

PRESENTS CORE PRINCIPLES OF DATA VISUALIZATION

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ABOUT PMRC

The Policy Monitoring and Research Centre (PMRC) is a public policy research think tank whose vision is "Unlocking Zambia's Potential".

PMRC STATED AIM

- Producing high quality, relevant and timely public policy analysis, delivery monitoring and reform proposals.
- Promoting and encouraging informed public debate on social and economic policy issues critical to national development.



To deliver its mandate, PMRC works with, and leverages from the programmatic, information, communication and outreach networks of various institutions and organisations. These include governmental, civil society and citizen groups. This approach of collaboration has enhanced PMRC's relevance to national development through awareness of public policy.

PMRC'S THEMATIC FOCAL AREAS



INSTITUTIONAL LINKAGES WHO DO WE WORK WITH

POLICY MONITORING AND RESEARCH CENTRE



DATA VISUALASATION



WHAT IS DATA VISUALIZATION?

- **1. 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.
- 2. In the world of Big Data, **data visualization tools and technologies** are essential to analyze massive amounts of information and make data-driven decisions.
- 3. Data visualization is the **presentation of data in a pictorial or graphical format.** It enables decision makers to see analytics presented visually, so they can grasp difficult concepts or identify new patterns.
- 4. With interactive visualization, you can take the concept a step further by using technology to drill down into charts and graphs for more detail, interactively changing what data you see and how it's processed.
- 5. Its actually dates back from the 17th Century

WHY IS DATA VISUALIZATION IMPORTANT



Because of the way the human brain processes information, using charts or graphs to visualize large amounts of complex data is easier than poring over spreadsheets or reports. ... Data visualization can also: Identify areas that need attention or improvement

WHY IS DATA VISUALIZATION IMPORTANT



Data visualization is a quick, easy way to convey concepts in a universal manner – and you can experiment with different scenarios by making slight adjustments.

Data visualization can also:

- Identify areas that need attention or improvement.
- Clarify which factors influence customer behavior.

- Help you understand which products to place where.
- Predict sales volumes.
- Comprehend information quickly (see large amounts of data in clear, cohesive ways

 and draw conclusions from that information.)
- Pinpoint emerging trends (It's easy to spot outliers that affect product quality or customer churn, and address issues before they become bigger problems.)
- Identify relationships and patterns (Identifying those relationships helps organizations focus on areas most likely to influence their most important goals.)
- Communicate the story to others (Using charts, graphs or other visually impactful representations of data is important in this step because it's engaging and gets the message across quickly.)



PRINCIPLES OF DATA VISUALIZATION



The best data in the world won't be worth anything if no one can understand it. The work of a data analyst is not only to collect and analyze data, but also to present it to the end users and other interested parties who will then act on that data. Here's where data visualization comes in.

KEEP YOUR AUDIENCE IN MIND



Any data visualization should be designed in such a way that it meets the needs of the audience and their information needs. As such, you need to determine exactly who is in that audience, and the kind of questions they may need answers to.

CHOOSE THE CHART WISELY



Not all charts are equal, and some will do a better job at displaying certain kinds of information than others.

THINK BEYOND THE POWERPOINT TEMPLATES



PowerPoint is by far the most popular visualization tool, but the built-in templates in the program might not be doing your data any favors. Try to keep your visualizations as simple and uncluttered as possible. If you really want to go for it Design Bundles has a great selection of tools for infographics. These can look spectacular and really make data sing.

FORM FOLLOWS FUNCTION



How will your audience use the data? Consider this and let it determine how you will present the data. Think of your audience as the dashboard of a cockpit, and be sure to only present the most useful, relevant information and in the clearest way possible.

DIRECT ATTENTION TO THE IMPORTANT DETAILS



As you design your visualizations, be sure to leverage the sensory details like size, color, graphics, and fonts to direct the attention of your audience to the most important pieces of the information.

USE TABLES AND GRAPHS APPROPRIATELY



Tables should be used when you want to display precise values. Graphs should be used to present information with regards to data patterns, relationships, and how things change over time.

