCE Magazine



Representing information in a visual manner through the use of maps is one of the biggest subsection of data visualization types. From planning a trip, to measuring a company's sales performance in different regions, maps allow a visual representation which communicates information quickly and adds a special dimension to the data.

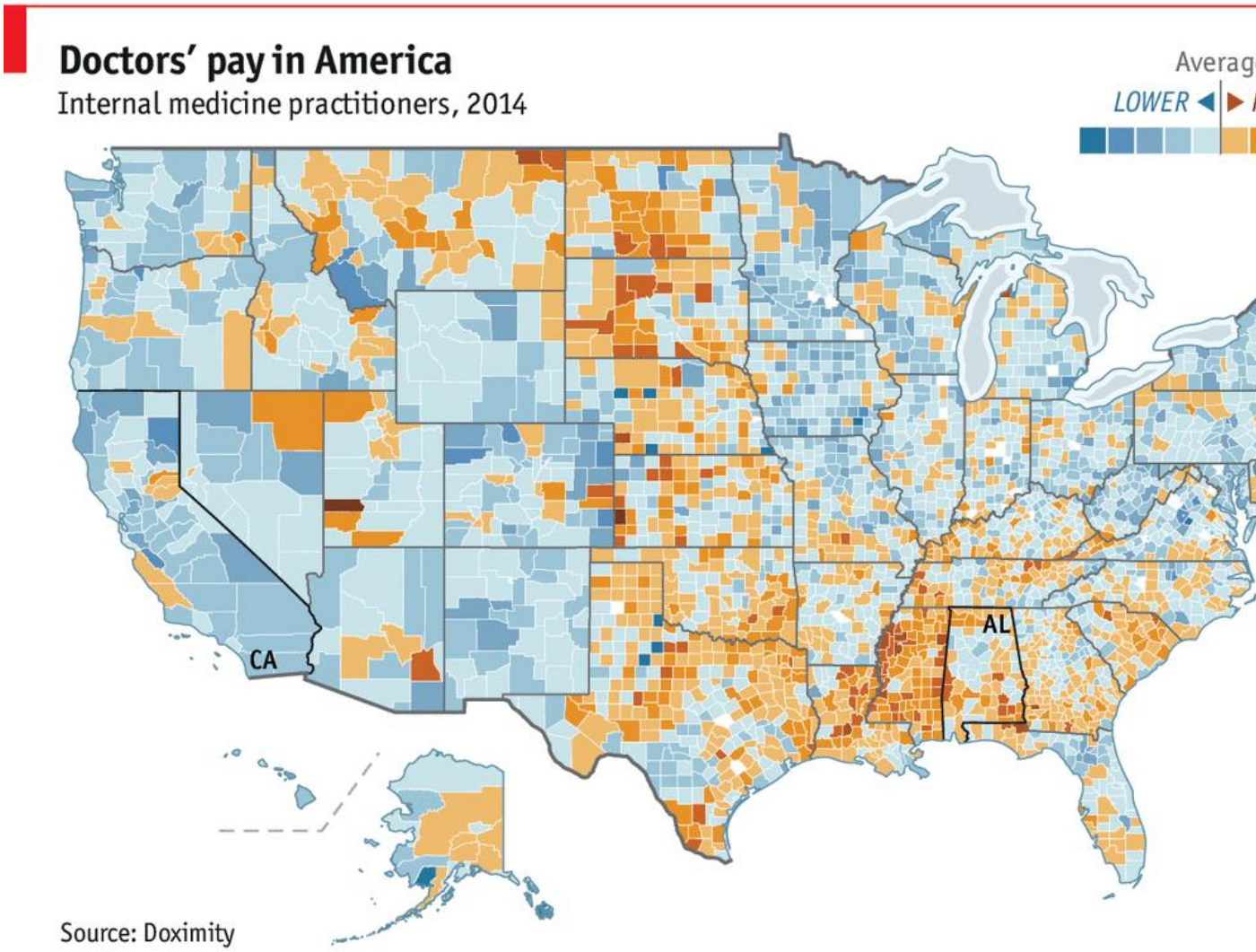
There are several map types, each with its strengths and weaknesses. These can be combined or altered to make new types of maps available or to diminish their flaws by adding value to the displayed information.

The most commonly used map types are:

1. Choropleth maps
2. Isopleth maps or heat maps
3. Proportional symbol maps
4. Pinpoint maps
5. Connection maps
6. Subway maps

1. Choropleth is the most widespread type of map. The name comes from two Greek words that signify area or region and multitude. Also, the name suggests a reference to color, which is the main aspect of this map type. In its visual representation, a color scale is allocated to categorical or numerical data and each region is colored according to the data value. This type of map generally uses political boundaries as regional delimitations. When used correctly, this map presents information in a clear and easy to understand manner.

