

# **Storytelling with Data Analytics and Dashboards for Insights**

# Data Analytics

Data analytics is the process and methodology of analyzing data to draw meaningful insight from the data.

Data analytics (DA) is the process of examining data sets in order to find trends and draw conclusions about the information they contain.

# Types of Data Analytics

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**Descriptive analytics** describes what has happened over a given period of time.

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**Diagnostic analytics** focuses more on why something happened.

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**Predictive analytics** moves to what is likely going to happen in the near term.

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**Prescriptive analytics** suggests a course of action.

# Types of Data Analytics



## Descriptive Analytics

Descriptive analytics describes what has happened over a given period.

- Have the number of views increased?
- Are sales stronger this month compared to last month?

## Diagnostic Analytics

Diagnostic analytics focuses on why something happened. This involves analyzing diverse data inputs and forming hypotheses.

- Did the weather affect drink sales?
- Did the latest marketing campaign impact sales?

## Predictive Analytics

Predictive analytics examines what is likely to happen in the near future.

- What happened to sales the last time we had a hot summer?
- How many weather models predict a hot summer this year?

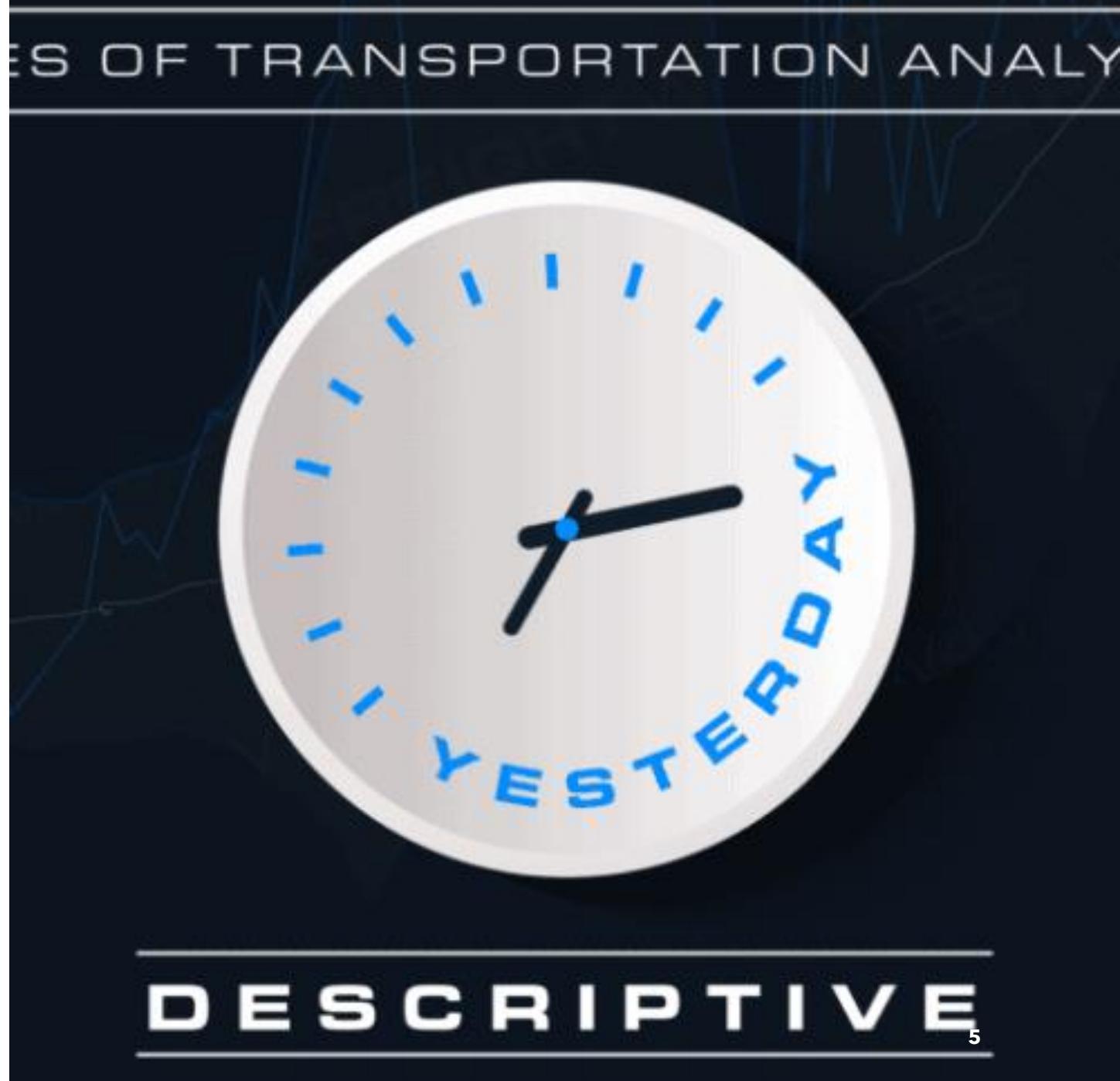
## Prescriptive Analytics

Prescriptive analytics suggests a course of action based on predictive insights.

- If the average likelihood of a hot summer, as measured by these five weather models, exceeds 30%, we should add an evening shift at the brewery and rent an additional tank to increase output.

# **Descriptive analytics for transportation logistics**

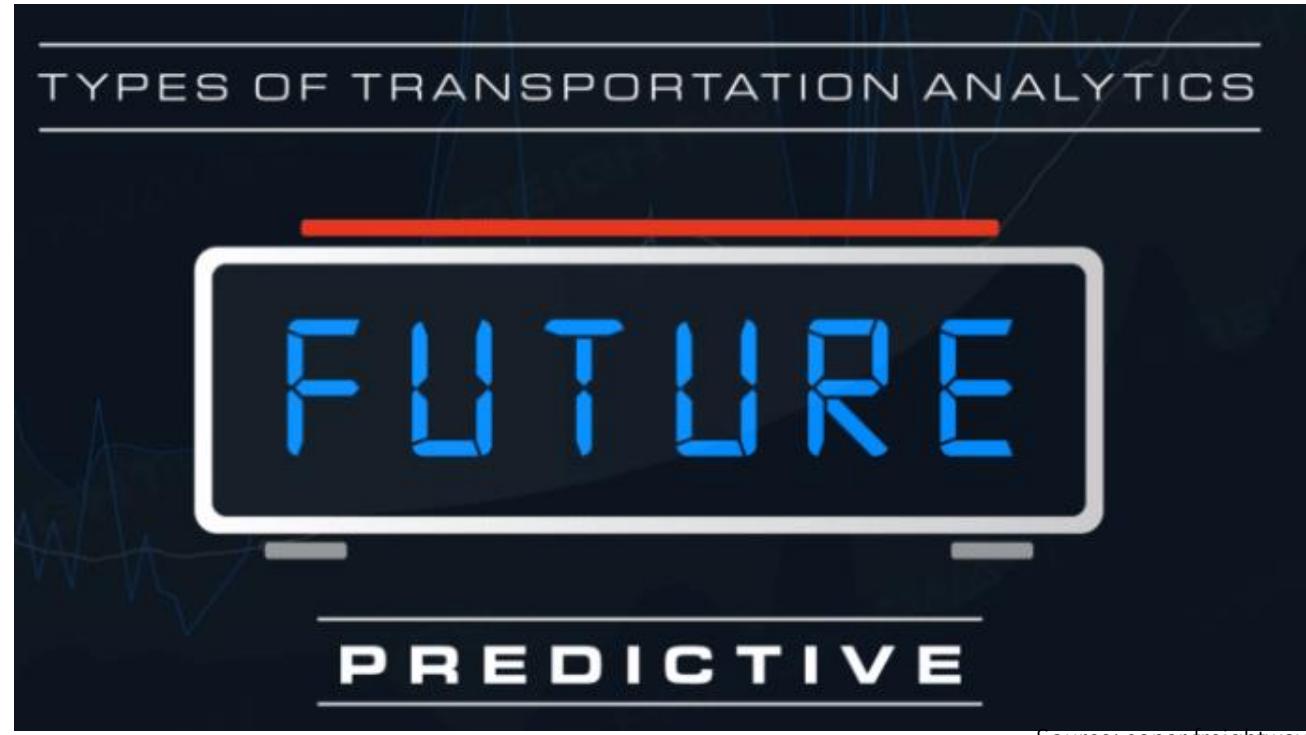
Source: sonar.freightwave





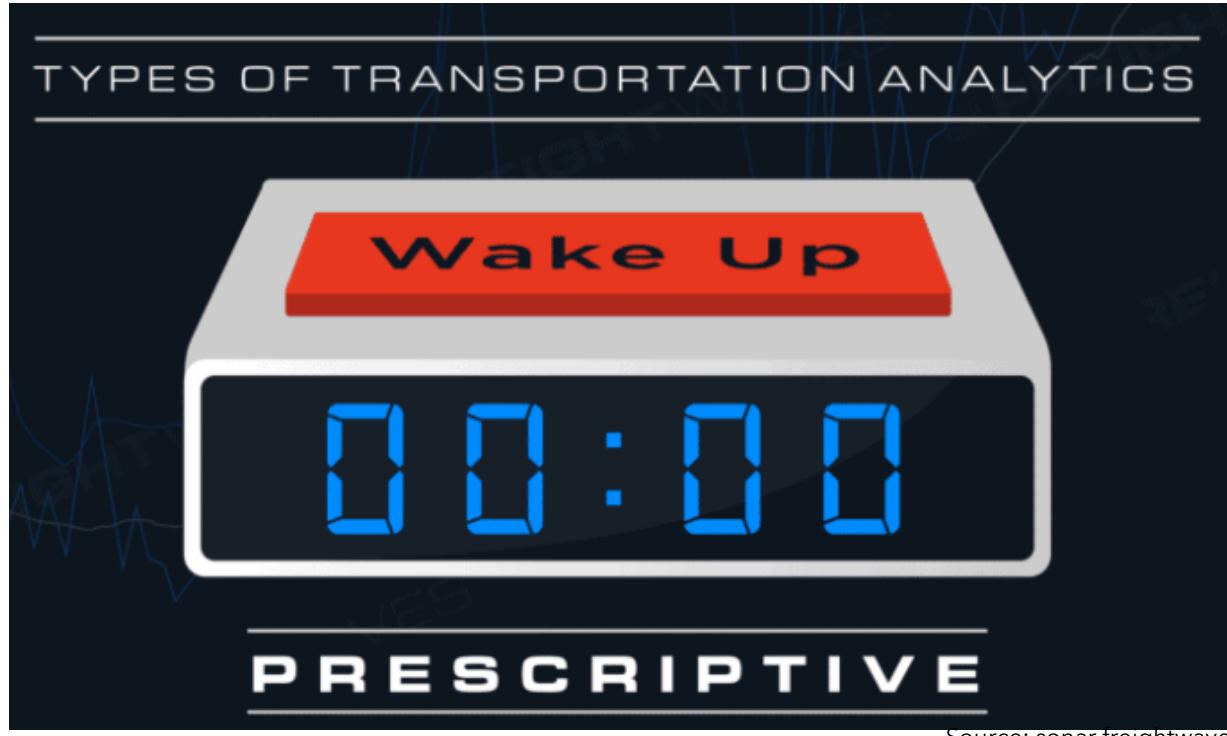
Source: sonar.freightwave

## **Diagnostic analytics and data interpretations**



Source: sonar.freightwave

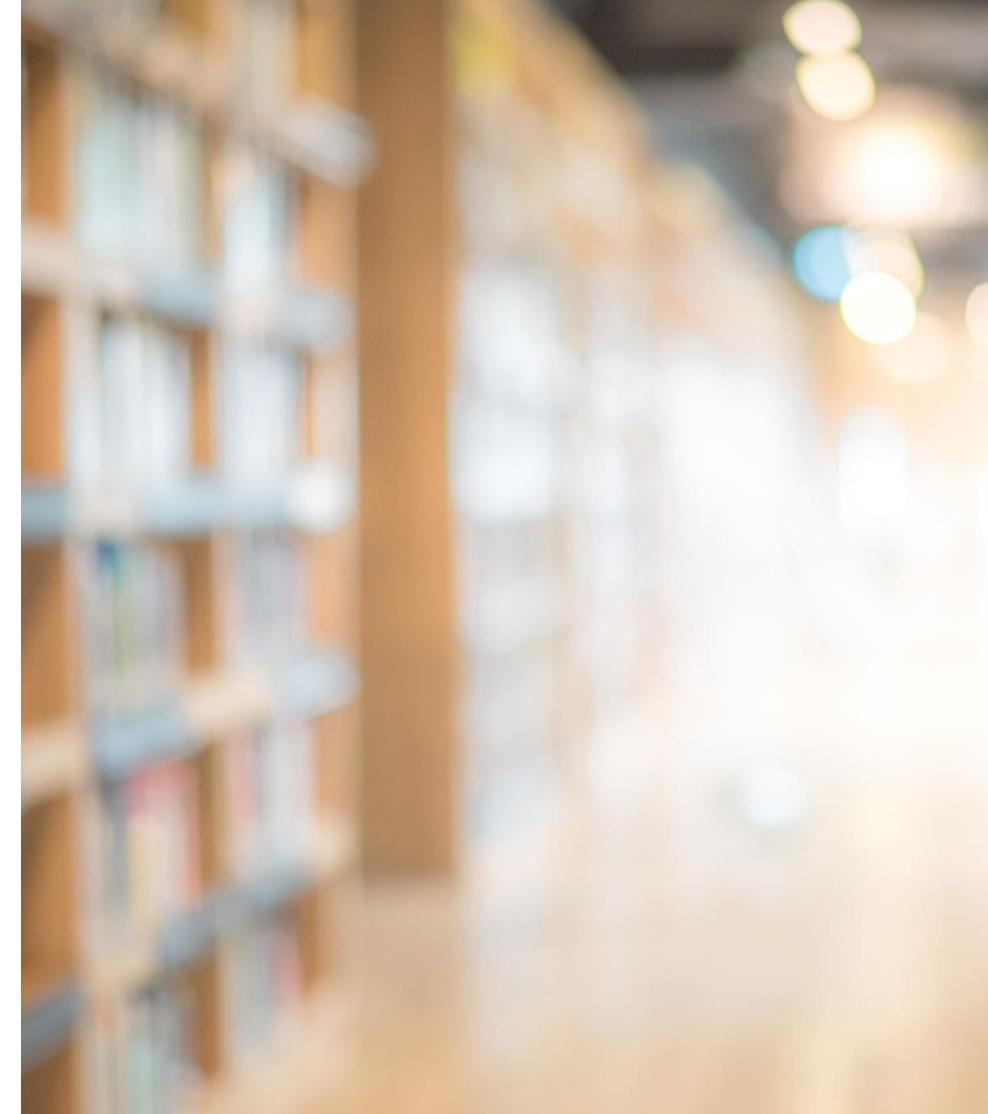
**Predictive analytics that  
impacts shipping chains**



Source: sonar.freightwave

**Prescriptive analytics for  
preventative planning**

# **Data Storytelling**



**Data  
Storytelling**



More  
**Memorable**



More  
**Engaging**



More  
**Persuasive**



# Why Data Storytelling ?

# Why Data Storytelling ?

- + Neuroscientists find the brain responds uniquely to stories, evoking emotions, while statistics are merely heard.
- + Emotion plays a vital role in decision-making, making storytelling a powerful tool to connect emotionally and simplify data processing.

# Why Data Storytelling ?

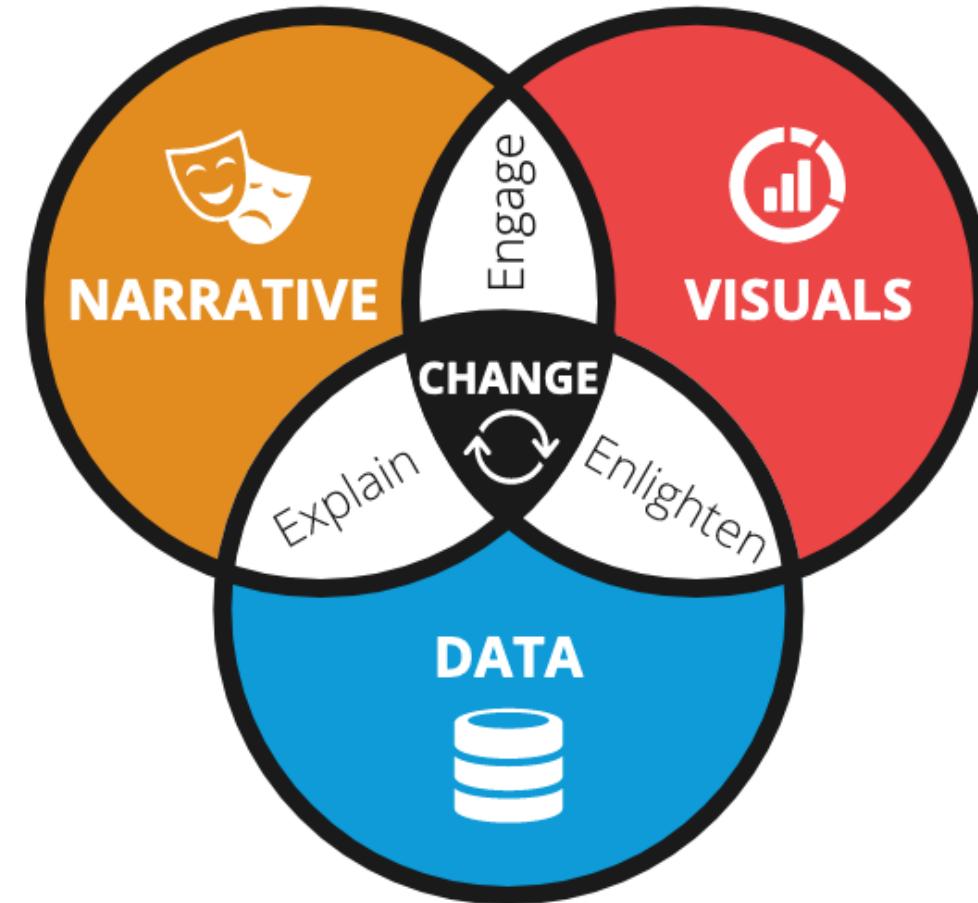
- + In what ways can data storytelling skills contribute to improved collaboration and alignment across different teams and departments?
- + What role does data storytelling play in fostering a culture of data-driven decision-making within an organization?
- + In what ways can data storytelling improve your business's competitive edge and overall success in today's data-driven landscape?
- + How can data storytelling enhance your business's ability to communicate complex insights to non-technical audiences?