PROVIDE CONTEXT



A well-done presentation should prompt the user to act on the presented data. However, this is hard to achieve if the context for that action has not been provided. Use size, color, and other visual cues to provide context, and be sure to include some short narratives to highlight the key insights

ALIGN THE DATA AND THE DISPLAYS RIGHT



Ensure that your displays of information are vertically and horizontally aligned, to make sure that the can be compared accurately. This also helps to prevent misleading optical illusions with your presentation.

CHOOSE THE RIGHT COLORS



You should add color to draw the attention of the audience to key data pieces, not just to brighten your presentation. Moreover, choose your color combinations wisely. For instance, you don't want to use red and green in the same diagram, since they will appear brown to color blinded people.

PAY CAREFUL ATTENTION TO TITLES



Give your graphs and charts useful, explanatory titles. This helps to highlight the focus of that presentation. View titles as the headline that draw people in, give them a snapshot of key insights and focuses them on the right questions.

USE CLEAR AXIS LABELS AND NUMBERS



Steer away from fancy gauges and labels that can affect the clarity. Always start at zero when labeling the axis of a graph or chart, unless there's a strong reason not to, such as when the data has been clustered at unreasonably high values.

LEVERAGE INTERACTIVITY WHEN APPROPRIATE



The newer generations of data visualization tools allow you to build interactivity into visualizations that can benefit the end user. However, remember that this is more of a parlor trick, which should be used when the interactivity helps to clarify, and not confuse the data presentation.



These basic principles should help you increase the effectiveness of your data presentation and communication. This way, key stakeholders will be in a better position to make better, and more informed decisions based on the data you have gathered and presented.

LAYING THE GROUNDWORK FOR DATA VISUALIZATION

Before implementing new technology, there are some steps you need to take. Not only do you need to have a solid grasp on your data, you also need to understand your goals, needs and audience. Preparing your organization for data visualization technology requires that you first:

- Understand the data you're trying to visualize, including its size and cardinality (the uniqueness of data values in a column).
- Determine what you're trying to visualize and what kind of information you want to communicate.
- Know your audience and understand how it processes visual information.
- Use a visual that conveys the information in the best and simplest form for your audience.

LAYING THE GROUNDWORK FOR DATA VISUALIZATION

Once you've answered those initial questions about the type of data you have and the audience who'll be consuming the information, you need to prepare for the amount of data you'll be working with. Big data brings new challenges to visualization because large volumes, different varieties and varying velocities must be taken into account. Plus, data is often generated faster that it can be managed and analyzed.

There are factors you should consider, such as the cardinality of columns you're trying to visualize. High cardinality means there's a large percentage of unique values (e.g., bank account numbers, because each item should be unique). Low cardinality means a column of data contains a large percentage of repeat values (as might be seen in a "gender" column).

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.
- 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.
- 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.

TYPES OF VISUALIZATION

More specific examples of methods to visualize data:

Common general types of data visualization:

ChartsTables

- Graphs
- Maps
- Infographics
- Dashboards
- Video Animations

- Area Chart
- Bar Chart
- Box-and-whisker Plots
- Bubble Cloud
- Bullet Graph
- Cartogram
- Circle View
- Dot Distribution Map
- Gantt Chart
- Heat Map
- Highlight Table
- Histogram
- Matrix
- Network
- Polar Area

- Radial Tree
- Scatter Plot (2D or 3D)
- Streamgraph
- Text Tables
- Timeline
- Treemap
- Wedge Stack Graph
- Word Cloud
- And any mix-and-match combination in a dashboard!

