

What's **WRONG** with This Picture?



DATA PRESENTATION AND  
BUSINESS PERFORMANCE

**COGNOS**<sup>®</sup>

THE NEXT LEVEL OF PERFORMANCE™

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## Abstract

Despite collecting a wealth of data about the finance and operations of their business, many companies still have difficulty understanding the basics about their performance and making the right decisions. This paper explores the possibility that the problem is not the amount of data companies work with, but in the ways that data is presented.

Many data presentations (graphs, charts, tables, and so on) are either poorly designed or filled with clutter that distorts and misleads. A company that fixes this problem will not only increase the return it generates from existing data and applications; the resulting improved decisions will improve its overall performance. This White Paper looks at why we may have a data presentation problem, its repercussions, and how we can solve it.

## Problem? What Problem?

We often hear that companies are “drowning in data.” That the opportunities, threats, trends, and other business information that people need to see lie buried in an avalanche of undistinguished numbers. To some extent this is true. Data volumes are growing at a torrential pace<sup>1</sup>. And when people need to make decisions about products, customers, and investments, they are often at a loss to know which data to use or where to start. But this doesn’t fully explain the problem.

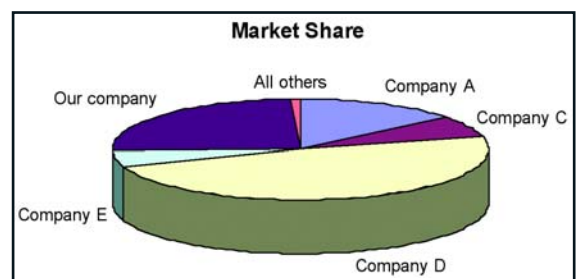
This becomes clear if we follow the problem as it’s currently presented to its logical conclusion: if the biggest barrier to better decisions is having too much data, then having less of it should be the answer. With less data, trends in product performance would emerge. People would see their best customers. Investment opportunities would reveal themselves and people could make the right decisions.

This is unlikely to happen. So where does the answer lie? We offer one explanation:

Rather than drowning in *volumes* of data, companies are drowning in *presentations* of data. But more than their sheer *quantity*, the problem is one of *quality*. Most of the graphs and tables created in a typical company are bad. Instead of informing, they exaggerate, distort, or mislead. Instead of communicating, they confuse with distracting color schemes, runaway font treatments, and other visual clutter.

Graph designs can also work against the data. Consider the difference between the two graphs below. Suppose an executive needs to know the market share of hers and other companies in her industry. Which graph communicates this best?

Figure 1

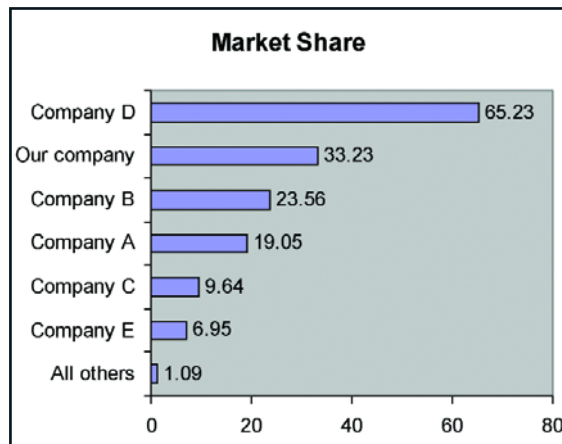


With Figure 1, it’s clear that “Company D” has the greatest market share. But the clarity ends there. Could the executive determine her company’s market share compared to its competitors? Does the use of three dimensions convey more information than two? In this graph, the display works against the data. There’s a lot of ink in this graph, but no story.

<sup>1</sup> Thirty percent of companies with revenues in excess of \$500 million can expect their data warehouses to double in size over the next three years. IDC #34243 *SAP Business Intelligence Accelerator: A High-Performance Analytic Engine for SAP NetWeaver Business Intelligence*.

Figure 2 presents the same information in a bar graph. Here, the display works with the data to communicate a clear picture. It's obvious that "Our Company" ranks second, 10 percentage points better than Company B, with a market share of 33.23 percent.

