

**User Group**  
**Summit**  
**NORTH AMERICA**

# Demystifying Visualizations and Enhancing Report Design

**Reid Havens** – Founder  
Havens Consulting Inc.



Reid Havens

- Founder | BI Evangelist | Consultant
- Microsoft MVP
- PBI User Group Co-Organizer – Redmond, WA
- Nickname: “The Viz Wiz”

<https://www.havensconsulting.net>

[reid@havensconsulting.net](mailto:reid@havensconsulting.net)



**Microsoft**<sup>®</sup>  
Most Valuable  
Professional



# Demystifying Visualizations and Enhancing Report Design

## • Applying Report Design Principles

- Information Processing
- Report Organization
- S.C.R.A.P Methodology
- Color Theory
- Visual Cues
- 8 Rules of Power BI Design

## • Designing Advanced Reports

- Conditional formatting
- Drillthrough filters
- Visual interactions
- Sync slicers
- Report tooltips
- Bookmarks
- Custom Visuals

# Power BI Real-Time Demo Survey





# Applying Report Design Principles

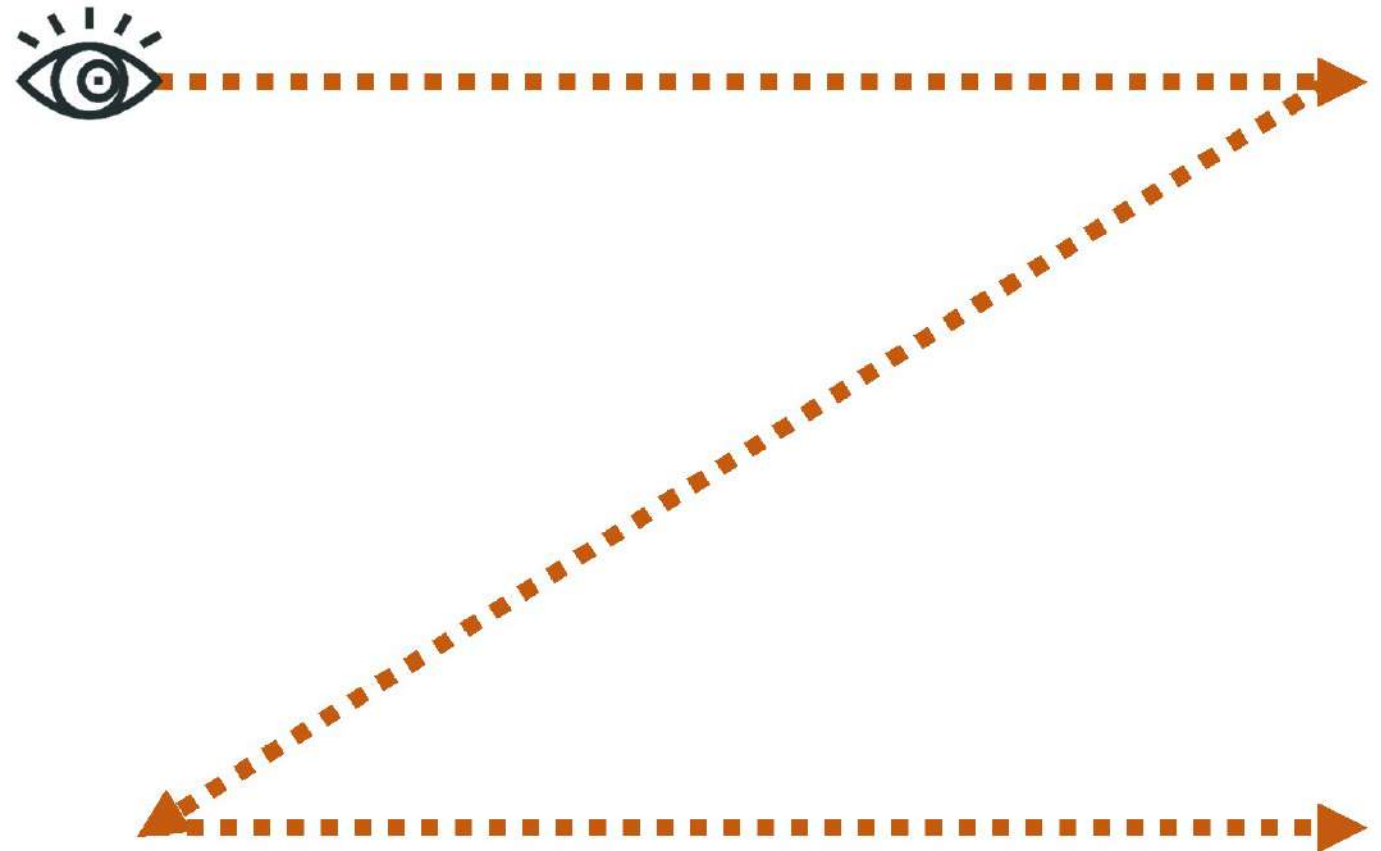
- Information Processing
- Report Organization
- S.C.R.A.P Methodology
- Color Theory
- Visual Cues
- 8 Rules of Power BI Design