2019

Million

EXAMPLES OF DATA VISUALIZATION

THE NATIONAL BUDGET 201

- 1. General Public Service- ZMK 31.3 Billion or 36.0%
 - a) External Debt Payment- ZMK 14. 9 Billion
 - b) Domestic Debt payment- ZMK 8.6 Billion.
 - c) Local Government Equalisation Fund- ZMK 1.2 Billi
 - d) Zambia Revenue Authority- ZMK 900 Million
 - e) Compensation and Awards- ZMK 200 Mi
 - f) Public Affairs and Summit Meetings- ZM
 - g) Constituency Development Fund- ZMK 249.
- 2. Defence- ZMK 5.1 Billion or 5.8%
- 3. Public Order and Safety- ZMK 2.8 Billion 3.3%
- 4. Economic Affairs- ZMK 20.7 Billion or 23.8%
 - a) Road Infrastructure- ZMK 6.5 Billion
 - b) Farmer input support programme (e-voucher)- ZM
 - c) Strategic Food Reserves- ZMK 672 Million
 - d) International Airports ZMK 1.6 Billion
 - e) Rural Electrification- ZMK 182.5 Million
 - f) Energy Power Infrastructure- ZMK 415.8 Million
- 5. Environmental Protection- ZMK 875.1 Million or 1.0%
 - a) Climate Change Resilience- ZMK 213 Million
- 6. Housing and Community Amenities- ZMK 2.2 Billion or 2.6 %
 - a) Water Supply and Sanitation- ZMK 2 Billion (1.98 Billion)
 - b) o/w Lusaka Sanitation Project (Millennium Challenge)- ZMK 175 Million
 - c) Kafue Bulk Water Supply and Sanitation Project- ZMK 267.8 Million
 - d) Kafulafuta Water Supply Scheme Project- ZMK 416.6 Million
 - e) Nkana Water Supply and Sanitation Project II- ZMK 304.5 Million
 - f) Markets and Bus Stations- ZMK 16. 8 Million
- 7. Health- ZMK 8.1 Billion or 9.3 %

General Public Service- ZMK 31.3 Billion or 36.0%

- a) External Debt Payment- ZMK 14. 9 Billion
- b) Domestic Debt payment- ZMK 8.6 Billion.
- c) Local Government Equalisation Fund-ZMK 1.2 Billion
- d) Zambia Revenue Authority- ZMK 900 Million
- e) Compensation and Awards- ZMK 200 Million
- f) Public Affairs and Summit Meetings- ZMK 176.5 Millie
- g) Constituency Development Fund- ZMK 249.6 Million
- 2. Defence- ZMK 5.1 Billion or 5.8%
 - Public Order and Safety- ZMK 2.8 Billion 3.3%
 - Conomic Affairs- ZMK 20.7 Billion or 23.8%
 - ad Infrastructure- ZMK 6.5 Billion
 - input support programme

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EXAMPLES OF DATA VISUALIZATION



EXAMPLES OF DATA VISUALIZATION



CARTOON ANIMATIONS





PMRC POLICY ANALYSIS OF SI No. 63 OF 2014

THE PUBLIC SERVICE (RETIREMENT AGE) REGULATIONS, 2014

On 19th November 2014 Government issued Statutory Instrument No. 63 of 2014. The Statutory Instrument refers to the increment of the statutory retirement age from 55 years to 65 years for persons serving on pensionable terms in the public service. The committee commissioned to recommend changes to retirement age sited financial challenges of the Public Service Pensions Fund (PSPF) and the fact that Zambia has the lowest retirement age in the region among other reasons.

However there is need to review the increase in the retirement age to ensure that it takes into account socioeconomic determinates of the retirement age such as the age structures of the population and the incidence of HIV/AIDS that have lowered life expectancy. An optimum retirement age will ensure that Zambia maintains an efficient and productive labour force.

