

# Dashboard Design

## Best Practices for Practical Benefits

Matt Barker



- What Is a Dashboard? .....2
- Types of Dashboard.....2
- Common design mistakes.....2
- Tables vs. Graphs.....3
- Data Comparisons .....3
  - Sparklines .....4
  - Bullet Graphs .....4
- Graph Design.....4
  - Example 1 .....5
  - Example 2.....6
- Clear and Simple Data.....7
  - Reduce the non-data pixels .....7
    - Eliminate all unnecessary non-data pixels .....7
    - De-emphasise and regularise any non-data pixels that remain .....7
  - Enhance the Data Pixels.....8
    - Eliminate all unnecessary data pixels .....8
    - Highlight the most important data pixels that remain .....8
- Colour Schemes .....8
  - Use Subtle & Vivid Colours Appropriately.....8
- Sources and Further Reading .....8

# What Is a Dashboard?

---

*"A picture is worth a thousand words."*

---

Dashboards are visual displays. The information on a dashboard is presented visually as a combination of text and graphics, with an emphasis on graphics. Well implemented graphics can often communicate with greater efficiency and richer meaning than text alone.

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

(Stephen Few, *"Dashboard Confusion"* Intelligent Enterprise 2004)

- Dashboards display the information needed to achieve specific objectives.
- A dashboard fits on a single computer screen.
- Dashboards are used to monitor information at a glance.
- Use intuitive display mechanisms – the correct chart type must be selected for a particular piece of information.
- Dashboard designs must be tailor made to the requirements of a specific person, group, or function.

## Types of Dashboard

- Operational – Contains service measures/SLAs. Often near or real time data.
- Strategic / Executive – KPIs tracked on a periodic basis. Provides a high level overview.
- Analytical – Operational or strategic, with drill-down functionality (but only where needed)

## Common design mistakes

- Exceeding a single screen – resorting to scrollbars and tabbed layouts
- Inadequate context – no comparison to historic data or a target
- Excessive detail – example: £3,499,832.00 instead of £3.5M
- Choosing a deficient measure – if the reader needs variance from target, display the figure, don't leave it to be worked out
- Introducing meaningless variety – keep to a consistent layout and colour theme
- Encoding quantitative data inaccurately – example: not starting the scale at zero on a bar graph
- Arranging the data poorly – reserve the top-left of the screen for important data, not a company logo
- Ineffective highlighting of important data – make the most important data stand out
- Cluttering the display with useless decoration – i.e. logos & flashy widgets such as speedometers
- Misusing or overusing colour decoration – example: RAG status where only red indicators are needed
- Designing an unattractive visual display – dashboards need to be plain, but not ugly
- Choosing the wrong display type – example: Using a graph where a table would be easier to read