Figure 2



This problem goes beyond aesthetics. It can directly hurt business performance. Poorly designed reports can lead to poor business decisions because they fail to communicate a clear picture of what's really going on. Without this understanding, people must choose from an array of undesirable options: act on what they think the report means; delay a decision, or avoid making one altogether.

This is also a systemic problem. Bad reports plague all industries at every level of an organization – from simple sales reports to executive dashboards. “Most presentations of quantitative business data are poorly designed – painfully so, often to the point of misinformation,” writes information design expert Stephen Few. “This problem, however, is rarely noticed.”<sup>2</sup>

Why does this problem exist? And why – with margins so thin and competition so fierce – is it allowed to continue?

The problem exists largely because we're not aware there is a problem to begin with. Instead, writes Few, we confuse computer skills with communication skills. “Knowing how to use Excel does not make you a data analyst and knowing how to use PowerPoint does not necessarily make you a communicator.”<sup>3</sup>

Data analysis and communication requires a set of skills that must be learned.<sup>4</sup> Yet less than one percent of those who prepare tables and graphs have been trained to design them for effective communication.<sup>5</sup>

BI software can compound the problem. Modern applications make it as easy to work with data as does MS Word with text. This makes it just as easy for people to build a good report as it is a bad one.

<sup>2</sup> Stephen Few, *Designing Effective Tables and Graphs*, 2004.

<sup>3</sup> Stephen Few, *Discovering the Source of Business Intelligence Within*, B-Eye Network, Dec. 13, 2005.

<sup>4</sup> *ibid.*

<sup>5</sup> Stephen Few, *Rare Business Assets: Tables and Graphs that Communicate*, Perceptual Edge, 2004.

## The Missing Link

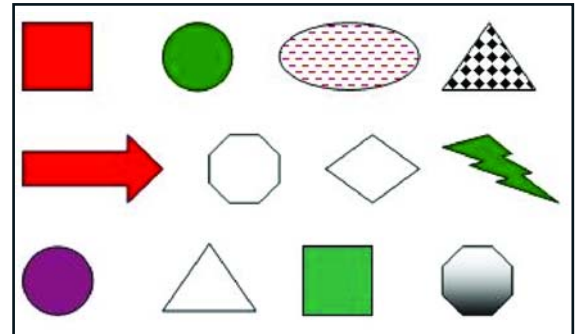
Successful reports depend on two criteria: having the right data; and presenting it in the right way. BI software on its own can satisfy the first. But it takes people – human intelligence – to satisfy the second.

“The “intelligence” of business intelligence resides in people, not machines.” writes Few. “What is meaningful in the data must be recognizable to the eyes.”<sup>6</sup> Many BI users know what is meaningful – trends, exceptions, cause-and-effect relationships. And in most reports the data is there. But the story it needs to tell is not. In building their reports, people unknowingly fail to take into account the critical link between perception and understanding: between the way the data is organized on a computer screen and the way it’s understood by the people viewing it.

Perception and understanding are inextricably linked. When presented with disparate visual items (in a BI report or elsewhere), the brain automatically tries to make sense of them. It looks for patterns, contrasts, repetitions, and similarities. These shape the conclusions that people make in their minds. Report authors need to understand this process. Otherwise, they risk building reports that – however accurate the source data – lead their users to the wrong conclusions. “Accidental commonalities in design can easily induce false groupings in the eyes of viewers,” writes data visualization expert Edward Tufte. “Viewers [can] mistake decorative tints for real information.”<sup>7</sup>

Figure 3 demonstrates this principle. Readers will most likely make a connection between the red square and the red arrow; or form a group including the green circle, square, and lightning bolt. Yet there is no information to explain if these shapes are actually connected, why the circles are different colors, or why one triangle is shaded and one is not.

Figure 3



Can you understand the connections? Chances are, your brain has already made up its mind which shapes are connected. Yet there is no additional information to explain why some shapes have colors and others do not, or the meaning of the shading in the triangle and the octagon. If this same treatment was applied to data in a report, would you be drawing the right conclusions?

*“When principles of design replicate principles of thought, the act of arranging information becomes an act of insight.”*

Edward Tufte, *Visual Explanations*

<sup>6</sup> *ibid.*

<sup>7</sup> Edward R. Tufte, *Visual Explanations*, Graphics Press, 1997.