# Data Storytelling

- + Storytelling is the most powerful way to put ideas into the world today,” says Robert McKee, a screenwriting guru.
- + Data storytelling serves as the key to transforming data into insights that inspire action and generate value.
- + Today's corporate world is saturated with poorly designed slides cluttered with inappropriate charts.

# Framework

How to Drive Change with Data, Narrative, and Visuals, formulated a valuable framework for building data stories.

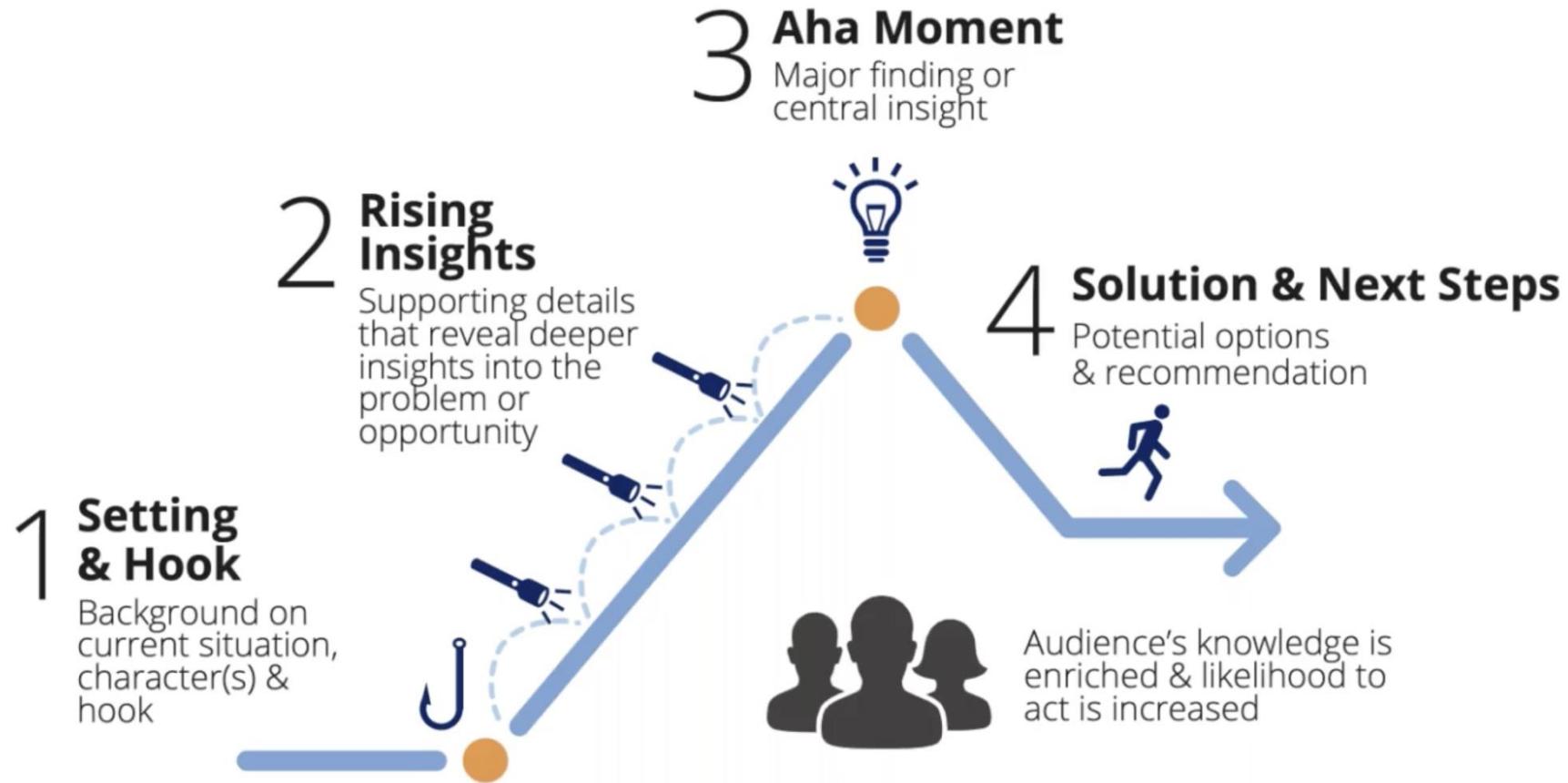


# Data Storytelling

| Element   | Description  |
|-----------|--|
| Data      | The foundation of a data story, involving the analysis of data to uncover key insights and their meaning for effective communication.                  |
| Narrative | The organizational structure of a data story, encompassing the arrangement of information into a coherent and engaging storyline to convey insights.   |
| Visuals   | The visualization of complex data through charts, diagrams, and images, aiding the audience in perceiving anomalies, patterns, and trends effectively. |

# Narrative Structure

- + Data stories follow a classic narrative pattern: setup, insights, central revelation, and actionable recommendations.
- + Data storytelling's narrative structure encompasses scene-setting, insight delivery, and recommendation formation.

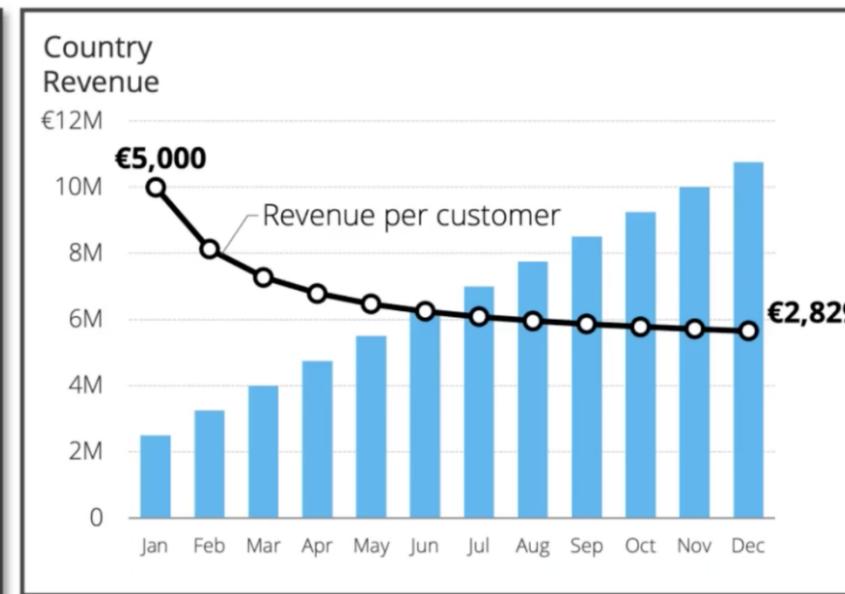
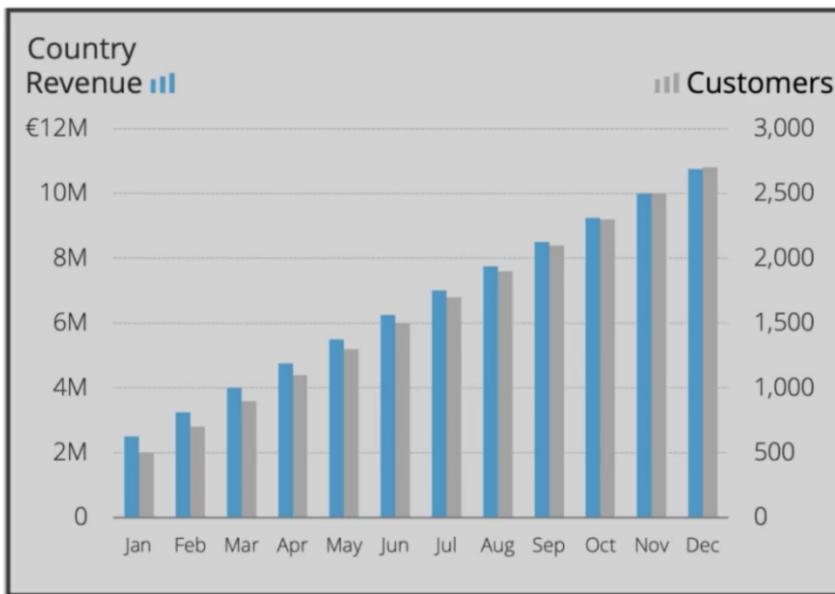


# Data

- + Avoid cluttering charts with too much data to keep data stories clear and understandable.
- + Selecting the right data is vital for creating effective data stories.

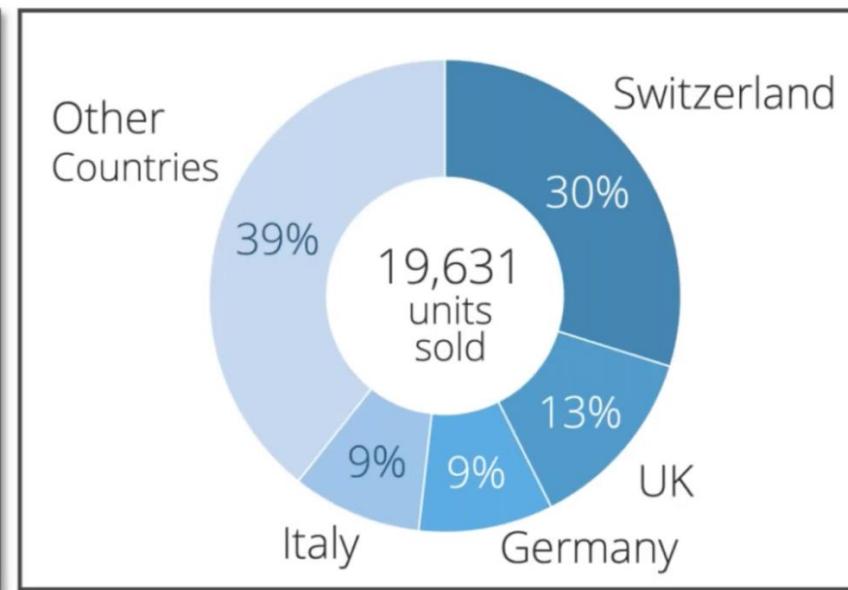
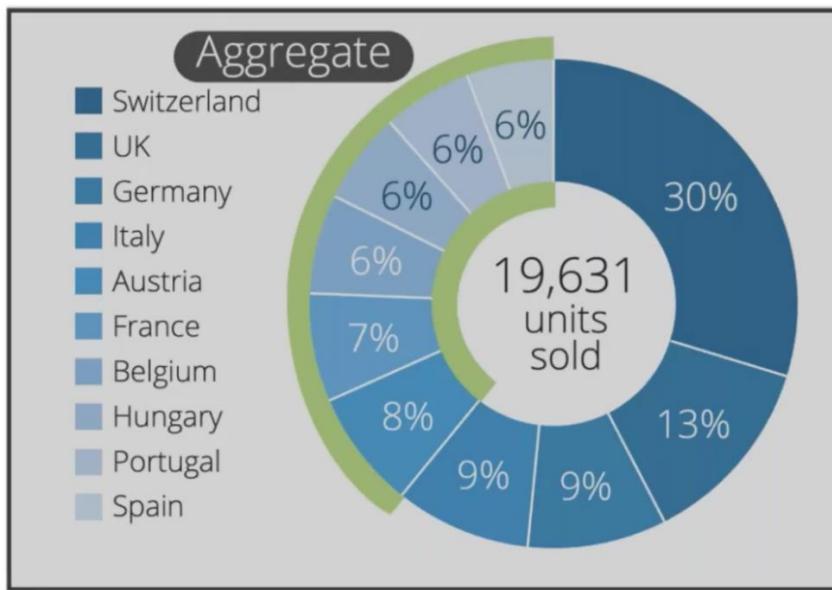
# Identify Right Data for Your Data Story

**Calculated metrics** may be more insightful than total values.



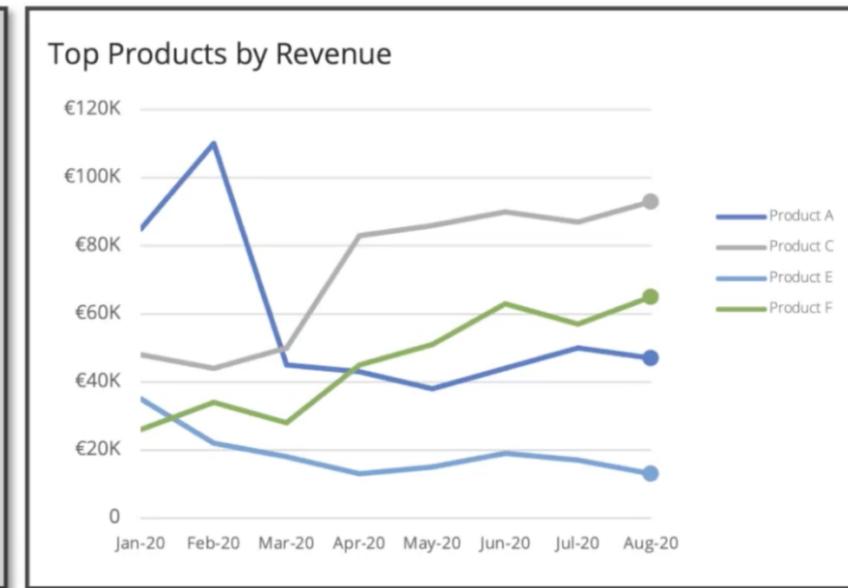
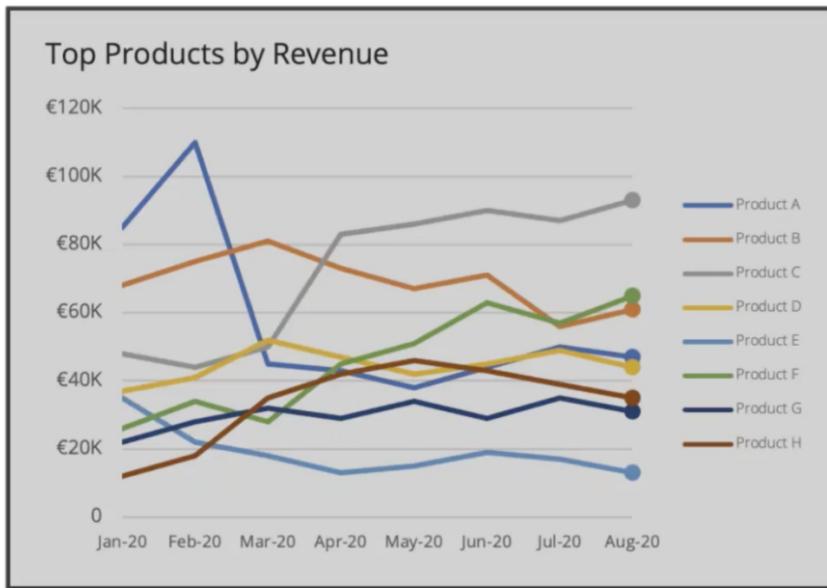
# Aggregate Less Important Information

To simplify charts, you can **aggregate less critical data** to reduce the cognitive load.



# Remove Surplus Data that Isn't Needed

Ask yourself **what is essential** to making your point. Remove what's unnecessary.



# Visuals

## + **Choose the right visualization**

Effective visualizations vary based on the data story's context; select the most suitable chart for the message.