To read the full PMRC Policy Analysis of SI No. 63 of 2014, please go to our website:

http://pmrczambia.org

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PMRC ENERGY POLICY THE IMPACT OF REMOVAL OF ELECTRICITY SUBSIDIES ON SMALL AND MEDIUM SIZED ENTERPRISES AND POOR HOUSEHOLDS

Electricity subsidies benefit the rich more than the poor. The richest Zambians currently receive nearly five times more in subsidies than the poor, according to a new research commissioned by *Policy Monitoring and Research Centre (PMRC)*. Given how unfair the current subsidy is, the government's aim of reforming subsidies by the end of 2017 is the

These conclusions are based on rigorous distributional analysis that will form part of PMRC's forthcoming report considering the impact of removing electricity subsidies on individuals and businesses. This analysis has revealed stark findings that demonstrate the regressive nature of energy subsidies and the consequences of removing them.

right move. But care also needs to be taken to protect the poorest when subsidies are cut.

To read the full PMRC Policy Energy Reform, please go to our website:



DATA VISUALIZATION THROUGH VIDEO



Seventh National Developement Plan

LINK: https://www.youtube.com/watch?v=Za86zyGpp3Q



Measles Explained — Vaccinate or Not?

LINK: https://www.youtube.com/watch?v=y0opgc1WoS4&feature=youtu. be&list=PLFs4vir_WsTyXrrpFstD64Qj95vpy-yo1

SKILLS REQUIRED FOR DATA VISUALIZATION

A data analyst must be able to facilitate meetings, make the right requests and be an active listener in order to assimilate new information. Your communication proficiency should also cut across different digital platforms such as Internet, conference calls, SMS among others.

- 1. Campaign Management (Adobe Campaign): To become a successful data analyst, you need to get a good grasp of this software. It allows you manage your data and makes it possible for you to monitor your cross-channel campaigns from a particular place. Don't just get familiar with this important tool, get confident with it.
- 2. Analytical and Creative Mind: You need to show that you are passionate about the industry and that you possess a creative and analytical mind for anyone to take you serious. Go ahead and create campaigns and projects of your own to showcase your creativity.
- **3.** Advanced Microsoft Excel: You cannot separate Excel form data analysis as it plays a very important role in the process. Make sure you know your way around the numerous functions available on Excel to be successful in data analysis profession.

SKILLS REQUIRED FOR DATA VISUALIZATION CONT.

- **4. Teamwork:** The Data and analytics industry is not different from other industries when it comes to preferring with relevant experience of working with people in a team over those who don't. In as much as the majority of data analytic work may be done independently, you still need a team to execute certain projects.
- **5.** Scripting and Statistical Language: You need to know such scripting and analytical languages as Python, Matlab, R and SAS
- 6. Adobe and Google Analytics: Though Google Analytics is the most popular analytical tool, Adobe Analytics is also very useful in powerful analytics. Acquiring an advanced understanding of these tools will definitely boost your chances of beating competitions in the market.
- 7. Structured Query Language (SQL) Programming: SQL is a very important language when it comes to data analysis.

TOP 11 BIG DATA VISUALIZATION TOOLS TO MAKE SENSE FROM CLUSTERED DATA



TOP 10 BIG DATA VISUALIZATION TOOLS TO MAKE SENSE FROM CLUSTERED DATA

With the amount of data being generated every second, it is vital to envisage the data to trace trends, outliers, patterns and interact with it to make informed decisions.

1. FusionCharts Suite XT

FusionCharts is a part of InfoSoft Global, which is a software provider of data visualization products. It is used over 80% of Fortune 500 companies. The idea of FusionCharts came to a 16-year-old Pallav Nadhani in 2001, who while completing his school assignment found himself dissatisfied with Microsoft Excel charting capabilities. The charts come with default modes and it claims that the very first chart can be created within 15 minutes. It comes with Extensive Docs, Ready to use dashboards and personalized Tech Supports. It gives more than 90 charts and graphs, right from the simple one to the more advanced ones like Funnel, Heat, Map, Zoom Line, Multi-Axis and Treemap Charts.