# Design Principles

## Information Processing

### How we process information

- ⇒ Information is read left to right
  - Most people are accustomed to read in the direction of **left to right**.

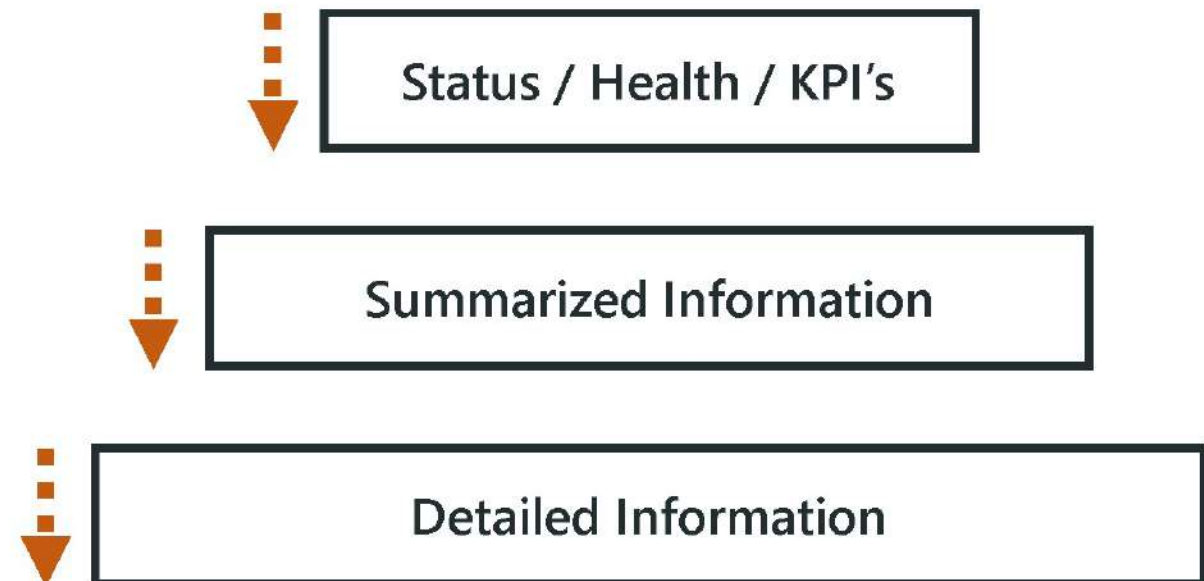


# Design Principles

## Information Processing

### How we process information

- ➔ Information is read left to right
  - Most people are accustomed to read in the direction of **left to right**
- ↓ Data is analyzed from the top down
  - People typically look at summarized data **first**, before seeking further information
- 🎯 Application of Principles
  - Leveraging these two principles in report design will create more **effective reports**