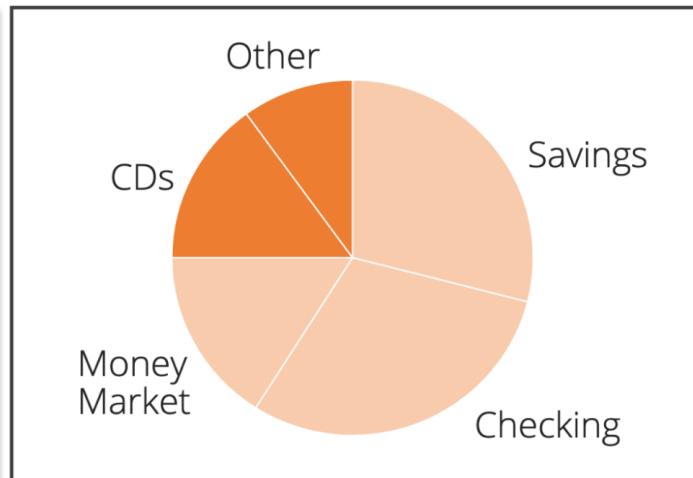
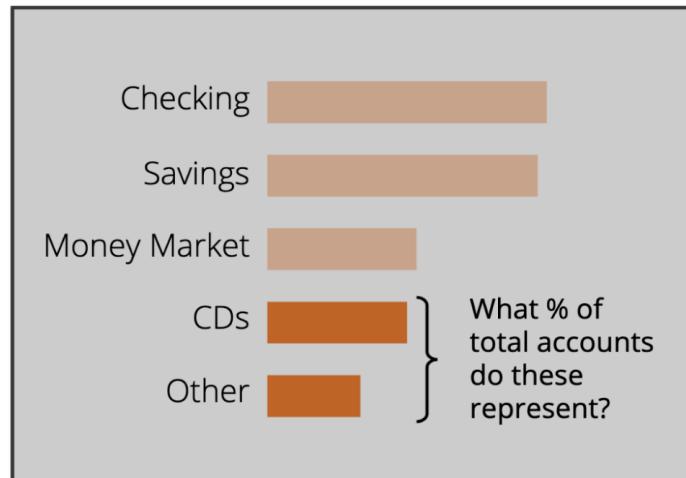
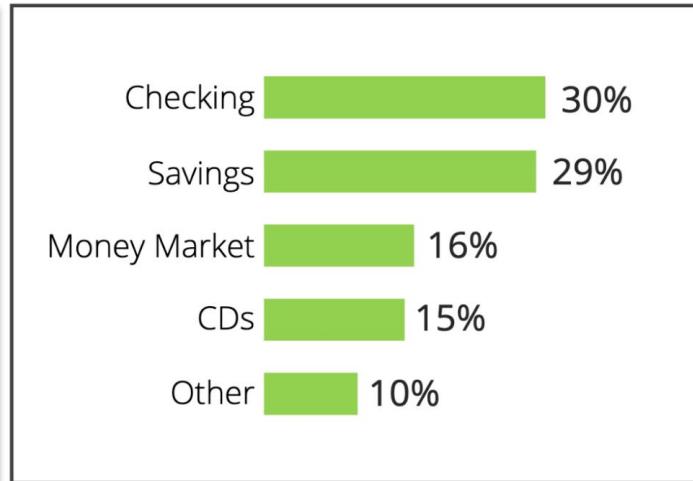
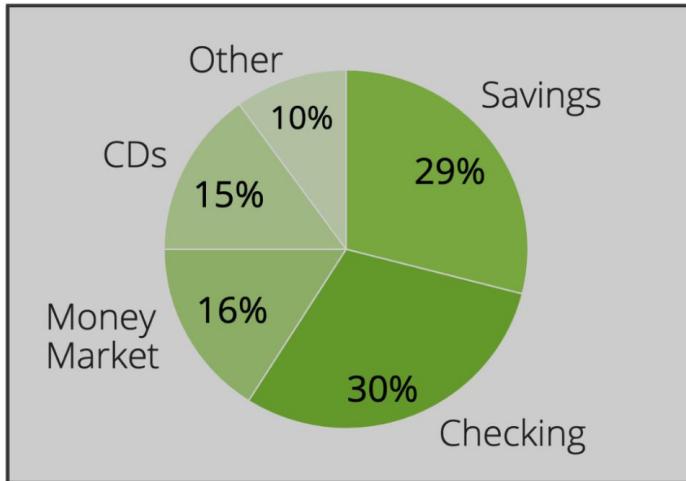
## + **Adjust visuals for the message**

Proper data storytelling aligns visuals with the audience's needs, ensuring clarity in conveying the point.

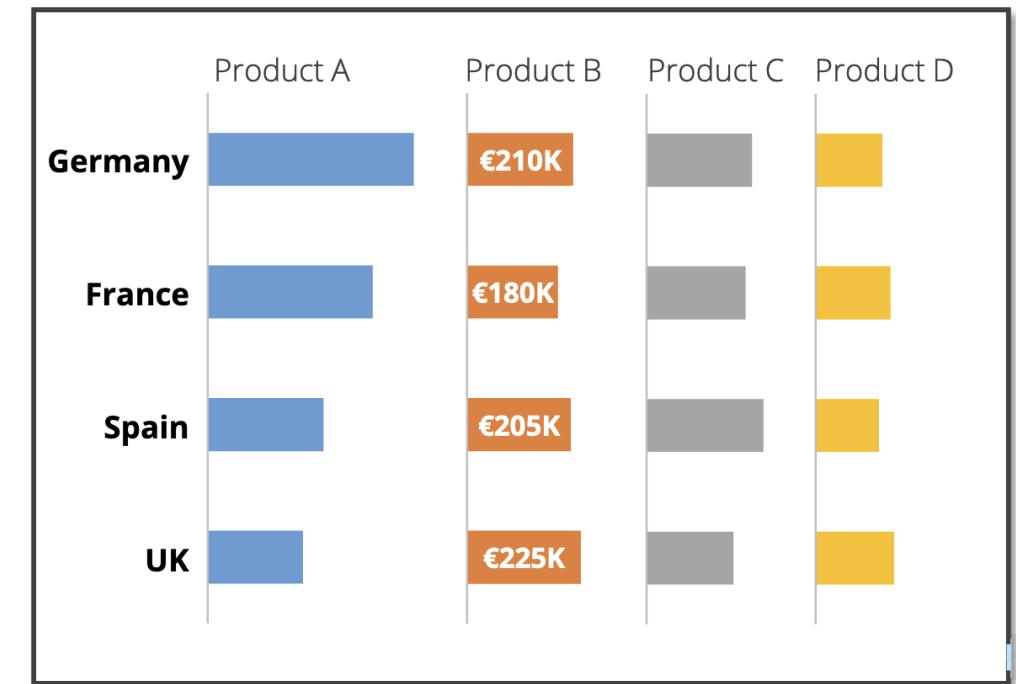
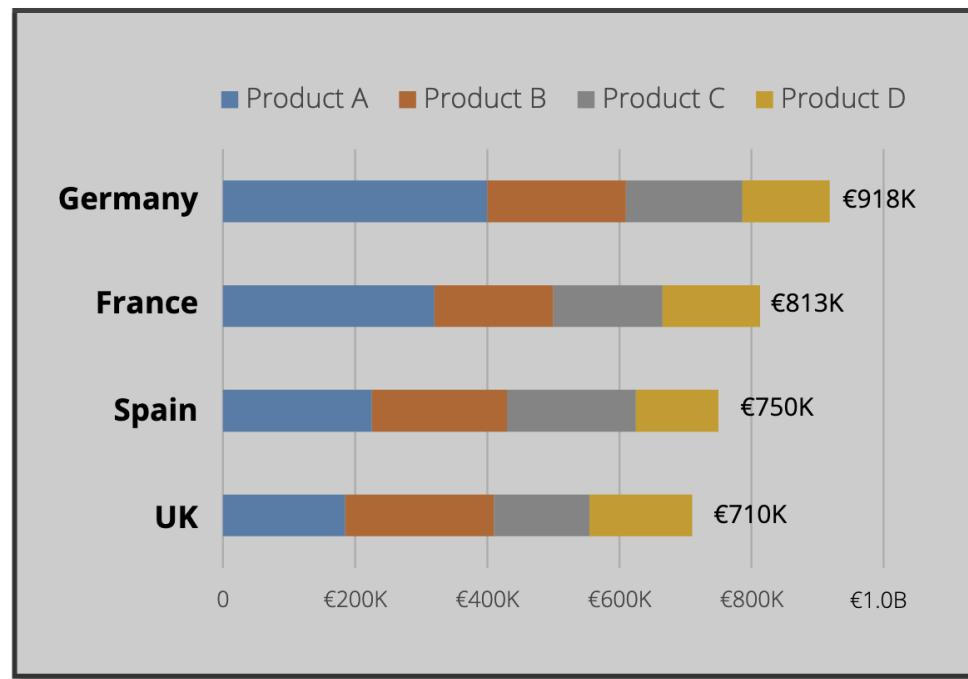
## + **Direct audience attention**

Highlighting key points in a chart captures the audience's focus, separating important insights from distractions.

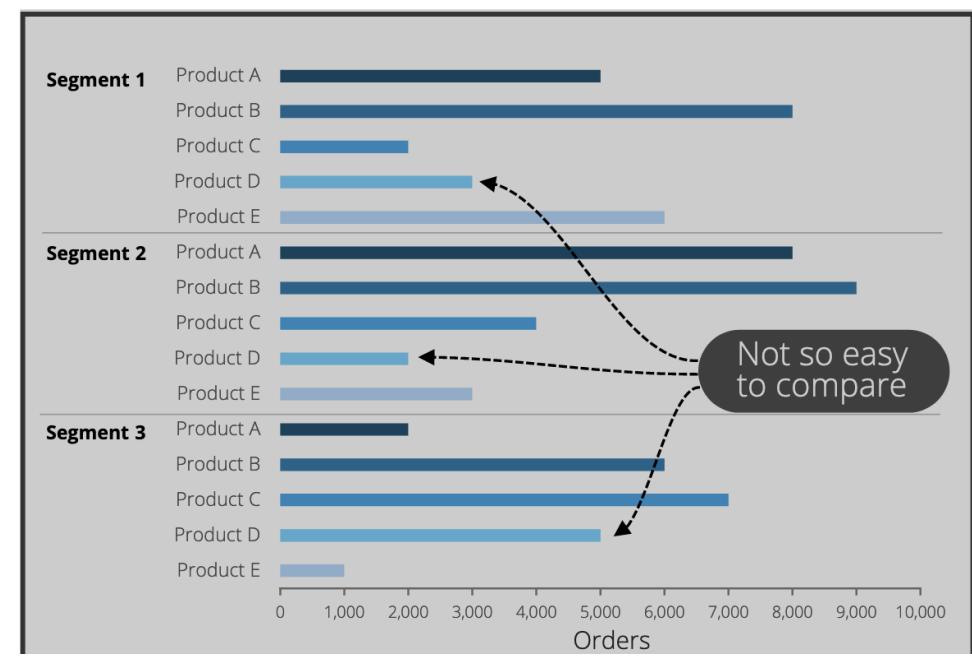
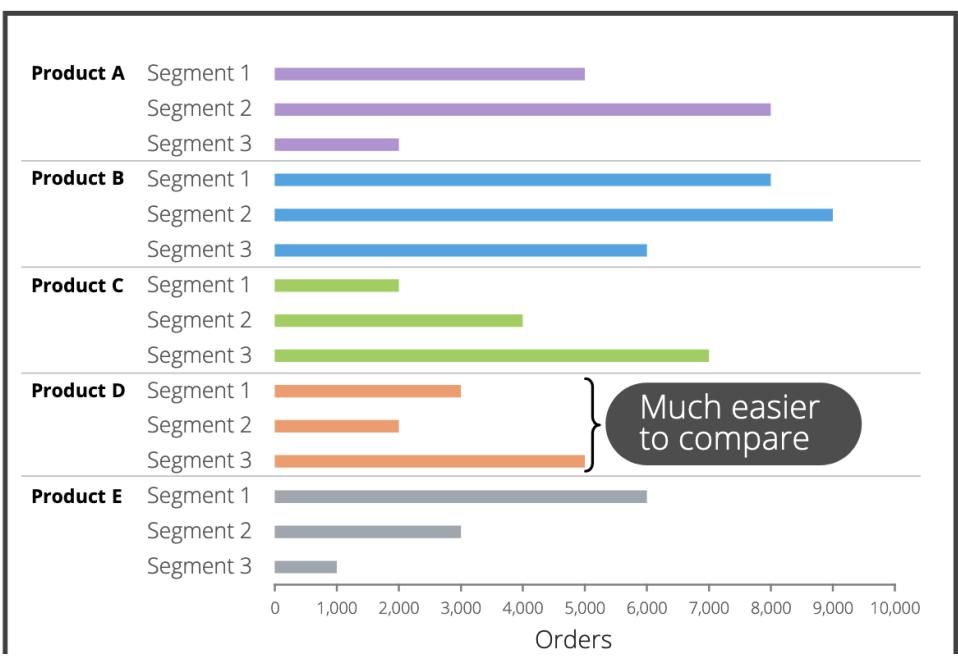
# Visuals - Choose the appropriate visualization



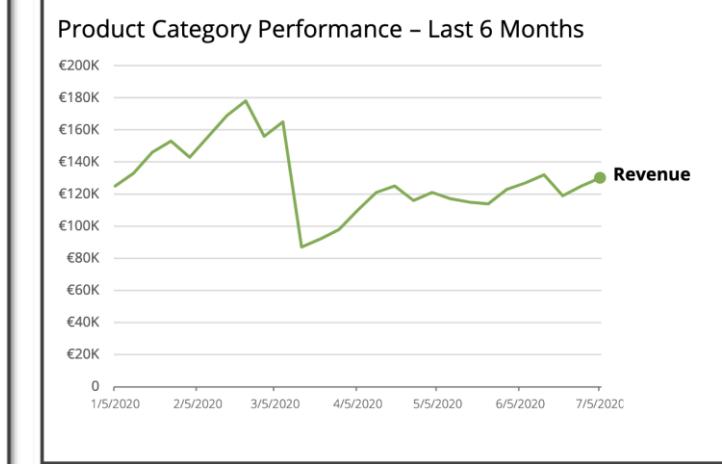
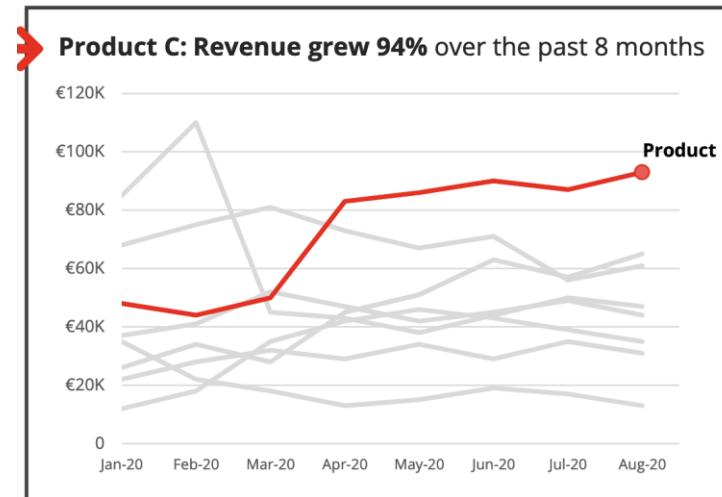
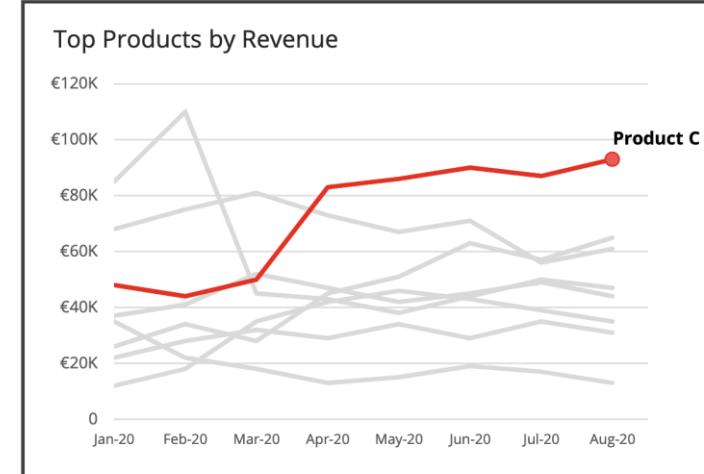
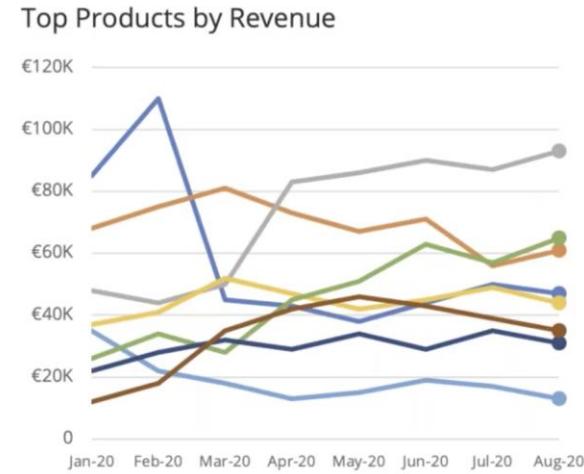
## Visuals - Calibrate the visuals to the message