1/10

TOP 10 BIG DATA VISUALIZATION TOOLS TO MAKE SENSE FROM CLUSTERED DATA 2/10

2. QlikView

QlikView is a product of Qlik, a software company based in Radnor, Pennsylvania, United States. QlikView is one of the fastestgrowingBusinessIntelligenceandDataVisualization tools which is easy to engage with. It provides Associative Search which makes decision-making uncomplicated. Its Associative Experience lets you focus on the most relevant data, whenever and wherever you require. It provides a real-time collaboration with co-workers and partners, a comparative analysis of data, lets you combine your pertinent data into a single app and makes sure that the right people of the organization have access to the information, through its reliable security features.



TOP 10 BIG DATA VISUALIZATION TOOLS TO MAKE SENSE FROM CLUSTERED DATA 3/10

3. Tibco Spotfire

Tibco Spotfire is an analytics and business intelligence platform which gives you a quick insight into your data. It is available in Desktop, Cloud and Platform Editions. It has an AI driven recommendation engine which dramatically shortens data discovery time. Its feature of Data Wrangling helps you to quickly spot data outliers, inconsistencies, and deficiencies. During 2010 World Cup, FIFA used the software to give viewers analytics on country teams' past performances. Spotfire power users include Procter and Gamble, Cisco, NetApp, Shell.



TOP 10 BIG DATA VISUALIZATION TOOLS TO MAKE SENSE FROM CLUSTERED DATA 4/10

4. Watson Analytics

Watson Analytics is IBM's cloud-based analytics service which helps you to quickly find insights in your data. When you upload your data on Watson Analytics, it shows you the questions it can help you to answer and then provides you with data visualizations instantly based on it. You can explore your data through natural language processing too. Its other key features include automated predictive analytics, oneclick analysis, smart data discovery, simplified analysis, accessible advanced analytics, self-service dashboards. Watson analytics also enables cognitive computing which in turn brings more insightful information from the data.



TOP 10 BIG DATA VISUALIZATION TOOLS TO MAKE SENSE FROM CLUSTERED DATA 5/10

5. Sisense

It's easy to use interface imparts a hassle-free operation to the non-techies. It does an ad-hoc analysis of high volume data and enables to gather information from all your sources into a single and accessible repository, thus making it a single platform managing the entire Business Intelligence workforce. It can also analyze data in real-time. For example- If during the peak season, the trends in sales have to spotted, it can provide a great insight into the vast amount of data quickly which can be traced as it occurs. The popular customers include eBay, Merck, NASA, ESPN, SONY.



TOP 10 BIG DATA VISUALIZATION TOOLS TO MAKE SENSE FROM CLUSTERED DATA 6/10

6. Tableau

Tableau makes you see and understand your data by combining data from multiples sources in few clicks. Through this you can create interactive and flexible dashboards making use of custom filters and its drag and drop functions. Tableau claims to work naturally with the way you think- Ask questions, change perspectives and reveal the meaning. It is available in desktop, online and service editions. You can share your data and dashboards quickly with Tableau online and Tableau server. It also has a plentiful of online video tutorials which make it easy to use, especially for the non-techies.



TOP 10 BIG DATA VISUALIZATION TOOLS TO MAKE SENSE FROM CLUSTERED DATA 7/10

7. Datawrapper

Datawrapper is easy to use tool for creating visualizations like infographics, maps, data tables and responsive charts like line, bar, stacked bar, donut, etc. Its use it popular among publishers and journalists. The popular users include The Washington Post, The Guardian, Buzzfeed, The Wall Street Journal. Its very easy to use and need not be a coder to use it.



Made with Datawrapper

TOP 10 BIG DATA VISUALIZATION TOOLS TO MAKE SENSE FROM CLUSTERED DATA 8/10

8. Microsoft Power BI

Microsoft Power BI is a business analytical tool which makes it easy for businessmen to visually analyze their data and form strategies based on it. It provides an access to on-premise and in-cloud data. It has two pricing plans, out of which one can be acquired for free. The free one comes with 1GB data limit, allows you to create, make and share dashboards and reports. The Power BI Pro has all power BI features, can consume live data with full interactivity, share data queries through the Data Catalog and much more.