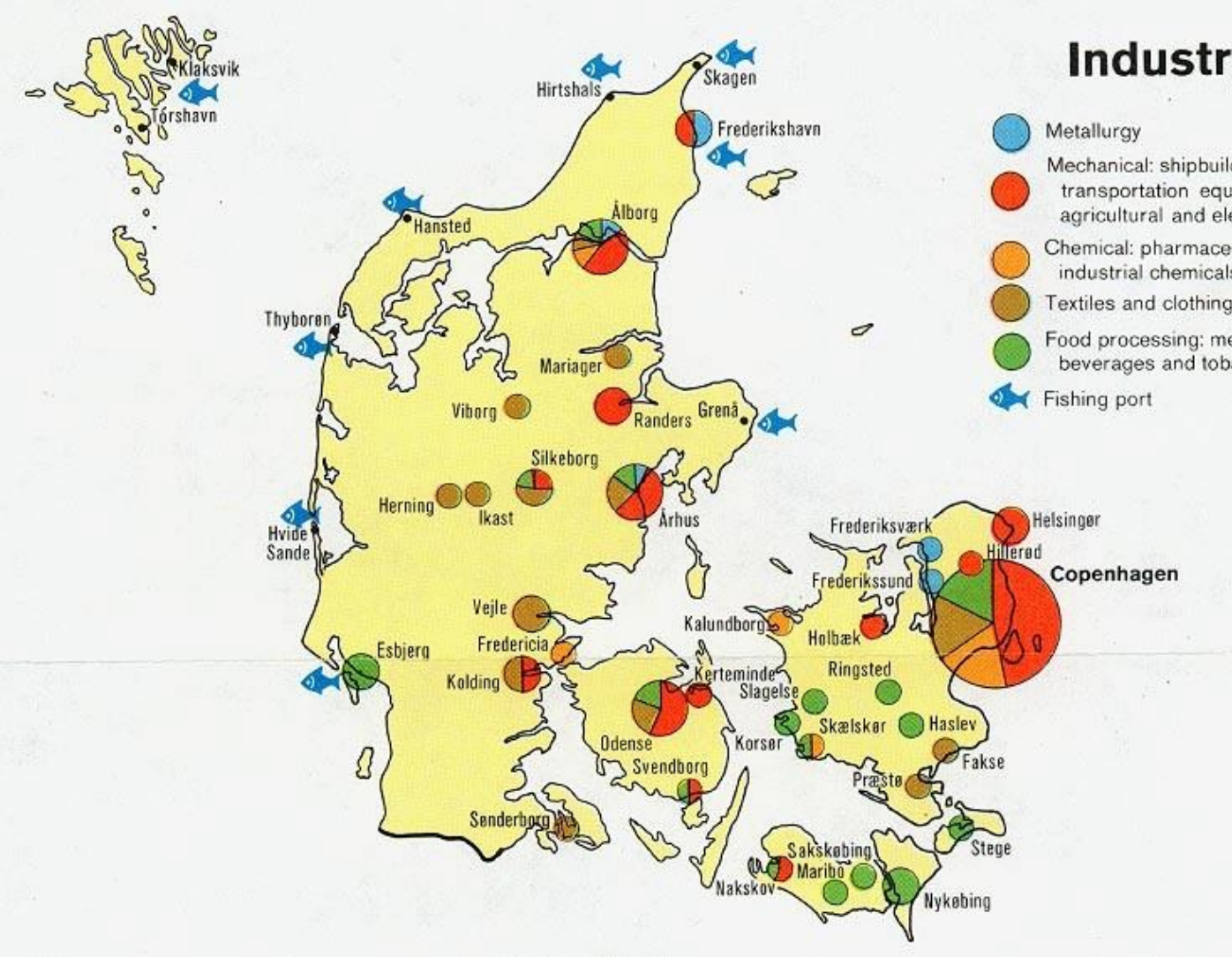
The below example represents the doctors' pay level in America. The values can go in two directions: from the average which is the middle, either towards higher or towards lower. Both of these directions have five different hues. Some choropleth maps offer additional information by providing an interval for each of the different color hues.



2. Isopleth maps are most commonly used for weather forecasts but they can also be radar maps, temperature maps or rainfall maps. The term "isopleth" means *range of quantity. It shows the gradual change over space but lacks sudden changes of border lines such as the ones in choropleth maps. The main disadvantage of this map type is that it requires a large amount of data for an accurate reporting.*

3. Proportional symbol maps use circles or some other simple shape centered on each region of interest. The shape differs in size according to the quantitative data. A very common visual representation of this map type is to use pie charts in place of the shape in order to add more data to a single map.