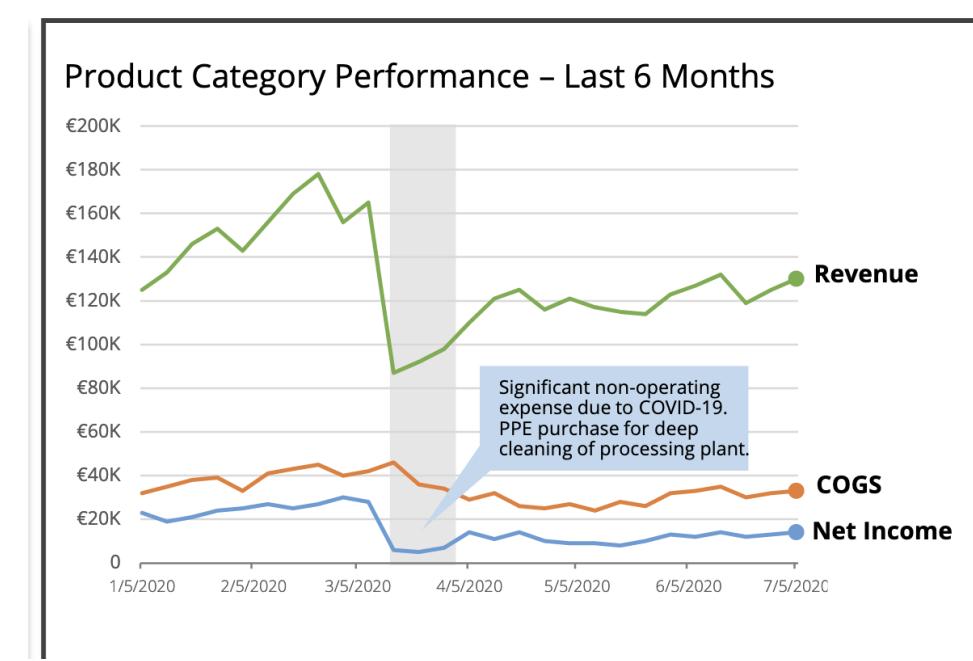
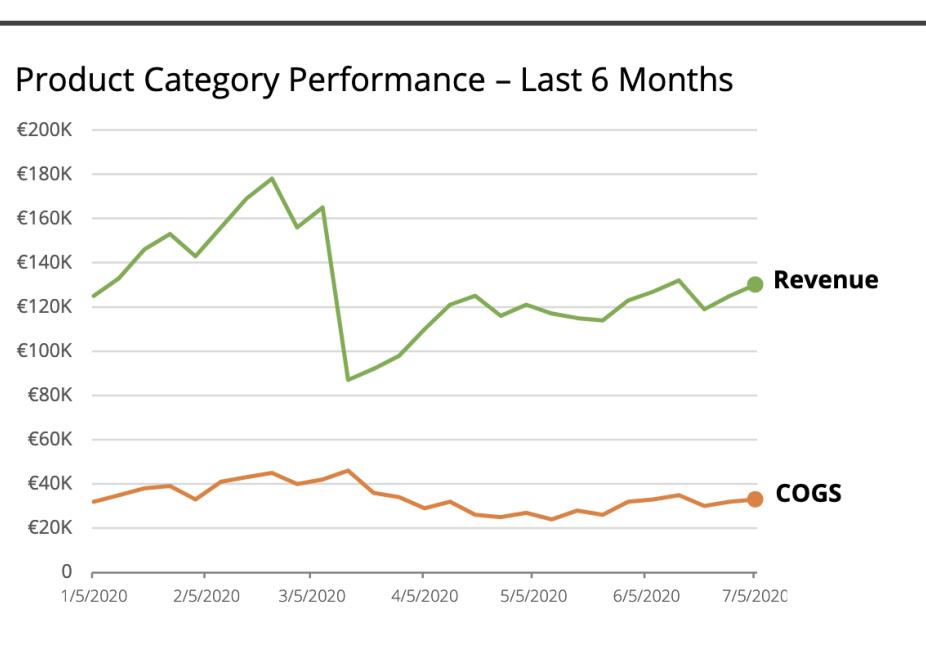
# Visuals - Calibrate the visuals to the message



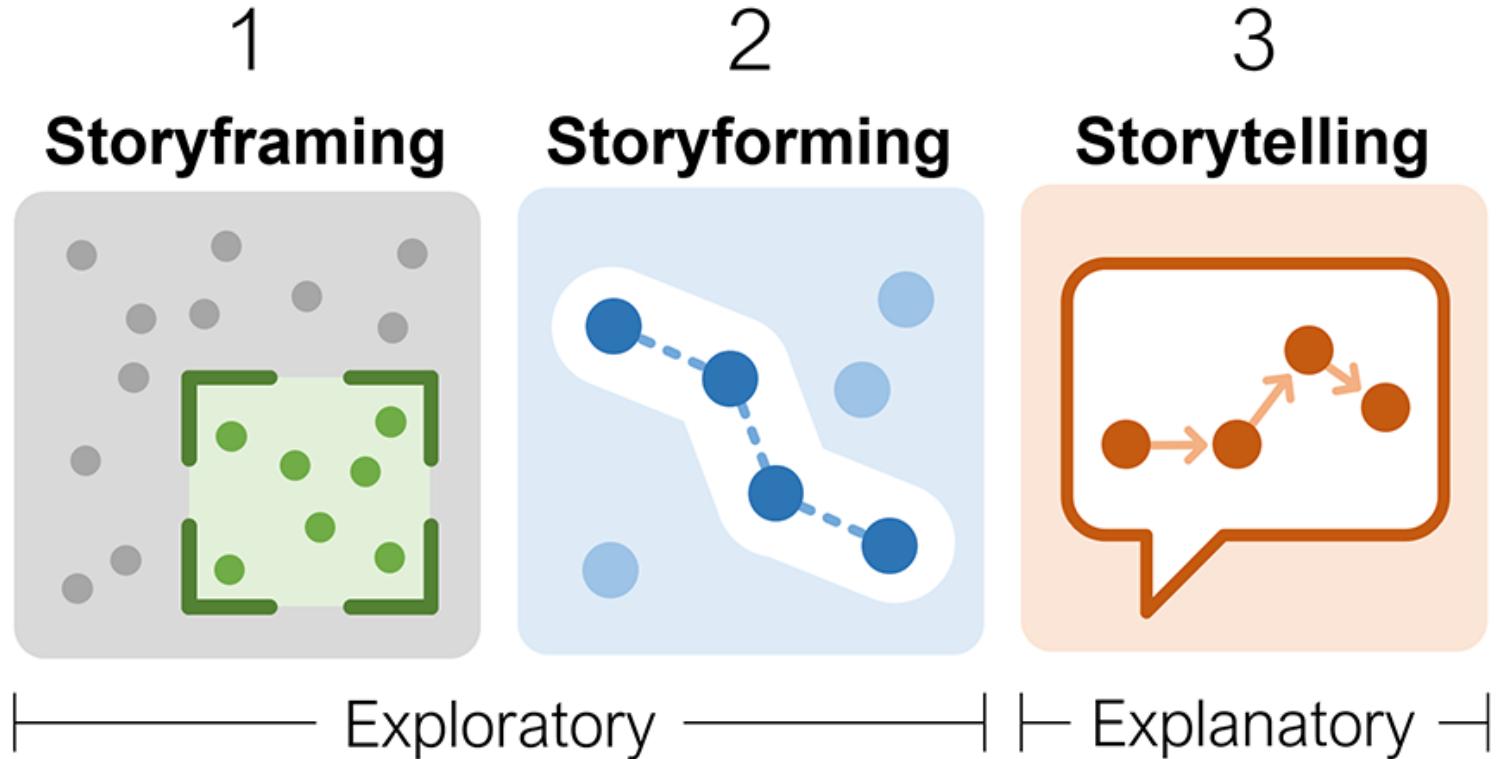
# Visuals - Focusing the attention of the audience



# Visuals - Focusing the attention of the audience



# Essential Steps Before Data Storytelling, Storyframing and Storyforming



[Effectivedatastorytelling.com](http://Effectivedatastorytelling.com)

*Storyframing and storyforming are exploratory steps.  
After you've found an insight that you want to communicate with others, you transition to data storytelling, which is explanatory.*

# **Key Questions at Each Stage of Data Storytelling**

| Stage        | Questions  |
|--------------|--|
| Storyframing | What are the business objectives and challenges of my target audience?                                       |
|              | What data is aligned with their business goals and challenges?   |
|              | What anomalies, trends, and patterns do I observe in this data?  |
| Storyforming | What key observations from the data should be explored further?  |
|              | What do I understand about these changes in the data and the internal/external factors contributing to them? |
|              | What impact will they have on the business if they continue?   |
| Storytelling | How can I communicate the insights with a narrative and visuals to aid understanding?                        |
|              | What context and supporting details are necessary to explain the insights to my audience?                    |
|              | How can I persuade decision-makers to act upon the insights?   |

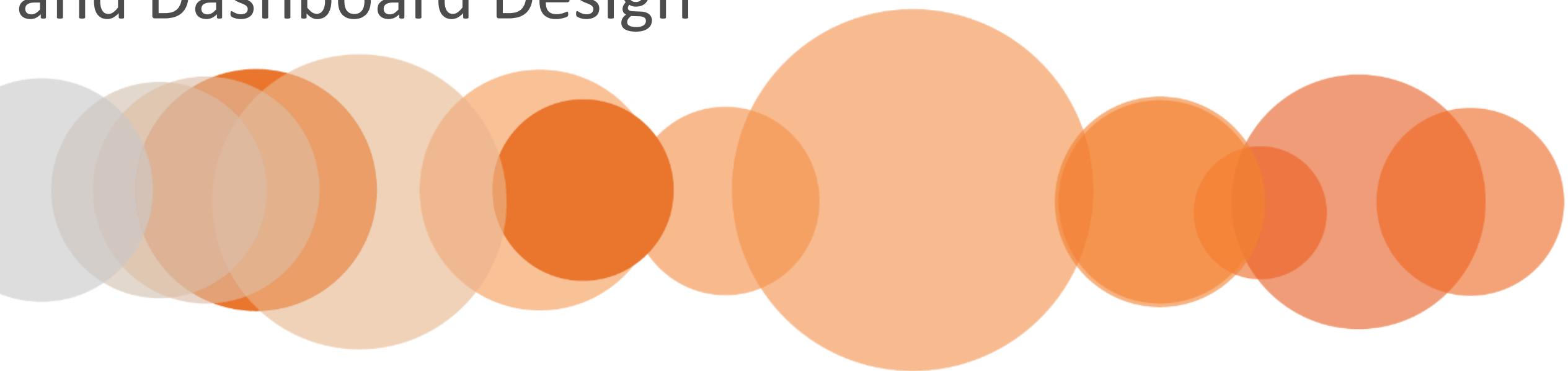
# Exploratory vs. Explanatory And Dashboard Design

# Goals

By completing the topic, students will:

- Learn Exploratory vs. Explanatory visualizations
- Discuss the definition of a dashboard
- Learn fundamentals of dashboard design
- Learn what makes data visualization actionable

# Exploratory vs. Explanatory and Dashboard Design

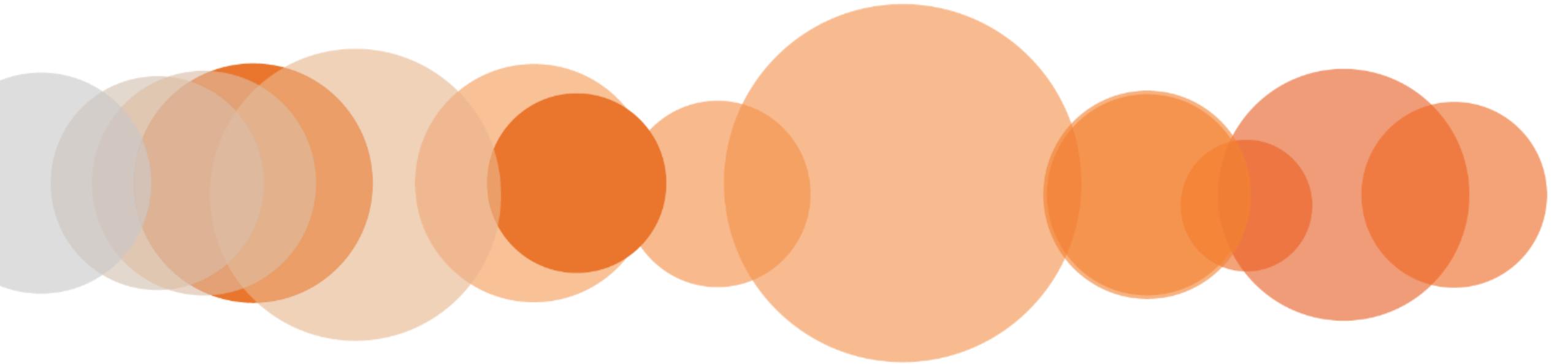


# Process of Discovery

*No matter how well-designed your graphic is, users will want to know “why” or to look at things in a different way.*

- Exploratory discovery
  - Give users tools to find the answer
  - Allows analysts and power users to find new patterns and relationships
- Directed discovery
  - Show the answer to a pre-known question
  - Options to change basic parameters
  - Suitable for general consumption by a wide variety of users

# What is a dashboard?



# Dashboard

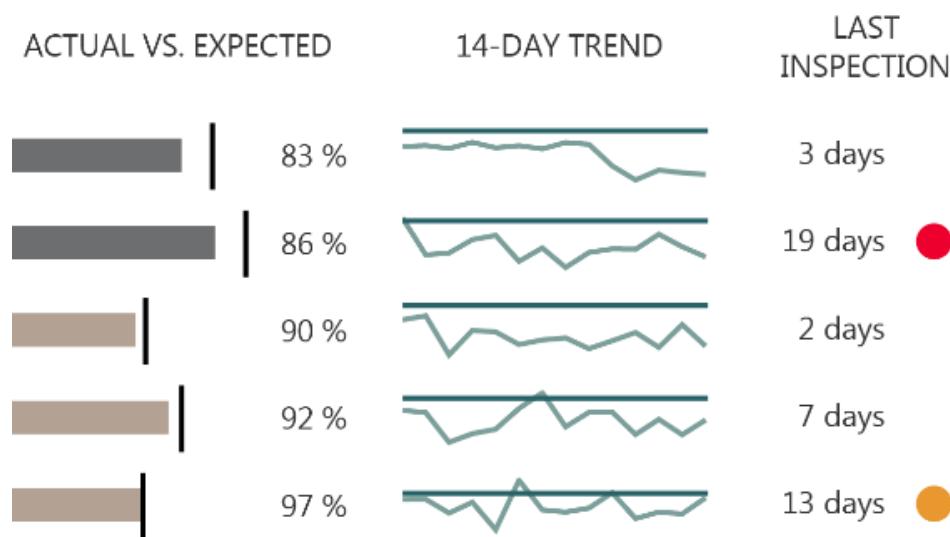
A dashboard is a visual display of the most important information needed to achieve one or more objectives; consolidated and arranged on a single screen so the information can be monitored at a glance.

- Stephen Few (2004)

# Dashboards as Directed Discovery

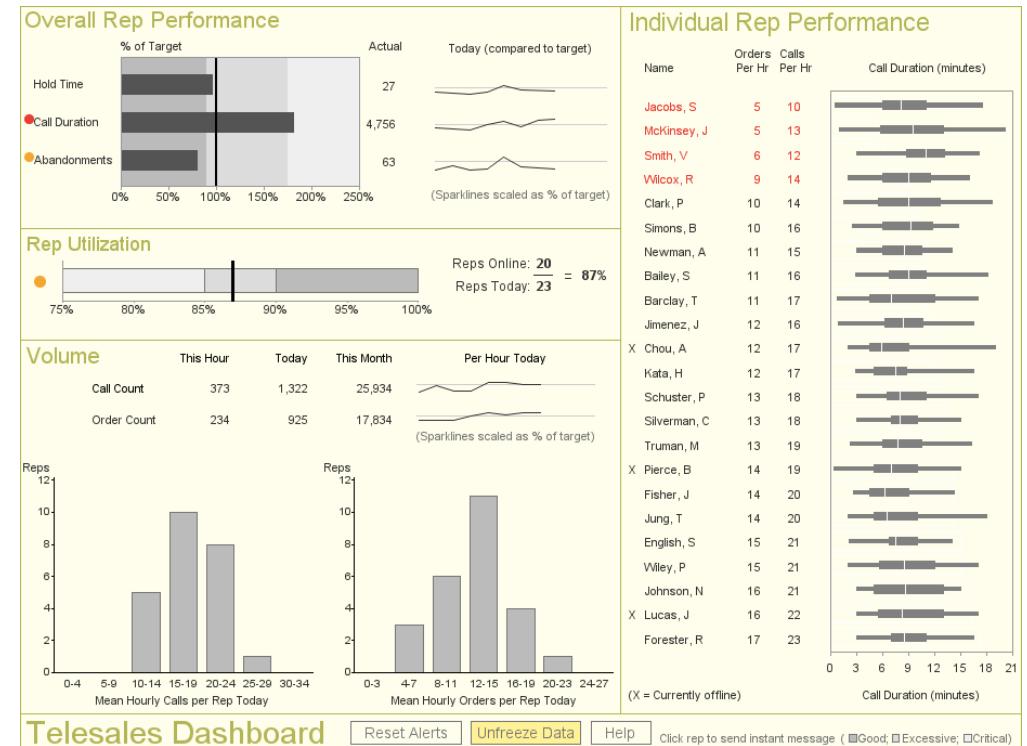
*Another way to think about it:*

An information display designed for  
people  
to help maintain situational awareness.