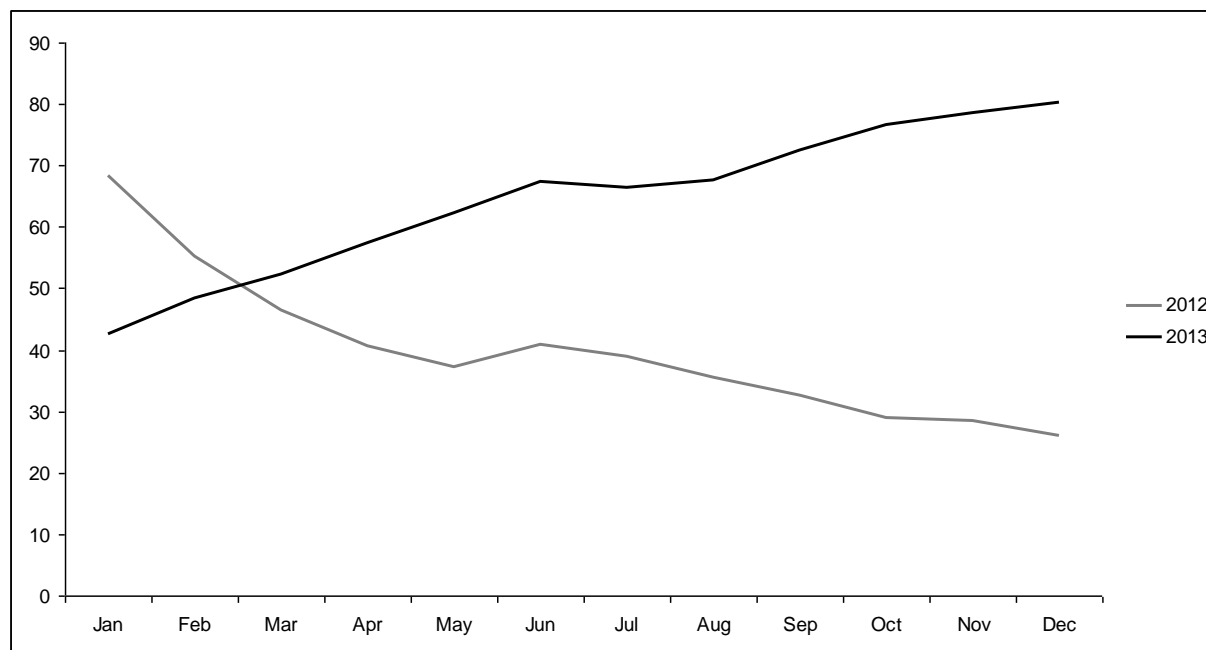
## Tables vs. Graphs

- Tables work best when the reader needs to look up individual values or the values must be precise.
- Graphs work best we need to communicate the shape of the data (patterns, trends, or exceptions).

### Example

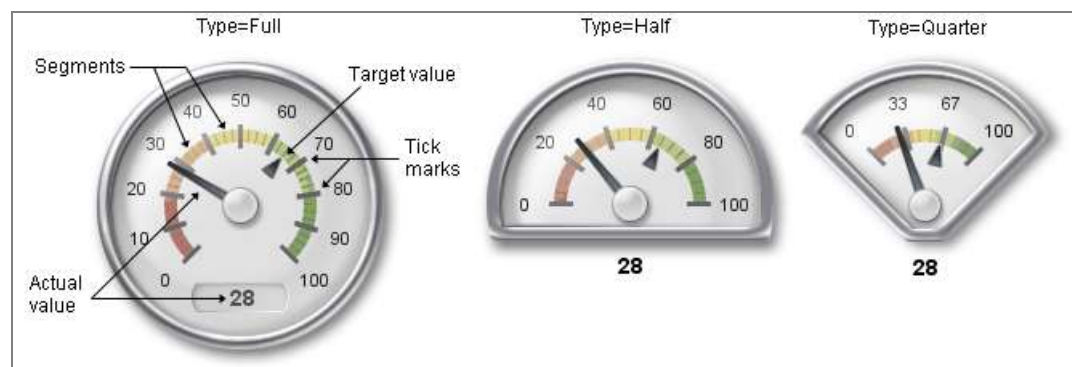
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2010	36.07	15.61	85.31	51.93	50.74	50.61	92.5	27.34	49.14	17.96	78.29	42.46	598
2011	86.39	60.32	99.78	73.71	93.43	66.89	90.45	37.02	22.25	83.65	92.82	15.18	821.9
2012	68.27	55.32	46.58	40.6	37.24	40.87	38.93	35.48	32.56	28.97	28.42	26.13	479.4
2013	42.68	48.42	52.36	57.51	62.34	67.48	66.38	67.58	72.56	76.52	78.45	80.32	772.6

This table works extremely well as a lookup table to find exact figures for a specific month. If we need to see the shape of the trend for 2013 compared to 2012 however, a graph would work much better:



## Data Comparisons

A common feature promoted by reporting software vendors is the speedometer graph:



Source: SAS

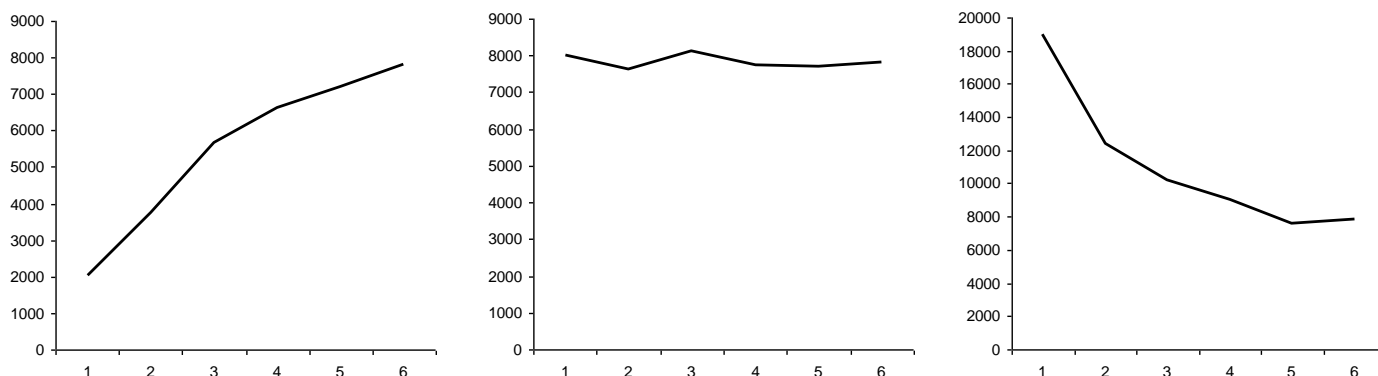
However, if we consider the central graph, several problems are apparent:

- We are on target according to the green conditional formatting, but *how much* over target are we?
- Is this better or worse than before?
- What is the trend – are sales increasing or decreasing?

A common answer to the “better or worse” question is the use of up or down arrows such as these:

Dec-13	Nov-13	% Difference
7822	7534	3.82

Unfortunately, this does nothing to give any indication of the overall trend; those figures could actually be any of these 3 situations (climbing, flat-lining, or crashing):



## Sparklines

A better approach is to use *sparklines* to give an indication of the historic trend.

The term sparkline was introduced by its inventor Edward Tufte for "small, high-resolution graphics usually embedded in a full context of words, numbers, images".

(Edward Tufte, "Beautiful Evidence" Graphics Press 2006)

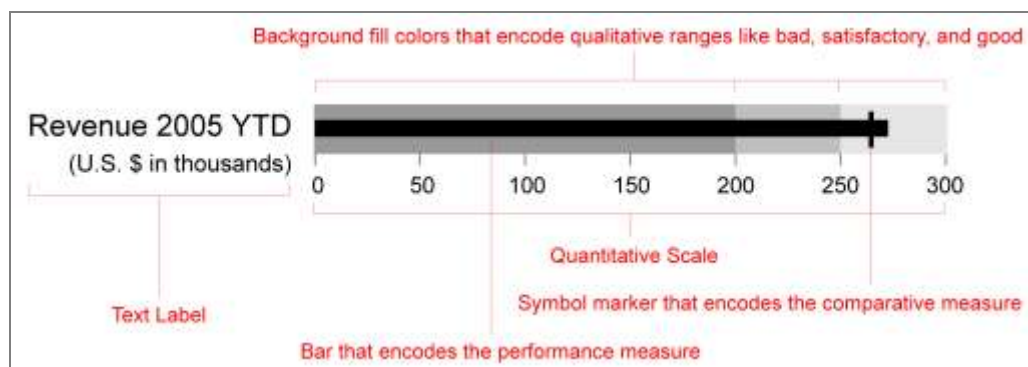
Tufte describes sparklines as "data-intense, design-simple, word-size graphics". As such, they are intended to appear inline with data and text to give context and meaning to displayed numbers:



The axes are deliberately missing; sparklines are not meant to provide the precision of a normal line graph. Their purpose is to provide an immediate indication of historical context to enrich the meaning behind the number. This is exactly what's required in a dashboard. Instead of details, you must display a quick view that can be assimilated at a glance. This will help highlight points of interest and anomalies that can be further investigated via drill-through analytical reports.

## Bullet Graphs

Another form of inline graph that provides an intuitive and compact view of performance against target is the *bullet graph*, invented by Stephen Few:



Source: Wikipedia

## Graph Design

This process consists of the following stages:

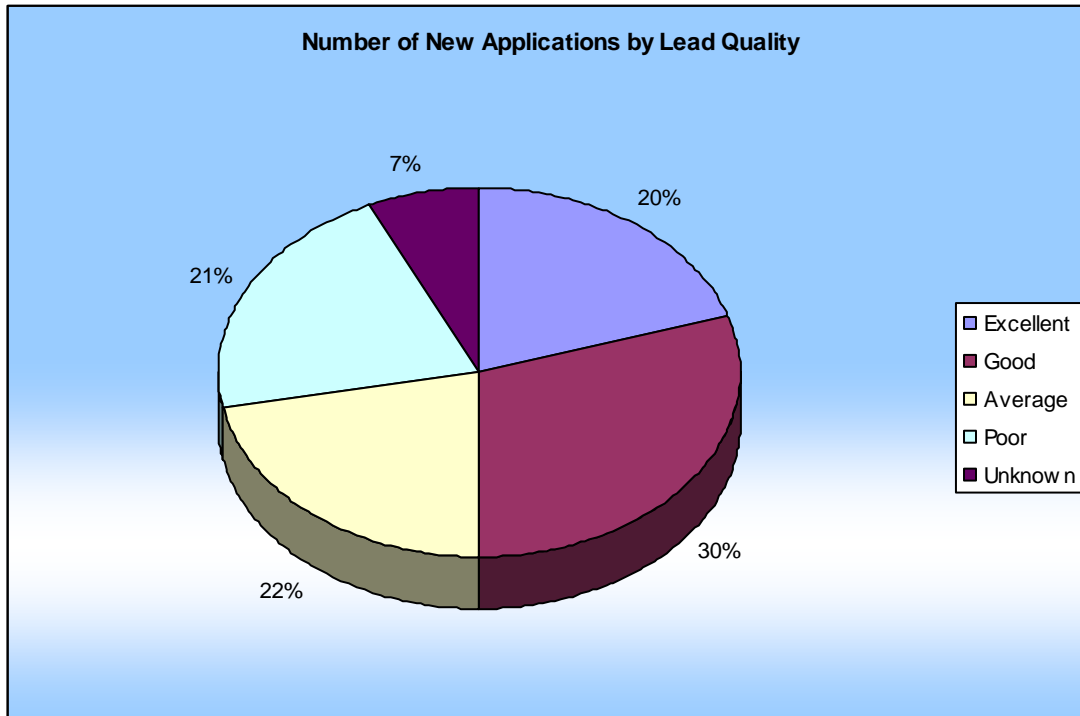
1. Determine your message and identify the data necessary to communicate it.
2. Determine if a table, graph, or combination of both is needed to communicate your message.

The remaining stages apply only if one or more graphs are required:

3. Determine the best means to encode the values (bar, line, scatter etc., a mixture of types, or multiple small graphs)
4. Determine where to display each variable (horizontal or vertical display, series ordered by size etc.)
5. Determine the best design for the remaining objects (legends, title, axis labels)
6. Determine if particular data should be featured above the rest, and if so, how

## Example 1

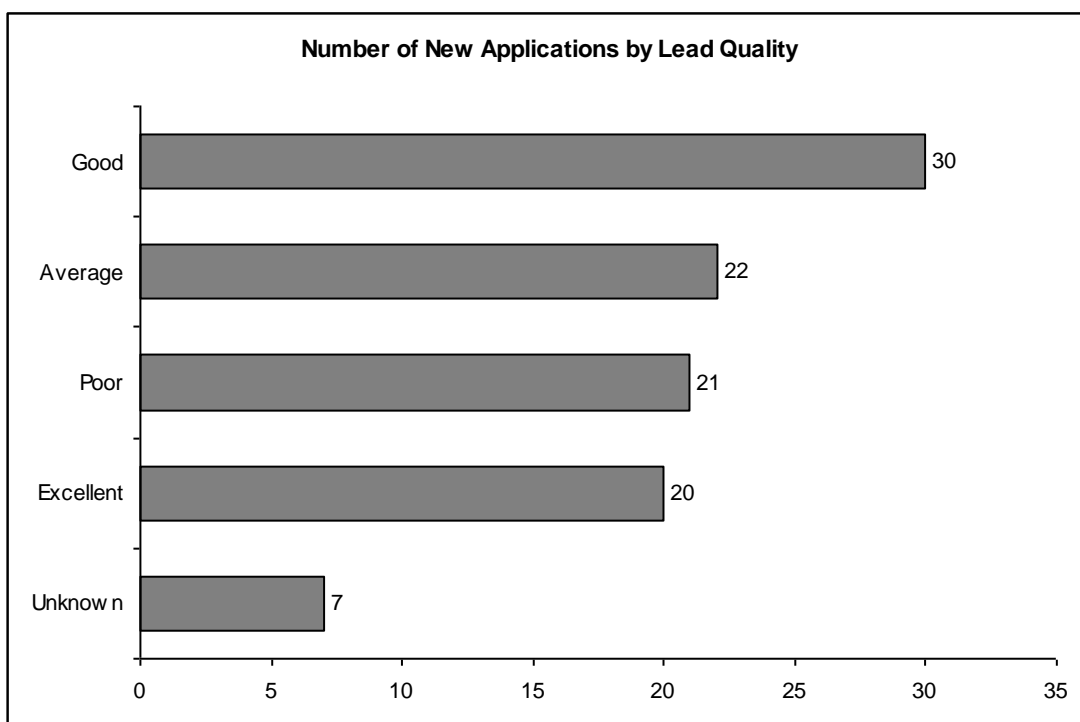
Here is an example with several problems:



### Problems

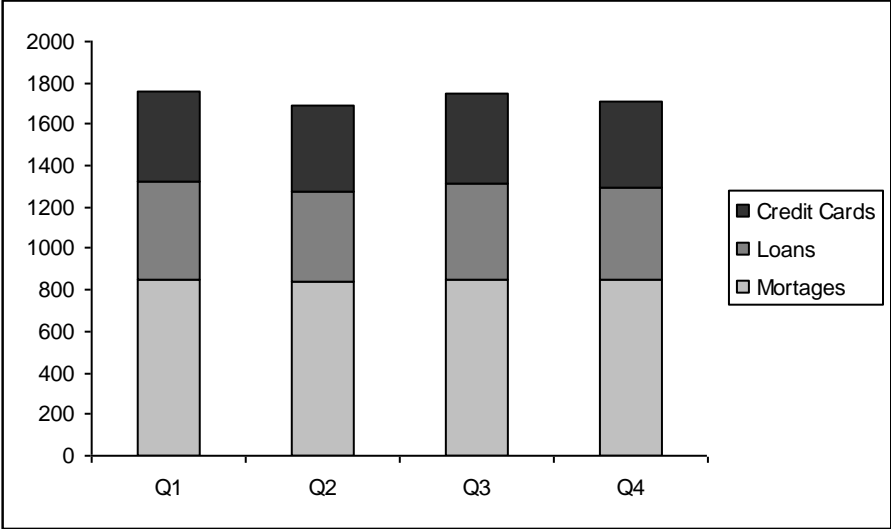
- It is hard to visually determine the size difference between the slices. It is much easier to determine differences in length or height rather than angle
- The 3D effect is needless and distracting
- The gradient effect in the background detracts from the readability of the data labels

A much clearer display of the same data could look like this:

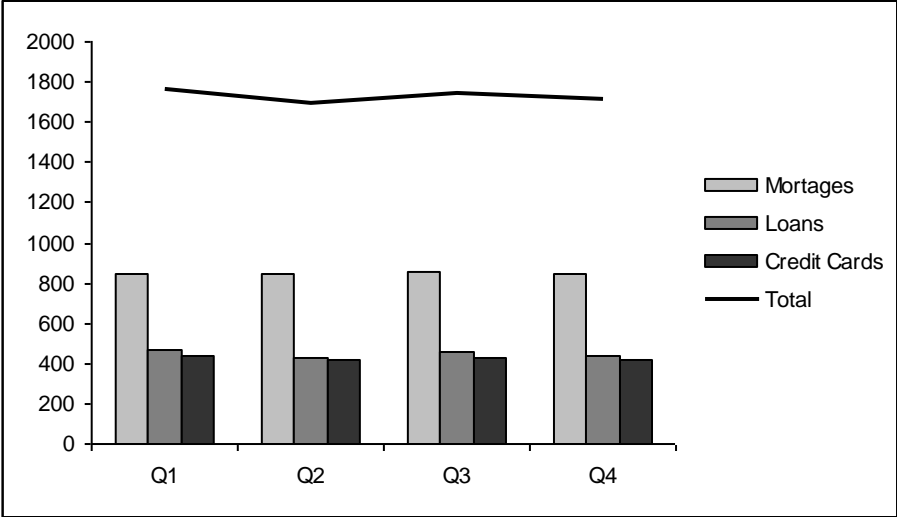


## Example 2

Stacked column graphs are often used to display a combination of a trend and to show the components that comprise a metric. However, they should be used with caution. The only circumstance when a stacked graph is useful is when you must display multiple instances of a whole and its parts, with a greater emphasis on the whole rather than the parts.