## Keep it Simple. Show the Data.

The solution to this problem is better education. But how do we begin? By following two simple principles of data presentation: Keep it simple. Show the data. The two famous examples below demonstrate these principles. It should also be noted that both date from the 19th century – well ahead of any data presentation software, BI or otherwise.

### *Keep it Simple: Dr. Snow's Cholera Map*

In 1854, London was hit with an outbreak of cholera. In 10 days, the disease had killed 500 people and officials were at a loss for answers. Six years earlier, London doctor John Snow had proposed that cholera was spread through contaminated water. But he had yet to find proof.

With the death toll rising, Dr. Snow took an innovative approach. He plotted the location of cholera deaths on a map of central London, using dots to indicate deaths and crosses to indicate the area's water pumps. With this technique, Dr. Snow observed that cholera deaths were concentrated in the area surrounding the Broad Street water pump. He ordered the handle of the pump removed, thus containing the outbreak and proving his theory.

Figure 4



*A section of Dr. Snow's famous "cholera map" showing the concentration of cholera incidents near the contaminated pump. The pump is located near the left-hand side, just to the right of the D in BROAD STREET.*

*Modern health officials use the techniques pioneered by Dr. Snow to understand the diffusion and spread of diseases within communities and around the world.*

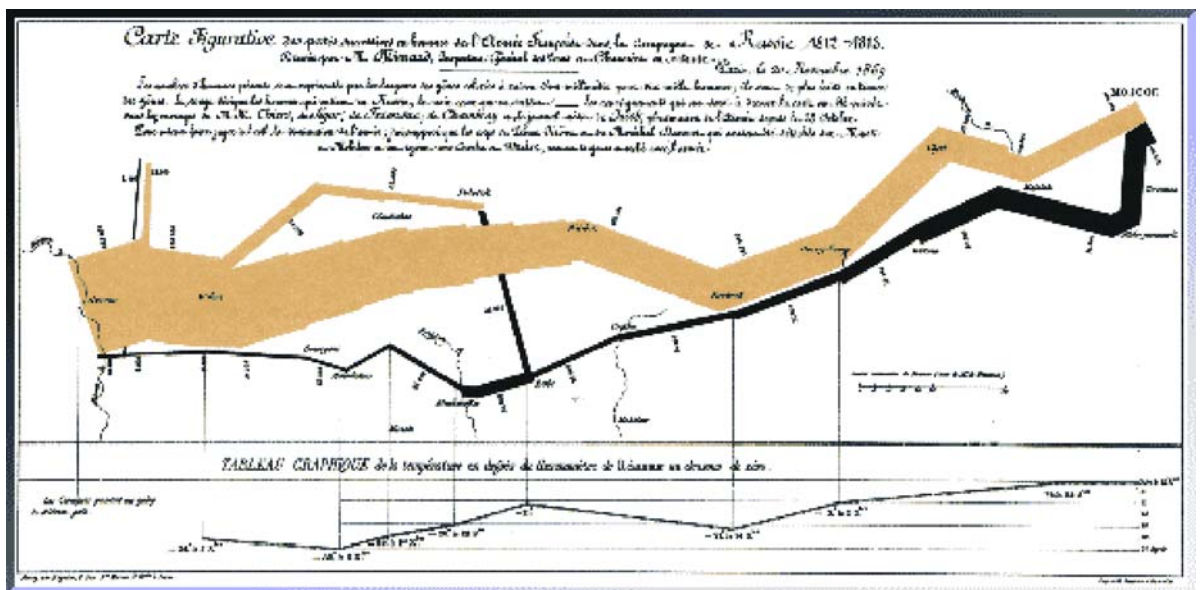
*Show the Data: Napoleon's Defeat*

In June 1812, Napoleon began his invasion of Russia with 422,000 men. In September, defeated, he began his retreat from Moscow. By December, the army finally left Russian territory. The disastrous campaign had cost more than 400,000 lives.

Charles Joseph Minard told the story of the campaign with brutal efficiency with his 1861 map.