# Dashboards – Supporting Attributes

- Information is presented using small, concise, direct, & clear display of media
  - Clearly stated messages
  - Each point should be limited to the space needed
- Customized
  - tailored to the needs of a specific group or individual
- Consistent layout
  - Data changes over time
  - Interface is consistent  
*(until it's time for the next revision)*



# Dashboard and KPI Rollups

## Different Views for Levels of the Organization



Prospects



Customer



Marketing



Sales



Billing

- Potential customers and activities

- Key customer contact data

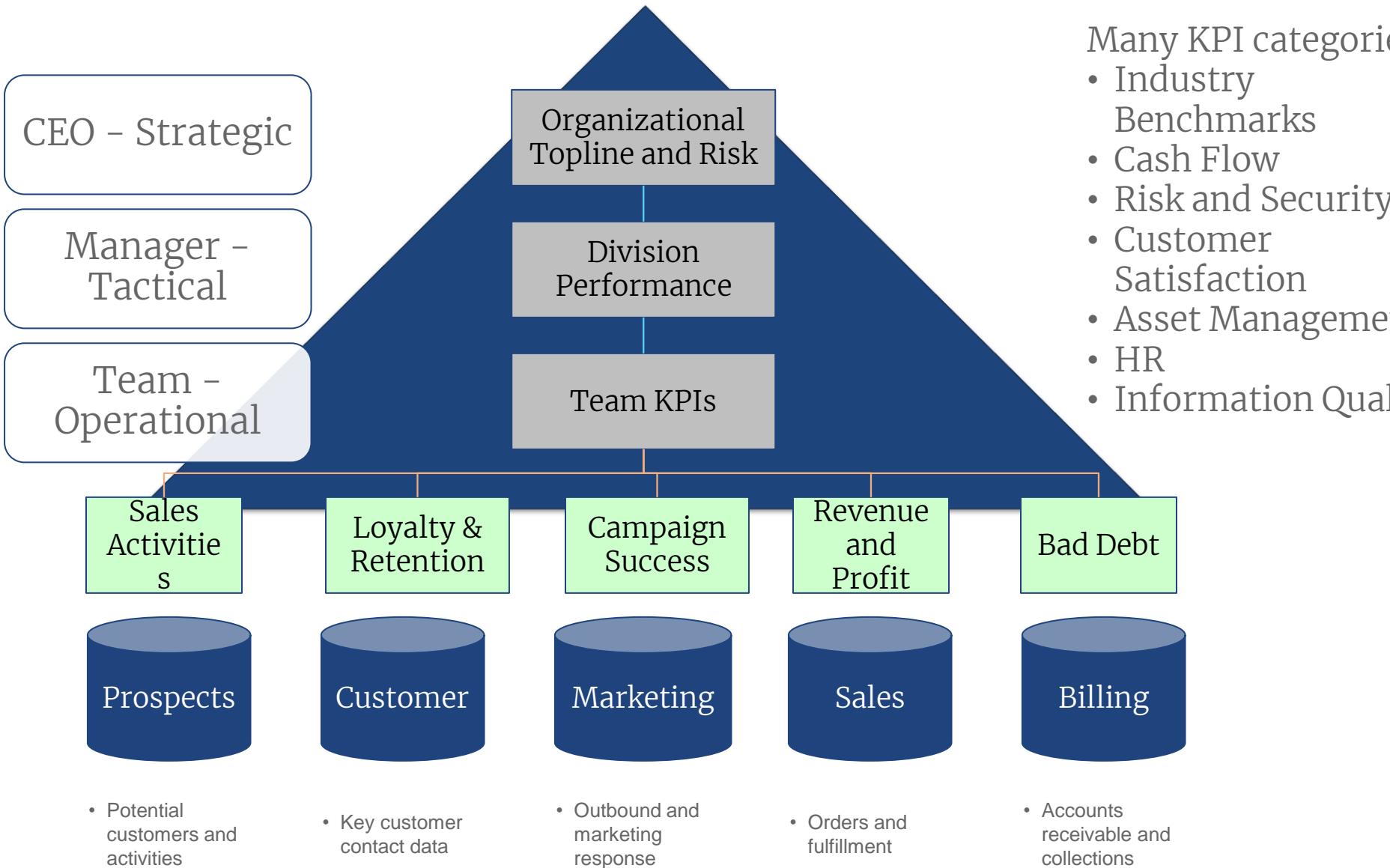
- Outbound and marketing response

- Orders and fulfillment

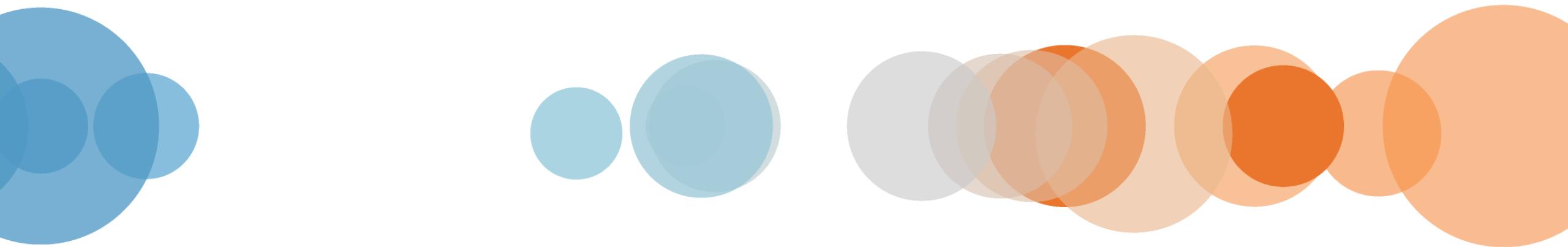
- Accounts receivable and collections

# KPI and Scorecard Rollups

## Example Scope and KPI Categories

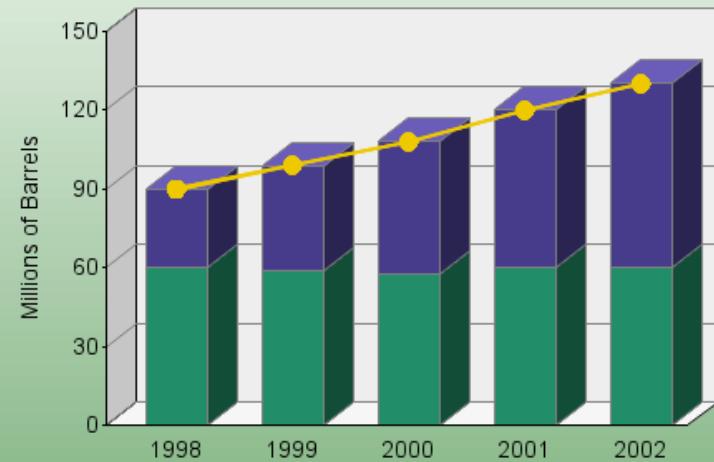


# Compare and Contrast



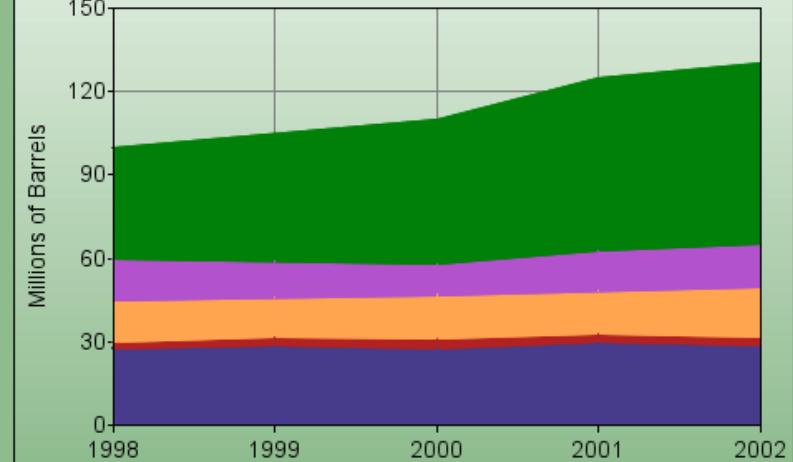
### Oil Production: 1998-2002

Northeast   South



### Oil Production: 1998-2002

Other   Chemicals   Diesel   Jet Fuel   Gasoline



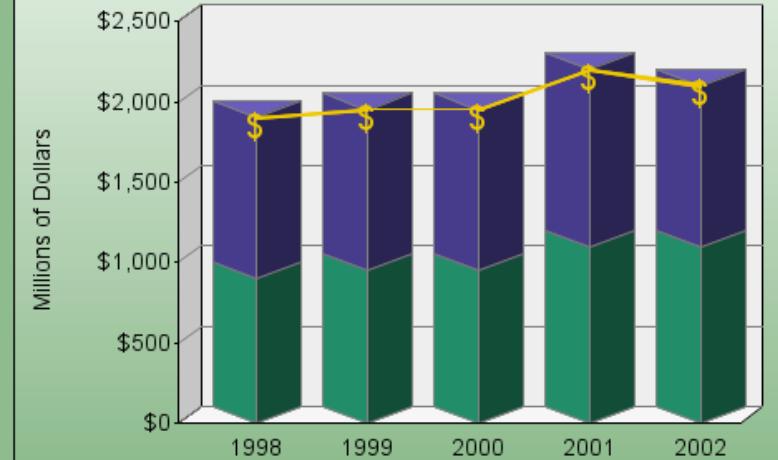
### Crude Oil Costs: 1998-2002

ANS West Coast   Berry Petroleum  
West Texas Int.   Average



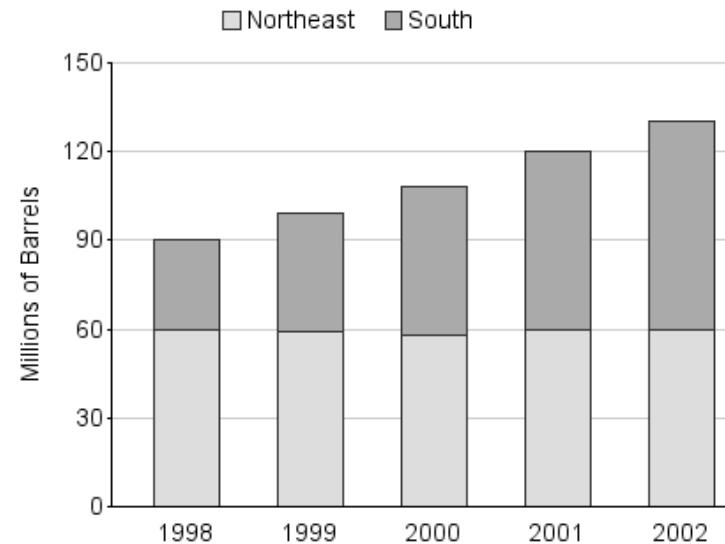
### Refinery Expenses: 1998-2002

Northeast   South

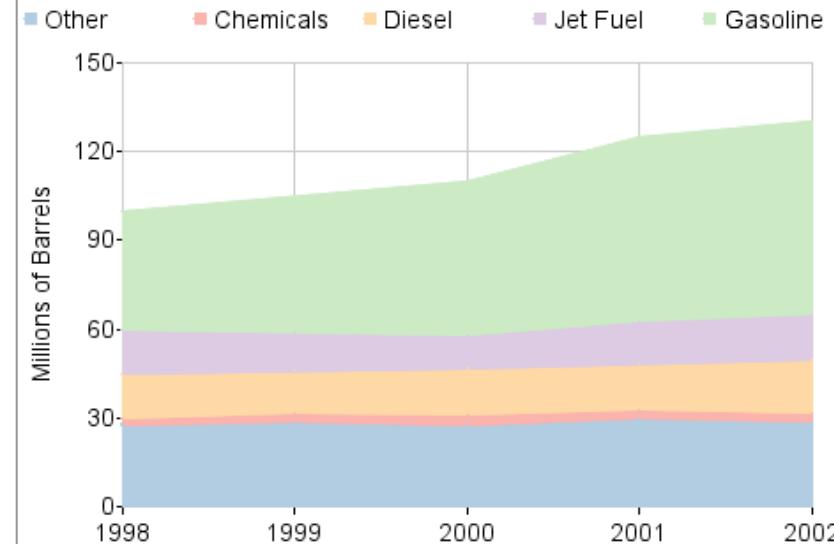


Source: "blinged dashboard" from [http://robslink.com/SAS/democd36/oil\\_blinged.htm](http://robslink.com/SAS/democd36/oil_blinged.htm)

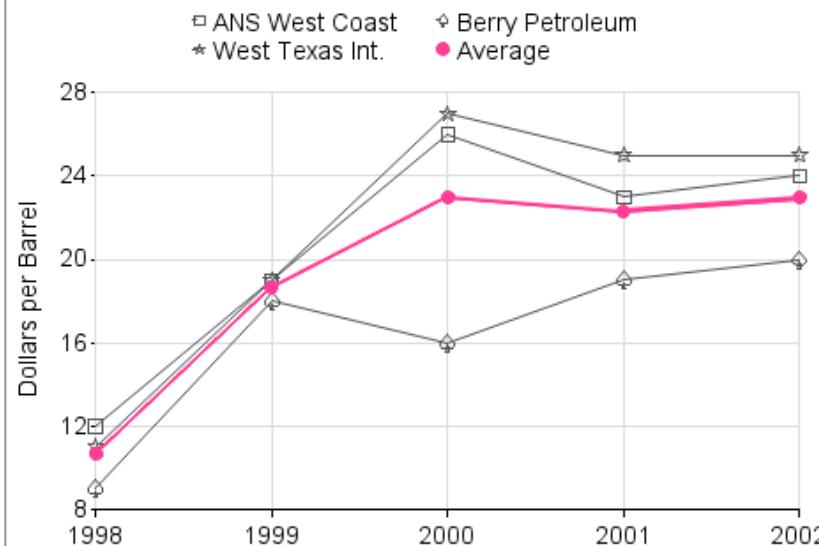
### **Oil Production: 1998-2002**



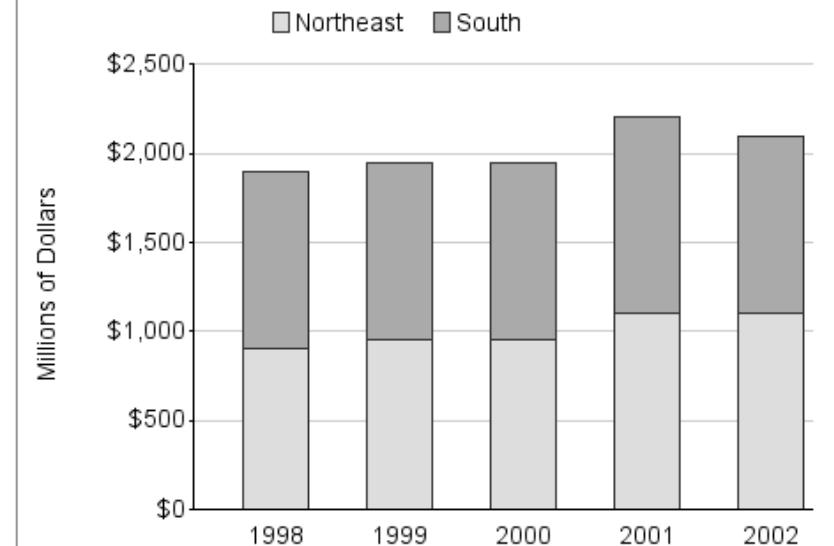
### **Oil Production: 1998-2002**



### **Crude Oil Costs: 1998-2002**

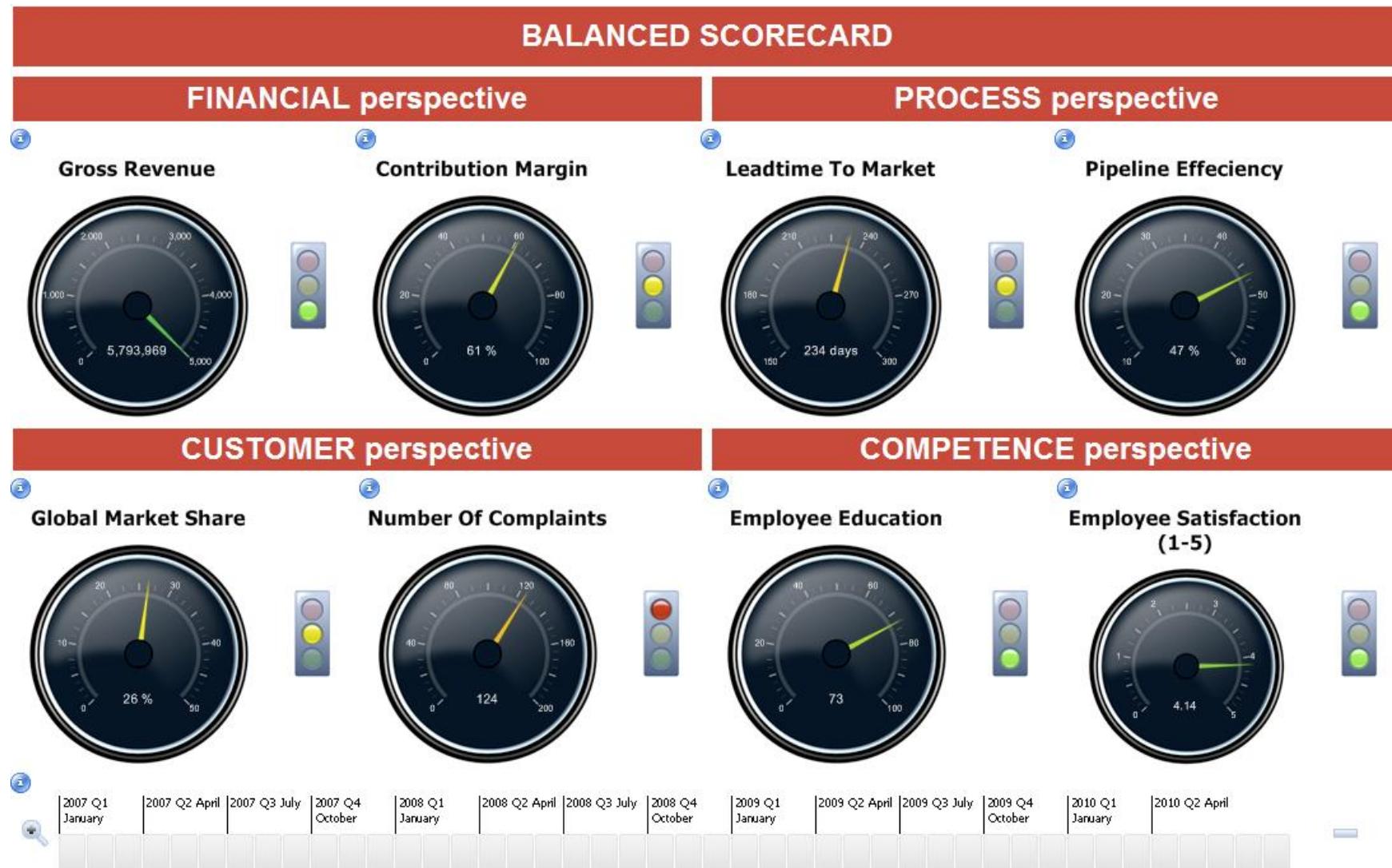


### **Refinery Expenses: 1998-2002**



Source: "unblinged dashboard" from [http://robslink.com/SAS/democd36/oil\\_unblinged.htm](http://robslink.com/SAS/democd36/oil_unblinged.htm)

# Dashboard – Low Effectiveness



Source: Targit BI Balanced Scorecard from <https://www.youtube.com/watch?v=4vuoQgYPdAw>