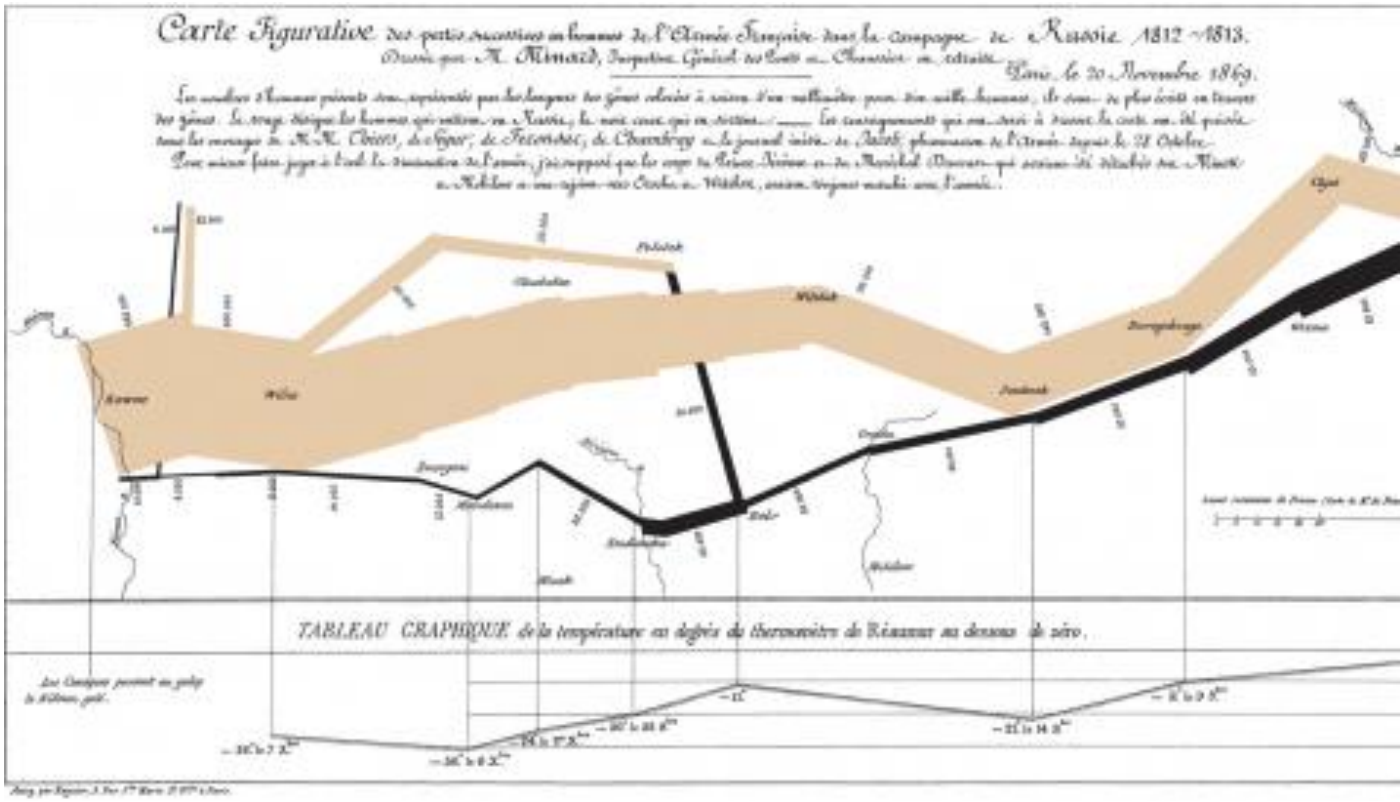
The following example reflects industries from Denmark as they were in 1974. Their proportions are expressed in each region as part of a pie chart.



4. Pinpoint maps show the exact location of certain things on a map. These have been increasing in popularity as more data sources are able to include exact location. Furthermore, as mobile devices continue to include more advanced GPS tracking options, pinpointing a certain person's location is becoming much easier. Twitter posts and Facebook check-ins are commonly mapped this way. Another version of this map is represented by searchable maps, like Google maps, that show the exact location of the items you searched for.

5. Connection maps are similar to the pinpoint maps but they have a small addition. Each point on the map is connected to the next. In many examples of this map type, the connections are abstract (like tweet replies of Facebook connections), and the connection lines are represented either with a straight or a curved line. These types of maps are, in essence, graphs or network data that has been drawn with a geo-spatial layout.

The famous map of Napoleon's march by Charles Joseph Minard is a version of a connection map with a quantitative dimension added. In this visual representation, the thickness of the connecting lines represents the size of each army at each geographical position.



6. Subway maps are a widespread and largely available version of the connection maps. The important aspect in this map type is the connection point and a lower accent is given to the exact geographical placement of that point. They are created by designers that simplify the routes of metros or subways to simple lines at different angles. This simplified visual representation increases the maps legibility and emphasizes the really important information: the stop name, desired destination and the route train/bus/metro take.

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