The width of the band indicates the size of the army at each location. The army's march east begins on the left-hand side at the Polish-Russian border in June 1812. The path of the army's retreat from Moscow is depicted by the darker, lower band, which is linked to a temperature scale and dates at the bottom of the chart. At a mere glance, one can see the path of Napoleon's retreat and the scope of the losses sustained by his army in the bitter Russian winter.

Figure 5



Minard's map plots six variables on a two-dimensional surface: (1) the size of the army as indicated by the line width; (2,3) the latitude and longitude of its various locations; (4) the direction of its movement; and (5,6) the temperature and dates during the retreat from Moscow.

*"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."*

Edward Tufte, Visual Explanations

## In the Real World

What can business learn from hundred-year-old maps? By keeping things simple, Dr. Snow's cholera map revealed a previously unknown relationship (cholera and water) that led to direct corrective action (removing the pump handle). By showing a complex interplay of multivariate data, Minard's Napoleon map tells a clear and compelling story.

Cause-and-effect relationships. Direct corrective action. The complex interplay of multivariate data. A clear and compelling story. These are precisely the qualities that people need from their business intelligence.

Luckily, modern BI applications make it easy for report authors to keep things simple and show the data. And the benefits of doing so are significant. And just as a small error can lead to large errors in judgment, small corrections can bring about large improvements, as shown in the real-world examples below.

Figure 6 is a sales report that a typical sales manager might see. It has typical flaws. These include:

No discernible visual hierarchy:

- Chart is very prominent but table goes unnoticed
- Report title is too small and needlessly underlined
- "Product name" prompt goes unnoticed
- X-axis of graph has unnecessary title, given context of report
- Shade of blue in table doesn't match blue in chart

Language is unclear:

- Prompt has no label
- Duplication of "Product" in table headings, product names and "tents"

Not informative:

- report fails to answer key questions: who is it for? what is the time period? are the results good or bad?

Figure 6



Figure 7 is based on the same data. By simplifying the layout and language, and by focusing on on the data, we can see:

- Revenue from all tents in the U.S. from 2004 to 2006 totalled \$970,111.60
- “Star Dome” tents are the best-sellers but have a lower margin
- “Star Peg” tents have the highest margin but are the poorest sellers

To arrive at this report, we made the following changes:

Establish Visual Hierarchy:

- 2x1 row/column grid in title area for title and image to provide focus
- 3x4 row/column grid in body to simplify the layout
- Removing table and placing values on graph to simplify data

Apply Clear Language:

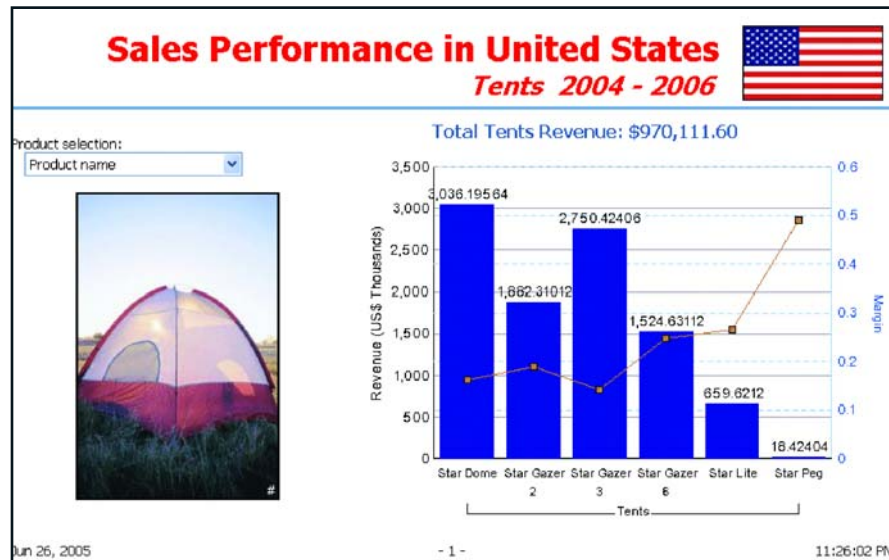
- Adding label to prompt to provide clarity (drill down to individual product performance)
- Eliminating chart eliminates duplicated words

Informative:

- report creation date, time period, product margin, sales region, and total revenue all clearly indicated

This report is simple. It shows the data. It also communicates important information that a sales manager can use. And it was built with Cognos software.