It is hard to determine from the above graph whether Credit Cards or Loans had the greater sales volume in Q1. If we need to compare the components and also see the trend for the total, a better version could look like this:



# Clear and Simple Data

Visual dashboard design revolves around 2 key objectives:

- Reduce the non-data pixels
- Enhance the data pixels

## Reduce the non-data pixels

The goal of reducing the non-data pixels can be further broken down into 2 steps:

### Eliminate all unnecessary non-data pixels

Examples:

- 3D effects on graphs
- Unnecessary grid lines on graphs
- Decorative backgrounds and logos
- Colour gradients in the backgrounds of graphs
- Bold grid lines in tables (when white space alone would do the job as well)
- Repetition of unit symbols

Before:

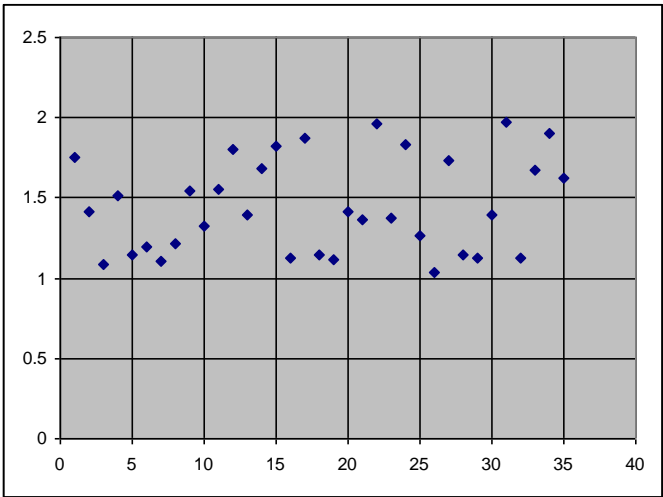
Name	Sales	Target	Achieved
Andy Arbuckle	£2,384	£2,000	119.20%
Bob Barker	£1,785	£1,500	119.00%
Clare Clitheroe	£1,989	£2,000	99.45%
Dave Dingle	£1,536	£3,000	51.20%
Eddie Edwards	£1,890	£2,000	94.50%
Total	£9,584	£10,500	91.28%

After:

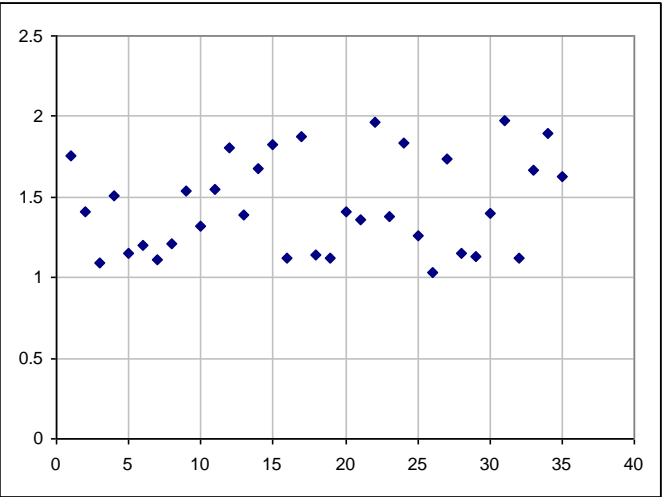
Name	Sales (£)	Target (£)	Achieved (%)
Andy Arbuckle	2384	2000	119.20
Bob Barker	1785	1500	119.00
● Clare Clitheroe	1768	2000	88.40
● Dave Dingle	1536	3000	51.20
● Eddie Edwards	1890	2000	94.50
Total	9363	10500	89.17

### De-emphasise and regularise any non-data pixels that remain

Before:



After:



## Enhance the Data Pixels

### Eliminate all unnecessary data pixels

On a dashboard, immediate insight is the goal, and each metric should be an identified *KPI* (Key Performance Indicator). Any lower level measures should be reserved for detail reports based on one of the KPIs. By removing information that isn't strictly necessary, focus is automatically increased on the information that remains.

### Highlight the most important data pixels that remain

The most important KPIs should be located in the top-left of the screen – this is the area that the eye of an English speaking reader will naturally scan first.

The layout and location of data on the screen should not change dynamically. Once users become accustomed to reading a certain dashboard, they will subconsciously come to expect specific data in a set place. This can be used to our advantage as it helps them to scan the dashboard quickly

#### Grouping

- Organise groups according to business functions, entities, and use
- Locate items together that belong to the same group
- Delineate groups using the least visible means

## Colour Schemes

You don't need to be a graphic artist to design an attractive dashboard, but you do need to understand a few basic principles about visual perception.

### Use Subtle & Vivid Colours Appropriately

#### Standard (Subtle) Colours



#### Emphasis (Vivid) Colours



## Sources and Further Reading

- Show Me the Numbers by Stephen Few (Aug 2004)
- Information Dashboard Design by Stephen Few (Jan 2006)
- Effectively Communicating Numbers by Stephen Few (Nov 2005)
- The Visual Display of Quantitative Information by Edward Tufte (Jan 2001)