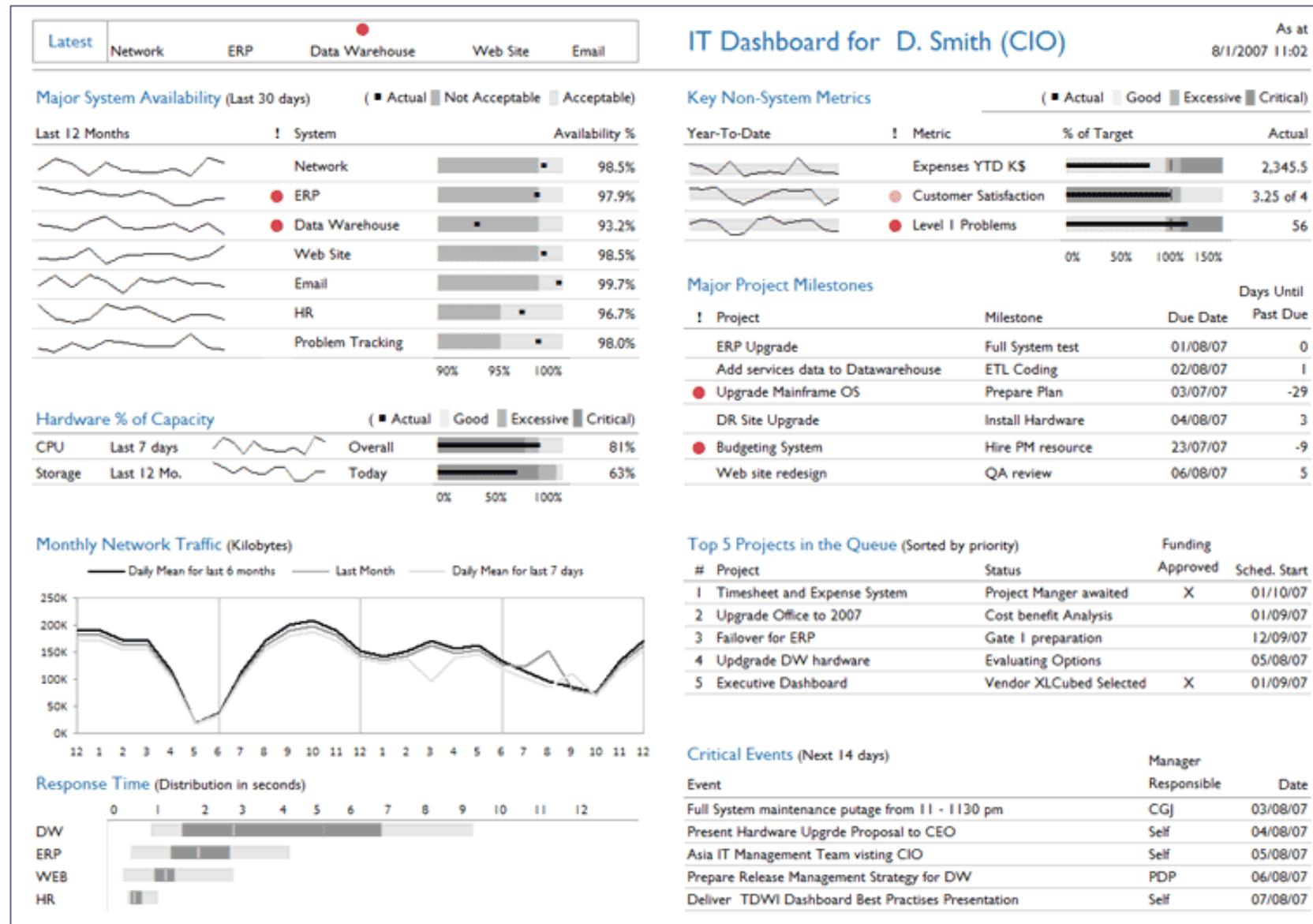
# Avoid Useless Bling

- Some of the widgets and displays provided by tool vendors are glitzy but unhelpful – like these:



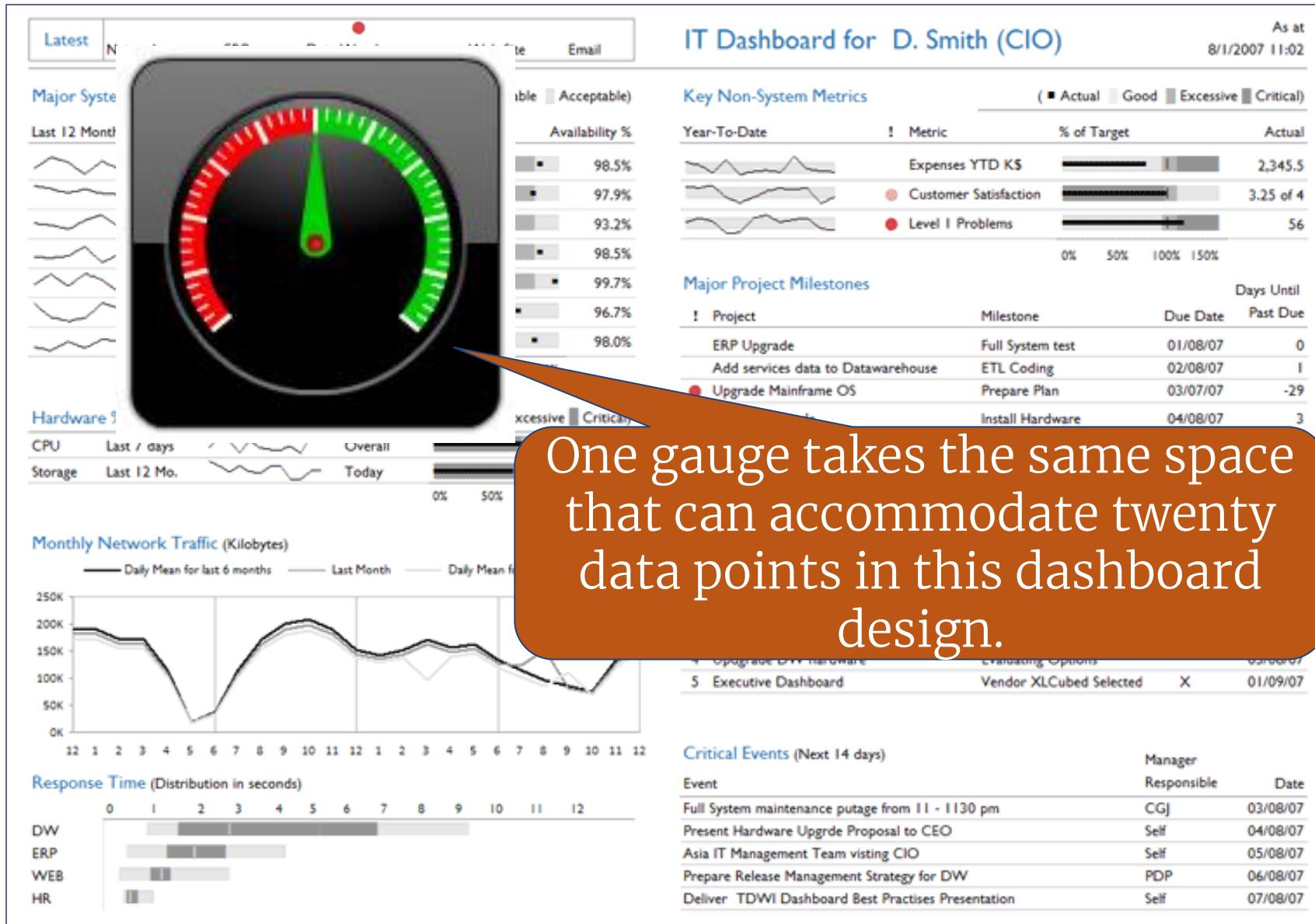
- Require a disproportionate amount of room for the information presented
- Hard to read and understand
- Little actionable information

# Dashboard – High Effectiveness



Source: *Information Dashboard Design* by Stephen Few

# CIO Dashboard



Source: *Information Dashboard Design* by Stephen Few

# Dashboard – High Effectiveness

**Latest** Network ERP Data Warehouse Web Site Email

**Major System Availability (Last 30 days)** (■ Actual ■ Not Acceptable ■ Acceptable)

Last 12 Months ! System Availability %

| System           | Actual | Not Acceptable | Acceptable | Availability % |
|------------------|--------|----------------|------------|----------------|
| Network          | ■      | ■              | ■          | 98.5%          |
| ERP              | ■      | ■              | ■          | 97.9%          |
| Data Warehouse   | ■      | ■              | ■          | 93.2%          |
| Web Site         | ■      | ■              | ■          | 98.5%          |
| Email            | ■      | ■              | ■          | 99.7%          |
| HR               | ■      | ■              | ■          | 96.7%          |
| Problem Tracking | ■      | ■              | ■          | 98.0%          |

90% 95% 100%

**Hardware % of Capacity** (■ Actual ■ Good ■ Excessive ■ Critical)

| Category | Period      | Overall | Actual | Good | Excessive | Critical |
|----------|-------------|---------|--------|------|-----------|----------|
| CPU      | Last 7 days | 81%     | ■      | ■    | ■         | ■        |
| Storage  | Last 12 Mo. | 63%     | ■      | ■    | ■         | ■        |

0% 50% 100%

**Monthly Network Traffic (Kilobytes)**

Daily Mean for last 6 months — Last Month — Daily Mean for last 7 days

**Response Time (Distribution in seconds)**

| System | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|--------|---|---|---|---|---|---|---|---|---|---|----|----|----|
| DW     | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■  | ■  | ■  |
| ERP    | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■  | ■  | ■  |
| WEB    | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■  | ■  | ■  |
| HR     | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■  | ■  | ■  |

**IT Dashboard for D. Smith (CIO)** As at 8/1/2007 11:02

**Key Non-System Metrics** (■ Actual ■ Good ■ Excessive ■ Critical)

| Metric                | % of Target | Actual    |
|-----------------------|-------------|-----------|
| Expenses YTD K\$      | ■           | 2,345.5   |
| Customer Satisfaction | ■           | 3.25 of 4 |
| Level I Problems      | ■           | 56        |

0% 50% 100% 150%

**Major Project Milestones**

| Project                            | Milestone        | Due Date | Days Until Due |
|------------------------------------|------------------|----------|----------------|
| ERP Upgrade                        | Full System test | 01/08/07 | 0              |
| Add services data to Datawarehouse | ETL Coding       | 02/08/07 | 1              |
| Upgrade Mainframe OS               | Prepare Plan     | 03/07/07 | -29            |
| DR Site Upgrade                    | Install Hardware | 04/08/07 | 3              |
| Budgeting System                   | Hire PM resource | 23/07/07 | -9             |
| Web site redesign                  | QA review        | 06/08/07 | 5              |

**Top 5 Projects in the Queue (Sorted by priority)**

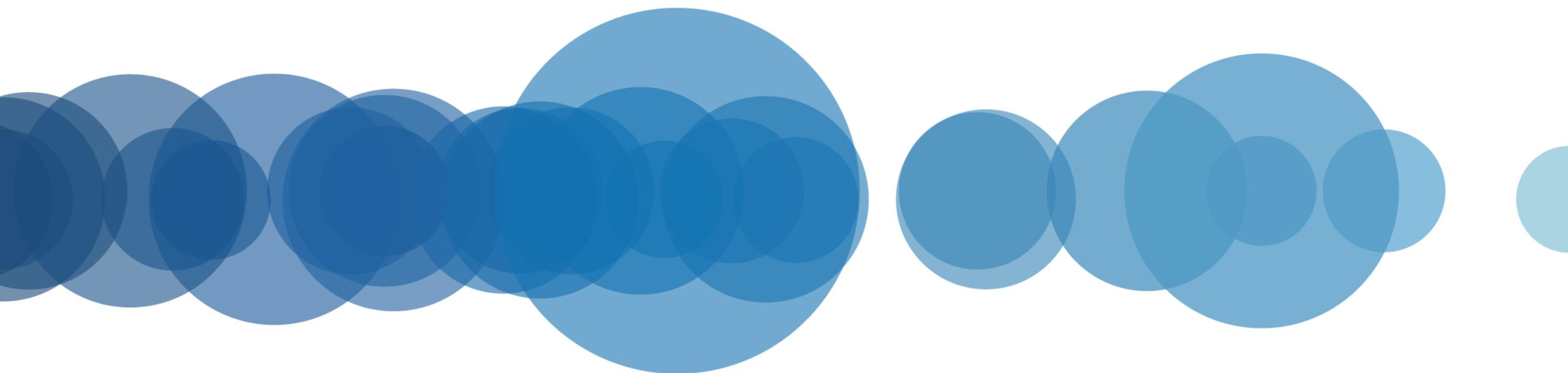
| Project                        | Status                  | Funding Approved | Sched. Start |
|--------------------------------|-------------------------|------------------|--------------|
| 1 Timesheet and Expense System | Project Manager awaited | X                | 01/10/07     |
| 2 Upgrade Office to 2007       | Cost benefit Analysis   |                  | 01/09/07     |
| 3 Failover for ERP             | Gate 1 preparation      |                  | 12/09/07     |
| 4 Upgrade DW hardware          | Evaluating Options      |                  | 05/08/07     |
| 5 Executive Dashboard          | Vendor XLCubed Selected | X                | 01/09/07     |

**Critical Events (Next 14 days)**

| Event  | Manager Responsible | Date     |
|--|---------------------|----------|
| Full System maintenance putage from 11 - 1130 pm   | CGJ                 | 03/08/07 |
| Present Hardware Upgrde Proposal to CEO            | Self                | 04/08/07 |
| Asia IT Management Team visting CIO                | Self                | 05/08/07 |
| Prepare Release Management Strategy for DW         | PDP                 | 06/08/07 |
| Deliver TDWI Dashboard Best Practises Presentation | Self                | 07/08/07 |

Source: *Information Dashboard Design* by Stephen Few

# Layout Basics



# Eye Scanning Patterns (Web)



*Red indicates more visual attention on that portion of the page*

Source: <http://styleguide.yahoo.com/writing/write-web/eye-tracking-where-do-readers-look-first>

# Eye Scanning Patterns (Web)



www.useit.com

*This “F” pattern is widely cited on the web  
but is partially a product of text-heavy pages.*

# Patterns are affected by content...

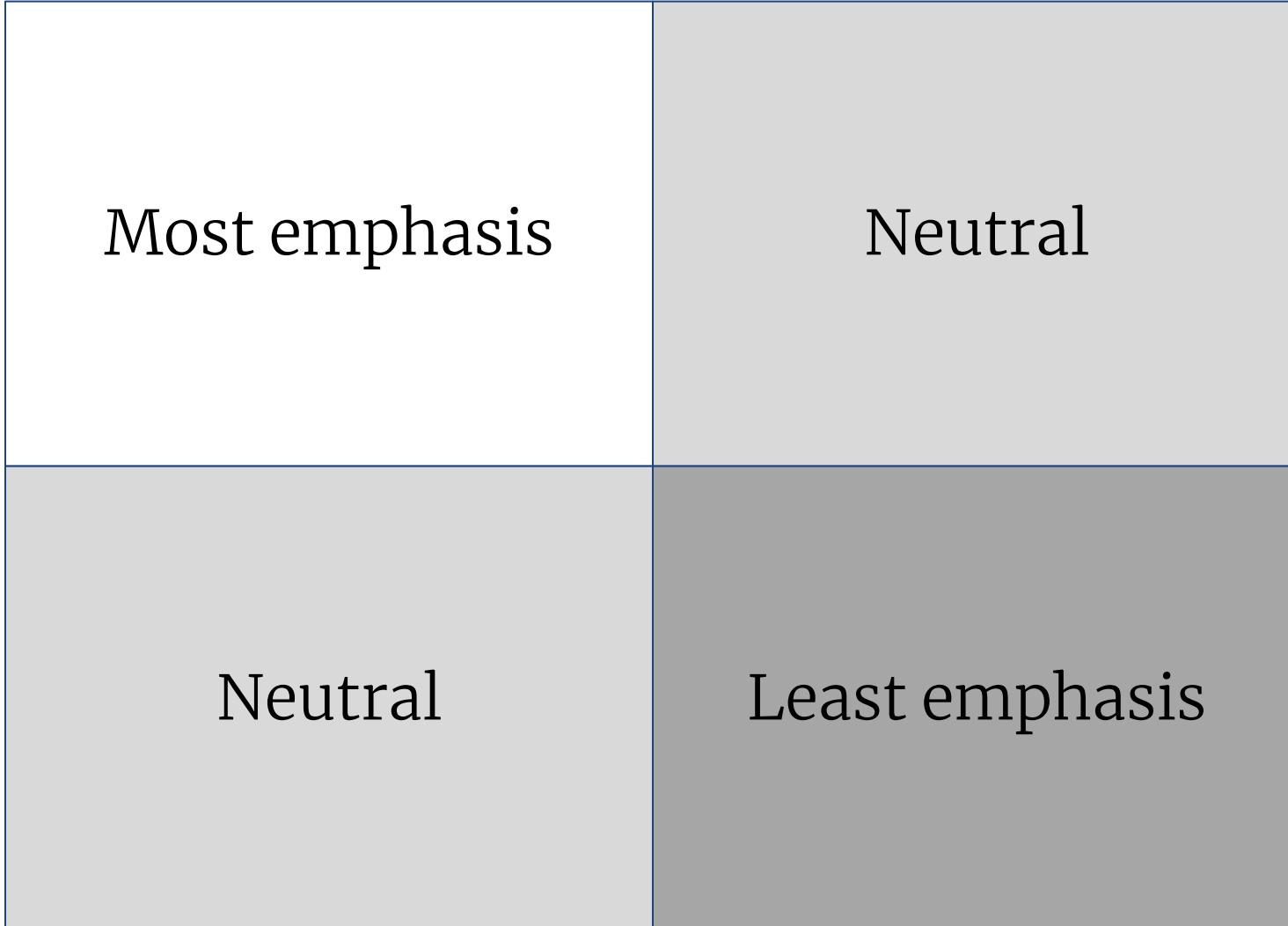


*...as well as the form of media being read.*

Source:

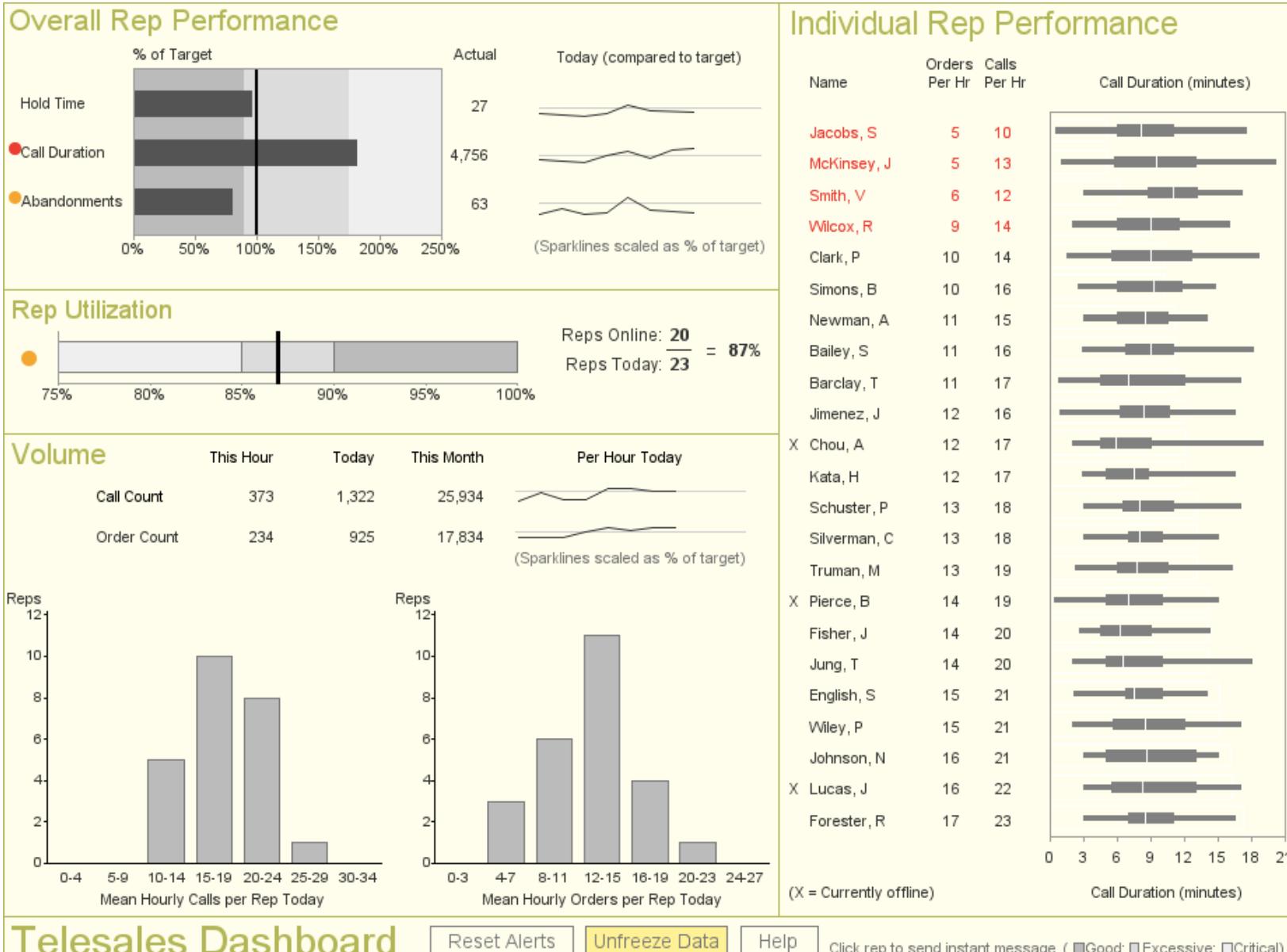
[http://www.humlab.lu.se/resources/publications/studentpapers/Holmberg\\_04](http://www.humlab.lu.se/resources/publications/studentpapers/Holmberg_04)

# Emphasis Guidelines for Dashboards



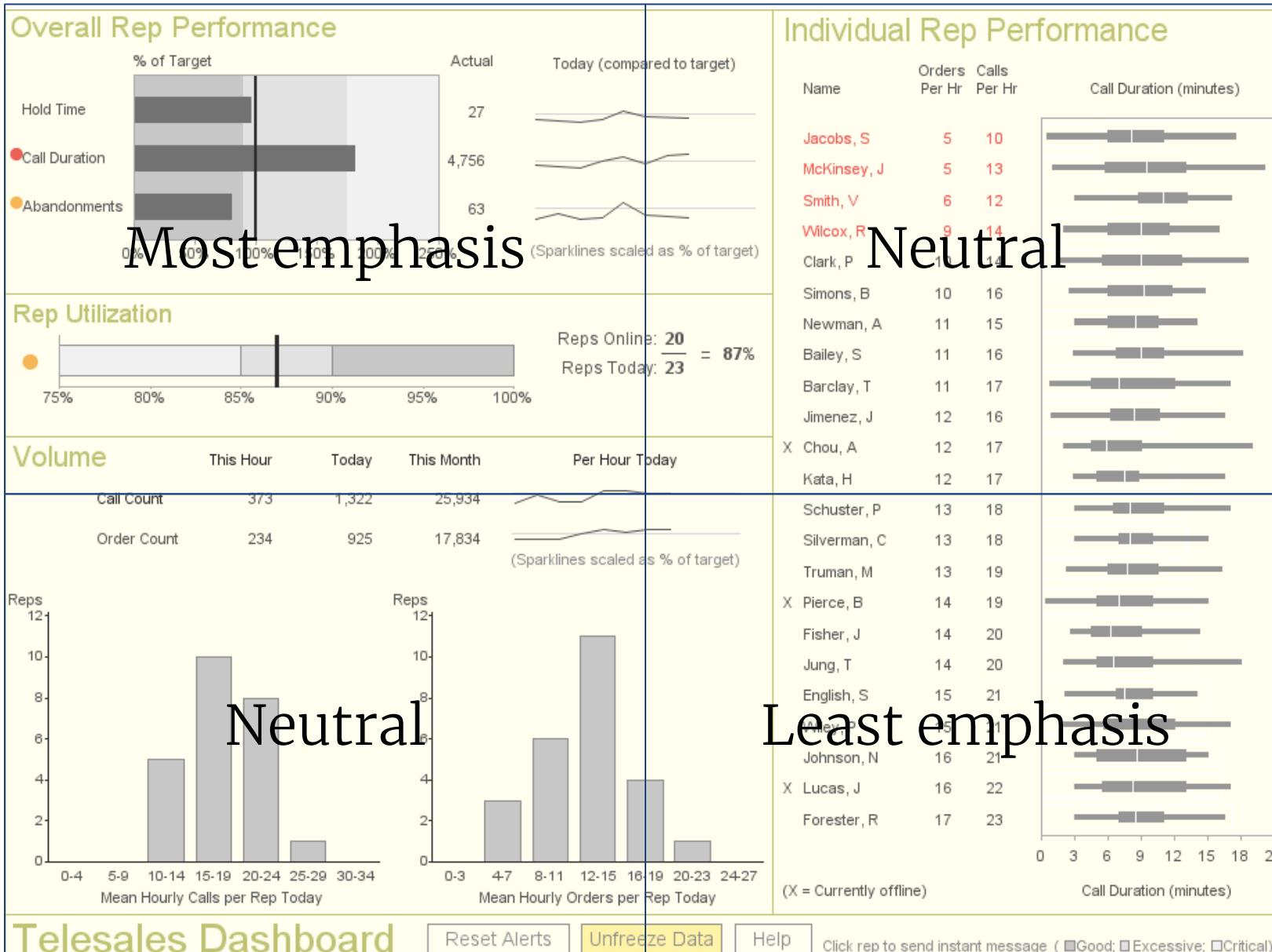
*Dominance of the neutral quadrants may change based on content.*

# Sales Team Dashboard



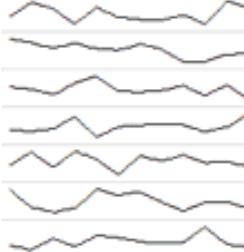
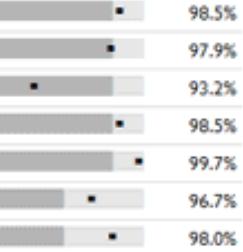
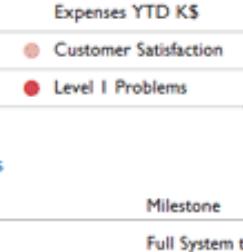
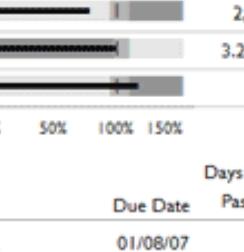
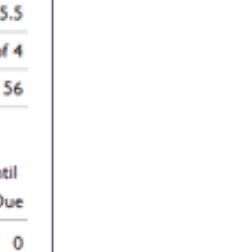
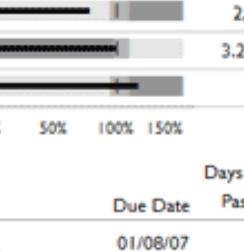
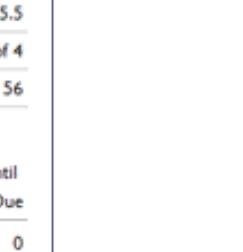
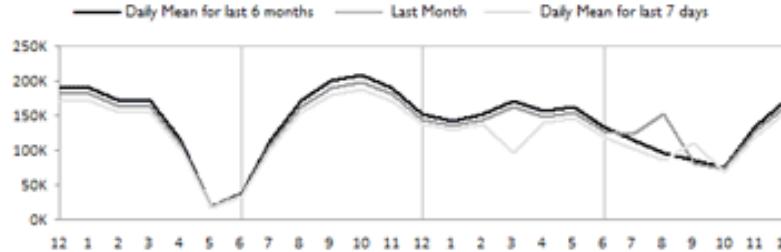
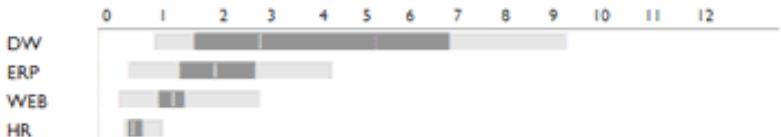
Source: *Information Dashboard Design* by Stephen Few

# Sales Team Dashboard



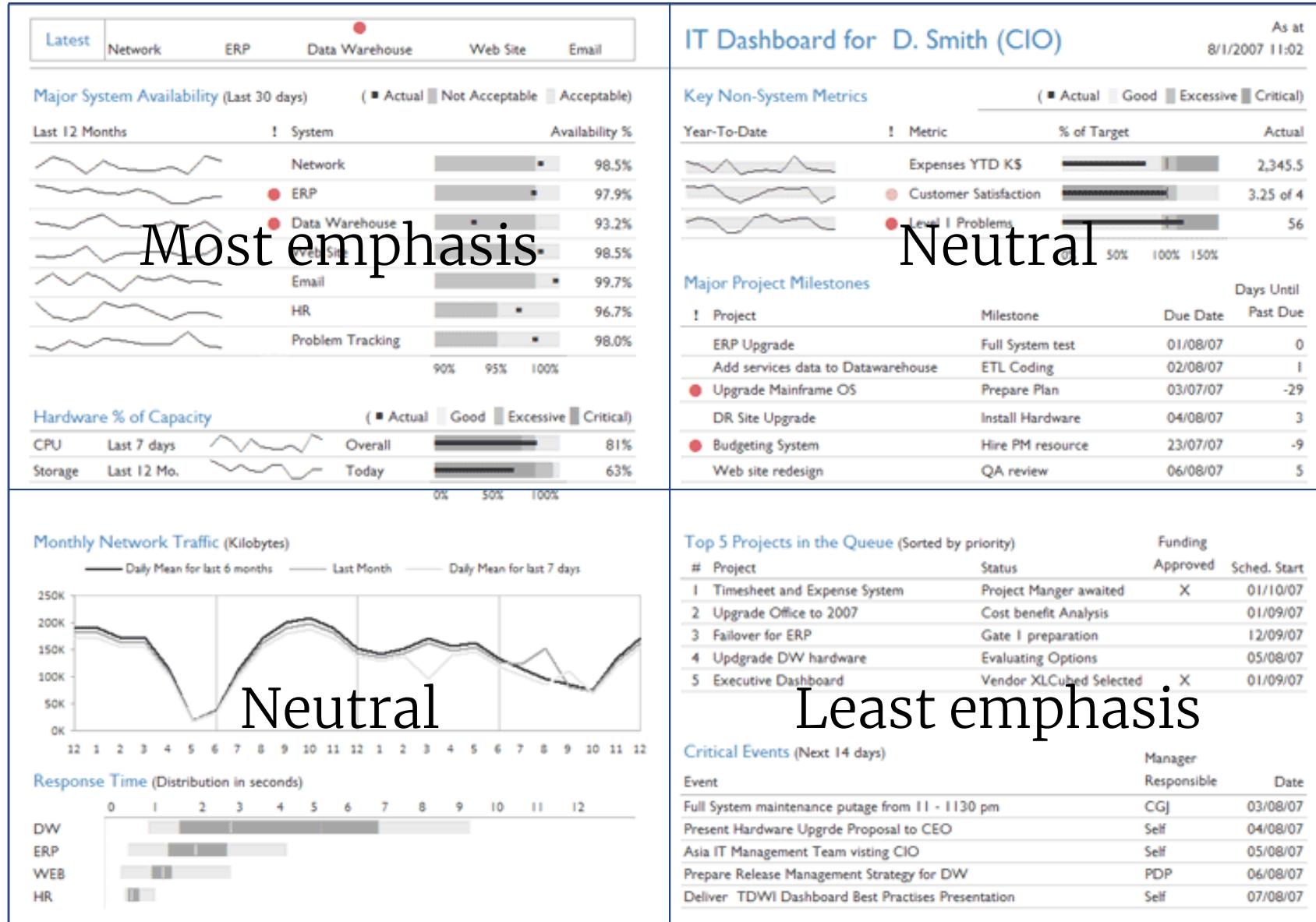
Source: *Information Dashboard Design* by Stephen Few

# CIO Dashboard

| Latest   | Network | ERP | Data Warehouse | Web Site | Email | IT Dashboard for D. Smith (CIO)   |  |  | As at<br>8/1/2007 11:02 |
|--|---------|-----|----------------|----------|-------|---|--|--|-------------------------|
| <b>Major System Availability</b> (Last 30 days) (■ Actual ■ Not Acceptable ■ Acceptable)   |         |     |                |          |       | <b>Key Non-System Metrics</b> (■ Actual ■ Good ■ Excessive ■ Critical)  |  |  |                         |
| Last 12 Months ! System Availability %   |         |     |                |          |       | Year-To-Date ! Metric % of Target Actual  |  |  |                         |
|  Network 98.5%<br> ERP 97.9%<br> Data Warehouse 93.2%<br> Web Site 98.5%<br> Email 99.7%<br> HR 96.7%<br> Problem Tracking 98.0% |         |     |                |          |       |  Expenses YTD K\$ 2,345.5<br> Customer Satisfaction 3.25 of 4<br> Level I Problems 56  |  |  |                         |
|  |         |     |                |          |       | 0% 50% 100% 150%  |  |  |                         |
| <b>Hardware % of Capacity</b> (■ Actual ■ Good ■ Excessive ■ Critical)   |         |     |                |          |       | <b>Major Project Milestones</b>   |  |  |                         |
| CPU Last 7 days Overall 81%<br> CPU 81%   |         |     |                |          |       | Days Until Due Date Past Due  |  |  |                         |
| Storage Last 12 Mo. Today 63%<br> Storage 63%   |         |     |                |          |       | ERP Upgrade Full System test 01/08/07 0<br>Add services data to Datawarehouse ETL Coding 02/08/07 1<br> Upgrade Mainframe OS Prepare Plan 03/07/07 -29<br>DR Site Upgrade Install Hardware 04/08/07 3<br> Budgeting System Hire PM resource 23/07/07 -9<br>Web site redesign QA review 06/08/07 5 |  |  |                         |
| <b>Monthly Network Traffic</b> (Kilobytes)   |         |     |                |          |       | <b>Top 5 Projects in the Queue</b> (Sorted by priority)   |  |  |                         |
|   |         |     |                |          |       | # Project Status Funding Approved Sched. Start  |  |  |                         |
|  |         |     |                |          |       | 1 Timesheet and Expense System Project Manger awaited X 01/10/07<br>2 Upgrade Office to 2007 Cost benefit Analysis 01/09/07<br>3 Failover for ERP Gate I preparation 12/09/07<br>4 Upgrade DW hardware Evaluating Options 05/08/07<br>5 Executive Dashboard Vendor XLCubed Selected X 01/09/07  |  |  |                         |
| <b>Response Time</b> (Distribution in seconds)   |         |     |                |          |       | <b>Critical Events</b> (Next 14 days)   |  |  |                         |
|    |         |     |                |          |       | Event Manager Responsible Date  |  |  |                         |
|  |         |     |                |          |       | Full System maintenance putage from 11 - 1130 pm CGJ 03/08/07<br>Present Hardware Upgrde Proposal to CEO Self 04/08/07<br>Asia IT Management Team visting CIO Self 05/08/07<br>Prepare Release Management Strategy for DW PDP 06/08/07<br>Deliver TDWI Dashboard Best Practises Presentation Self 07/08/07  |  |  |                         |