TOP 10 BIG DATA VISUALIZATION TOOLS TO MAKE SENSE FROM CLUSTERED DATA 9/10

9. Infogram

Infogram is a data visualization and infographic company founded by Uldis Leiterts, Raimonds Kaže and Alise Semjonova in 2012. It lets you choose from more than 1 million images to make infographics. It makes accessing data easy by letting you edit the data in the editor and connect to your desirable cloud service. Some of its users are Deloitte, Nielsen, Skyscanner, and MSN. It's easy to use steps makes the educators, journalists and business professionals to conveniently visualize their data. It has created over 4.8 million infographics, that are viewed by over 500 people every month.



TOP 10 BIG DATA VISUALIZATION TOOLS TO MAKE SENSE FROM CLUSTERED DATA 10/10

10. Plotly

Plotly or Plot.ly is a data visualization tool with the company's headquarters in Montreal, Quebec. It lets you make interactive charts, presentations, and dashboards. Plot.ly has a graphical user interface for importing and analyzing data into a grid and using stats tools. It uses web native D3.js for all of its graphics. It makes dashboards easy to create by Excel users, SQL database connectors, Python, R, and MATLAB.





Visualizing Big Data can help companies glean new insights and form strategies which can bring profits and make them understand their clients. As Jonsen Carmack rightly says, **"Both data visualizations and infographics turn data into images that nearly anyone can easily understand- making them invaluable tools for explaining the significance of digits to people who are more visually oriented."**

We at NewGenApps specialize in making sense out of large data sets both curated and non-curated. If you are looking for a company to give you insights that matter for your business then feel free to contact us.

CHALLENGES OF DATA VISUALIZATION

THE PROBLEMS WITH VISUALIZATION



PROBLEM NO. 1

1. The oversimplification of data. One of the biggest draws of visualization is its ability to take big swaths of data and simplify them to more basic, understandable terms. However, it's easy to go too far with this; trying to take millions of data points and confine their conclusions to a handful of pictoral representations could lead to unfounded conclusions, or completely neglect certain significant modifiers that could completely change the assumptions you walk away with. As an example not relegated to the world of data, consider basic real-world tests, such as alcohol intoxication tests, which try to reduce complex systems to simple "yes" or "no" results—as Monder Law Group points out, these tests can be unreliable and flat-out inaccurate.

THE PROBLEMS WITH VISUALIZATION



PROBLEM NO. 2

2. The human limitations of algorithms. This is the biggest potential problem, and also the most complicated. Any algorithm used to reduce data to visual illustrations is based on human inputs, and human inputs can be fundamentally flawed. For example, a human developing an algorithm may highlight different pieces of data that are "most" important to consider, and throw out other pieces entirely; this doesn't account for all companies or all situations, especially if there are data outliers or unique situations that demand an alternative approach. The problem is compounded by the fact that most data visualization systems are rolled out on a national scale; they evolve to become one-size-fits-all algorithms, and fail to address the specific needs of individuals.

THE PROBLEMS WITH VISUALIZATION



3. Over-reliance on visuals. This is more of a problem with consumers than it is with developers, but it undermines the potential impact of visualization in general. When users start relying on visuals to interpret data, which they can use at-a-glance, they could easily start over-relying on this mode of input. For example, they may take their conclusions as absolute truth, never digging deeper into the data sets responsible for producing those visuals. The general conclusions you draw from this may be generally applicable, but they won't tell you everything about your audiences or campaigns.

THE PROBLEMS WITH VISUALIZATION



PROBLEM NO. 4

4. The inevitability of visualization. Already, there are dozens of tools available to help us understand complex data sets with visual diagrams, charts, and illustrations, and data visualization is too popular to ever go away. We're on a fast course to visualization taking over in multiple areas, and there's no real going back at this point. To some, this may not seem like a problem, but consider some of the effects—companies racing to develop visualization products, and consumers only seeking products that offer visualization. These effects may feed into user overreliance on visuals, and compound the limitations of human errors in algorithm development (since companies will want to go to market as soon as possible).



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