Figure 7



# Cognos 8 Business Intelligence

For more than 30 years, Cognos has been helping its customers transform their vast stores of corporate data into reports and other formats that communicate the truth about their performance.

Cognos is the world leader in business intelligence and performance management software for the enterprise. Our software is used by the largest organizations in every industry, around the world. For example:

- 9 of the top 10 banks in the U.S. and in Europe use Cognos.
- 19 of the 20 largest consumer packaged goods manufacturers use Cognos.
- 24 of the top 30 pharmaceutical firms choose Cognos.
- Cognos is a leading provider of BI software to major public sector organizations including defense, education, and emergency services, in countries around the world.

## *Proven Results*

The return on investment that Cognos software delivers to its customers is well-documented. Among the many benefits that our customers derive from our software are increased visibility into performance; greater efficiencies in key processes; and better information that drives better business decisions.

## *No Limitations, No Imitations: Cognos 8 Business Intelligence*

The latest in a long history of product innovation, Cognos 8 Business Intelligence is the first and only product to deliver all BI capabilities on a single, proven Web services-based architecture. Cognos 8 BI delivers reporting, analysis, scorecarding and dashboards, business event management, and data integration, all from a zero-footprint, browser-based user interface.

## *Overcome IT Complexity*

Cognos 8 BI lets IT organizations overcome the barriers that have prevented them from realizing the full promise of their BI deployments. For example: its Web services architecture integrates into the most complex IT infrastructures and leverages existing security providers. It provides support for Unicode. Its open data strategy means IT can access and analyze all corporate data, regardless of its source or structure. And its common metadata model applies consistent business rules, dimensions, and calculations to all data to provide consistent information to all users.

## *Rapid User Adoption*

Cognos 8 BI is also equally suited to business users. It provides a task-based interface that matches functionality to a user's skill set. Rather than overwhelm casual users with advanced features and functionality, Cognos 8 BI provides only those controls appropriate to each user and report type. This helps people explore data simply and find answers more quickly using simple keyboard commands and familiar toolbar icons. Business users can find and share the information they need quickly, without the need for IT intervention.

Cognos partners with the most innovative thought leaders in performance management. And the Cognos ecosystem of 3,000 worldwide partners ensures that our customers receive tailor-made BI environments that meet their specific needs.

## Summary

BI software now provides access to all types of corporate data and a wide range of ways to present it. Nevertheless, barriers to understanding business performance remain. This is because most reports are marred by poor design choices that can distract users' attention from the data and lead to poor decisions that hurt business performance. This situation is entirely avoidable, and entirely solvable.

In the short term, report authors can create more effective reports immediately by following two simple principles: keep it simple; show the data. In the longer term, better education about the links between perception and understanding can raise the bar for data presentation across the entire BI user community. Business performance is too important to hide behind garish colors and runaway fonts. The solution is too easy to ignore.

## Appendix: Reading and Resources

### *Free Online Demo: Cognos 8 Business Intelligence*

See how you can achieve the full promise of business intelligence. Our interactive demo includes:

- Flash presentation on the high-level benefits for IT staffs
- Guided tour of innovative new features
- Interactive, hands-on demos of key capabilities
- Customer and Cognos partner perspectives
- Access to the Gartner report, "Avoid the Fatal Flaws of Business Intelligence and Corporate Performance Management"
- White Papers on Cognos 8 BI

To view the demo, visit [www.cognos.com/c8demo-web](http://www.cognos.com/c8demo-web)

### *Reading*

Books and Articles by Stephen Few:

*Show Me the Numbers: Designing Tables and Graphs to Enlighten* (Analytics Press, 2004)

*Discovering the Source of Business Intelligence Within*. B-Eye-Network, Dec. 13, 2005.

*Rare Business Assets: Tables and Graphs that Communicate*, 2004

*Designing Effective Tables and Graphs*, 2004

Available at [www.perceptualedge.com](http://www.perceptualedge.com)

Books by Edward Tufte:

*Visual Explanations*, 1997

*The Visual Display of Quantitative Information*, 1995

*Envisioning Information*, 1990

All titles are published by Graphics Press, Cheshire, Connecticut.

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