Source: *Information Dashboard Design* by Stephen Few

# CIO Dashboard



Source: *Information Dashboard Design* by Stephen Few

# Website Analytics

All data from August 1, 2015 through July 15, 2016

data + science  
= transforming data to insight

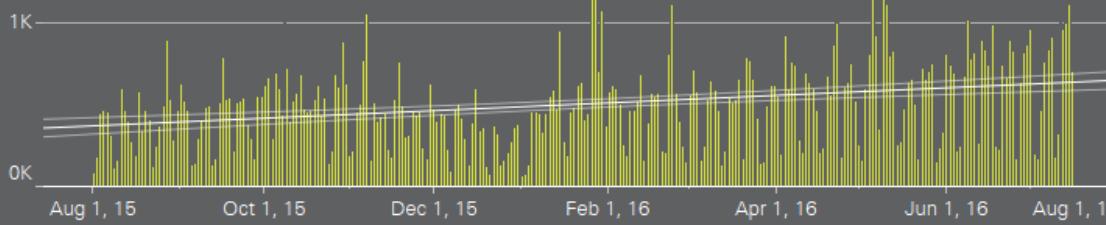
## DATAPLUSSCIENCE.COM

**174,828**  
pageviews

**81,938**  
users

**32**  
blog posts

Daily pageviews



Most Visited Topics  
(pageviews)

|  |        |
|--|--------|
| Sankey                                 | 32,977 |
| Tableau Reference Guide                | 19,240 |
| Tableau with Reveal.js and Deck.js     | 11,381 |
| Node Link Tree Diagram                 | 5,529  |
| Geocoding in Tableau Using R           | 4,601  |
| Venn Diagram                           | 4,072  |
| Tableau Jitter                         | 4,050  |
| Tableau Tips                           | 3,809  |
| iframe for Tableau maps                | 3,303  |
| Tableau Converter                      | 2,588  |
| Tableau Voice Recognition and Response | 1,086  |

Location of Visitors



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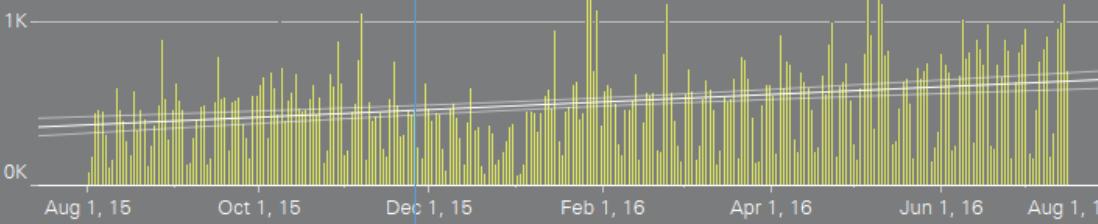


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Neutral

Neutral

Location of Visitors



Least emphasis

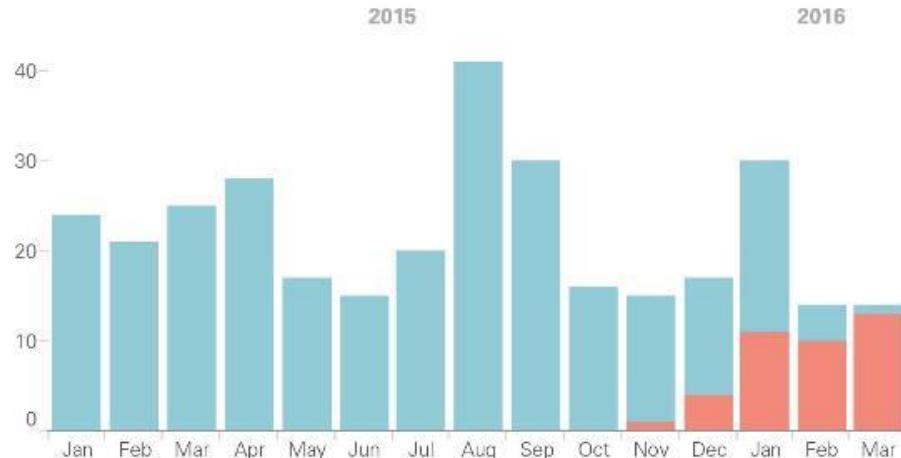
# Complaints Dashboard

**Total Complaints:** Closed 288 Open 39 Total 327

Date Received  
 1/1/2015  3/18/2016

Source Type All Show Open/Closed All

## Complaints by Month



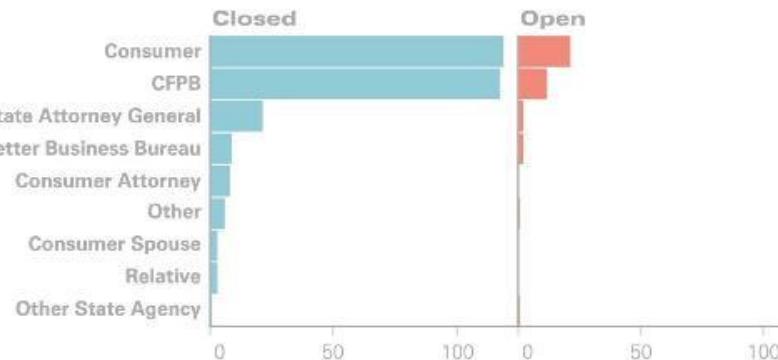
## Open Complaints by State (click to filter)



## Complaints by Reason



## Complaints by Party (click to filter)



# Complaints Dashboard

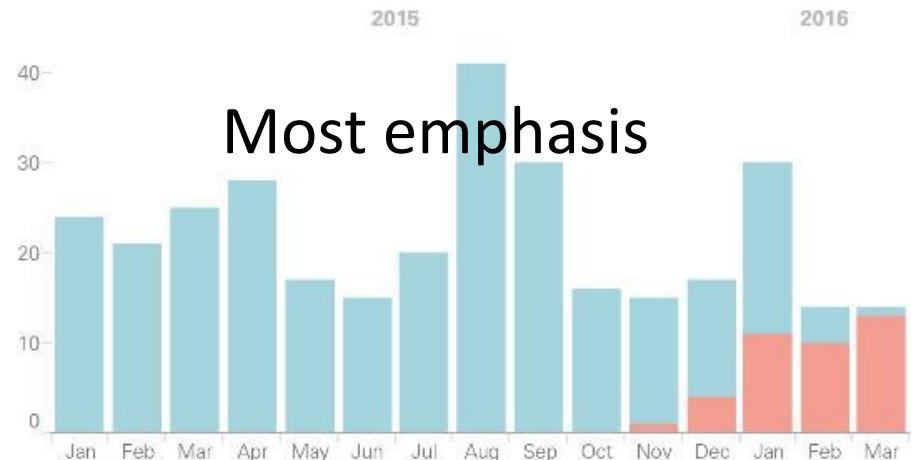
Date Received

1/1/2015

3/18/2016

**Total Complaints:** 288 39 Total 327

## Complaints by Month



Most emphasis

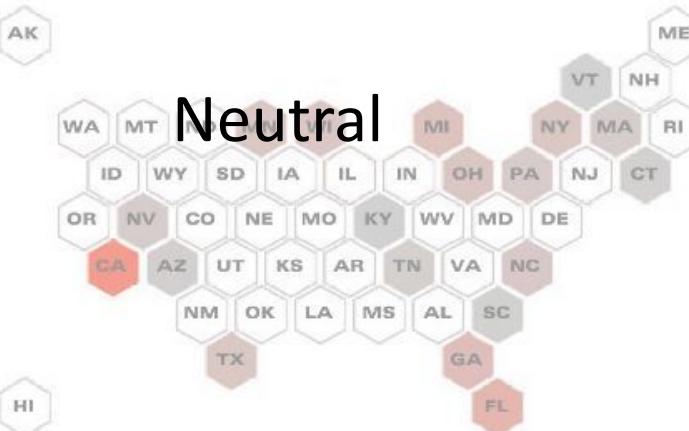
Source Type

All

Show Open/Closed

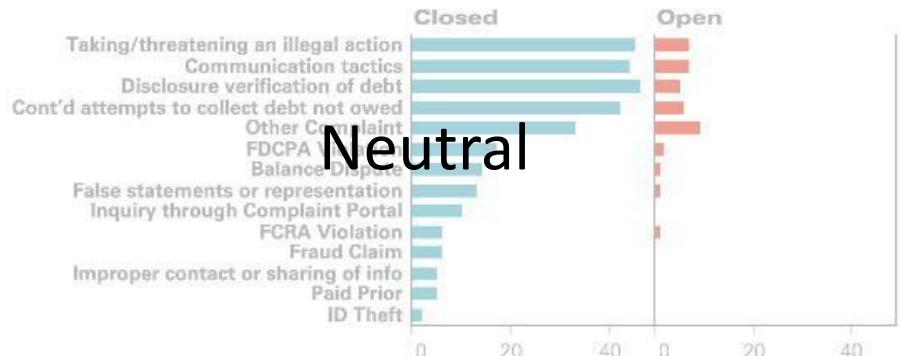
All

## Open Complaints by State (click to filter)



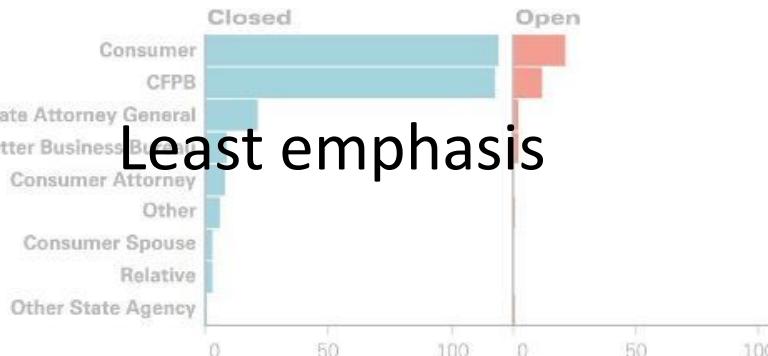
Neutral

## Complaints by Reason



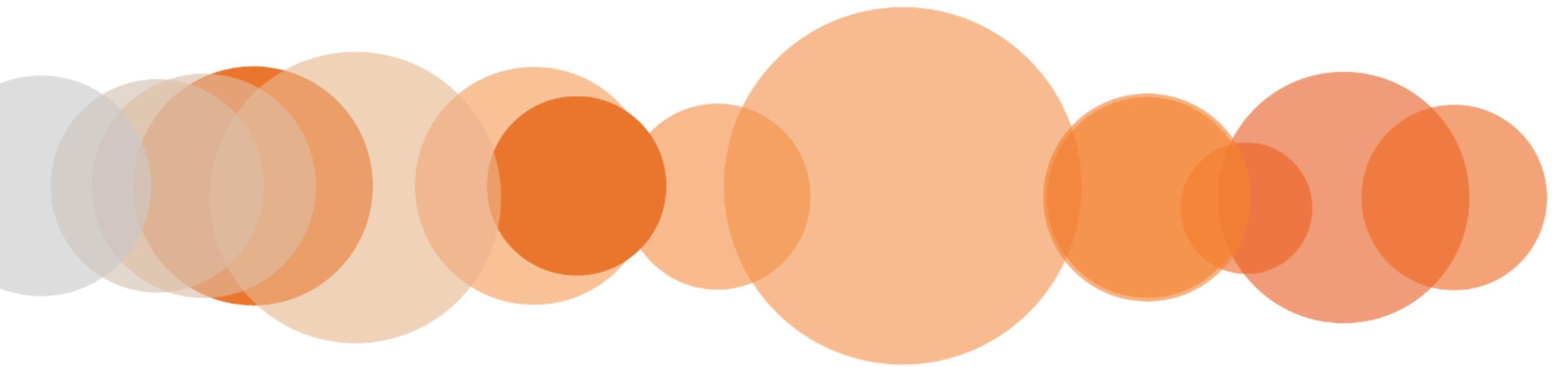
Neutral

## Complaints by Party (click to filter)

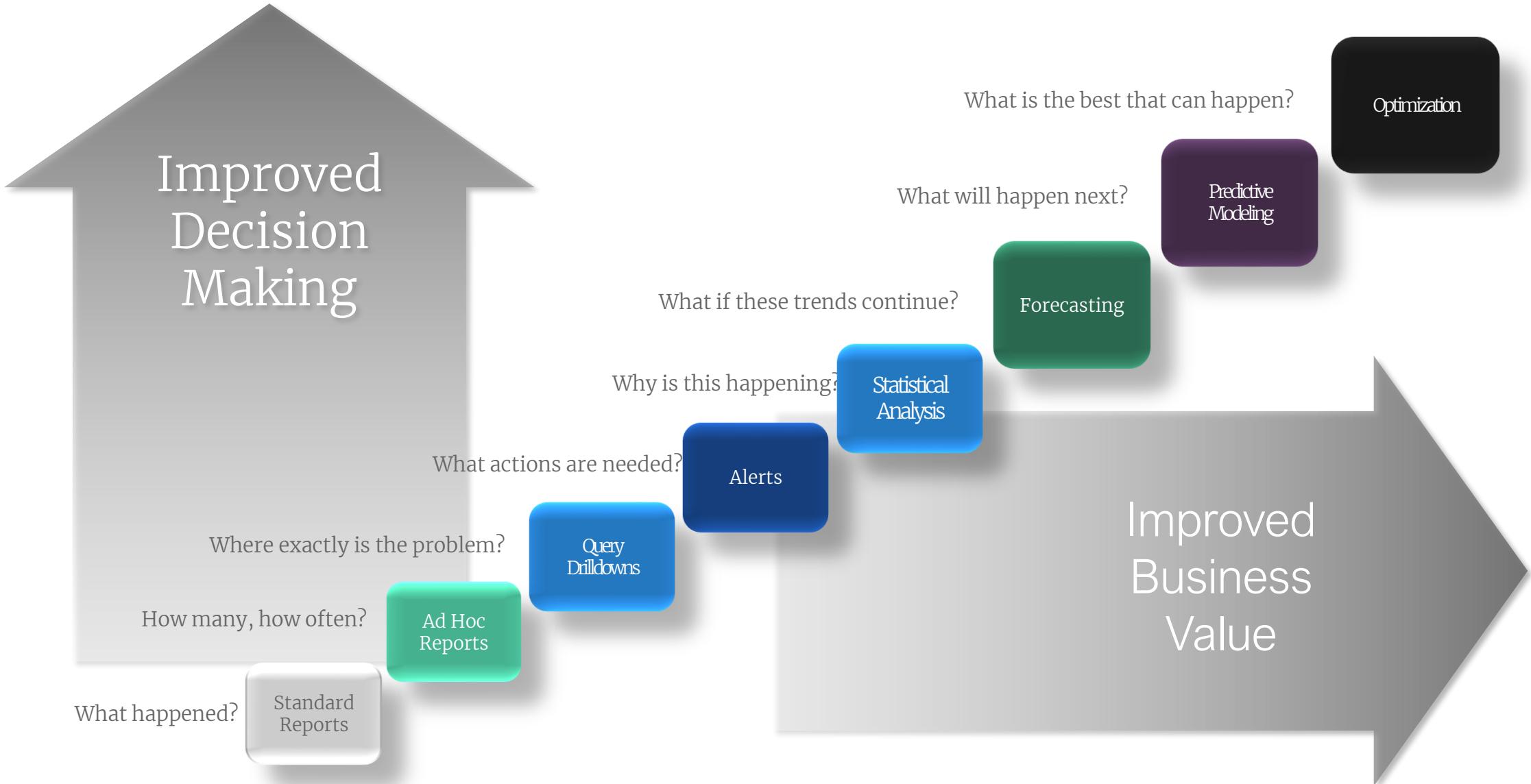


Least emphasis

# What Makes Visualization Actionable?



# Questions and Analytics Maturity



# Key Performance Indicators (KPIs)

A KPI is a type of performance measurement, used to evaluate success or achievement against a specific goal

- Can be operational or strategic
- Help to identify areas that need attention
  - More “where to look” vs. “this happened”
- Knowledge of “what matters” to an organization makes KPIs relevant
- Often included in dashboard displays

*You must know what you’re measuring and what performance is desired before you create a KPI.*

Tableau - Go to Start

File Data Worksheet Dashboard Story Analysis Map Format Server Window Help

Data Analytics

Orders (My Superstore)

**Dimensions**

- Order ID
- Postal Code
- Product ID
- Product Name
- Region
- Row ID
- Segment
- Ship Date
- Ship Mode
- State
- Sub-Category

**Measures**

- Discount
- Profit
- Quantity
- Sales
- Latitude (generated)
- Longitude (generated)
- Number of Records

**Sets**

- City Set

**Parameters**

- Shipping Cost Parameter

**Data Pane**

Pills

Fit

Show Me

Pages

iii Columns

ROWS Category SUM(Sales) AVG(Discount)

Sample Worksheet

Category

Furniture

Office Supplies

Technolo...

Sales

Discount

\$40K \$20K \$0K

30% 20% 10% 0%

View

30% 20% 10% 0%

30% 20% 10% 0%

2012 2013 2014 2015 2016

Month of Order Date

Legend

Furniture

Office Supplies

Technology

Measure Names

Discount

Caption

The trends of sum of Sales and Discount for Order Date Month broken down by Category. For pane Sum of Sales: Color shows details about Category. For pane Average of Discount: Color shows details about Discount. The data is filtered on

Data Source Tab

Status Bar

288 marks 3 rows by 1 column SUM of AVG(Discount): 2221%

Region

- (All)
- Central
- East
- South
- West

Displayed Filter

Source: oreilly

# Summary