# Design Principles

## Information Processing ► Effective Report Organization

### The data processing flow

1. Key Performance Indicators (KPI's)
  - Information pertaining to the **status**, **performance**, or **health** of the organization

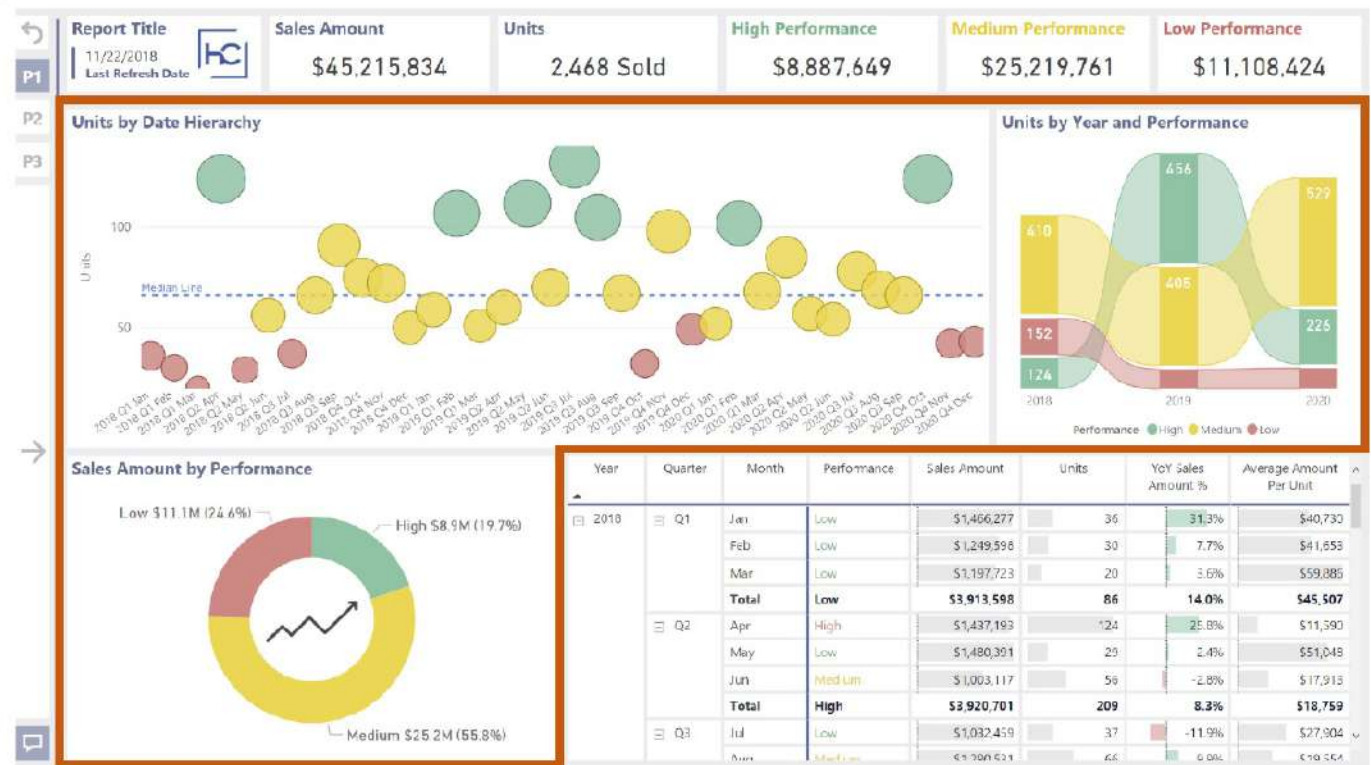


# Design Principles

## Information Processing ► Effective Report Organization

### The data processing flow

1. Key Performance Indicators (KPI's)
  - Information pertaining to the **status**, **performance**, or **health** of the organization
2. Summarized Information
  - Visuals displaying **patterns** or **trends** in the data. Allowing additional insights to the KPI's

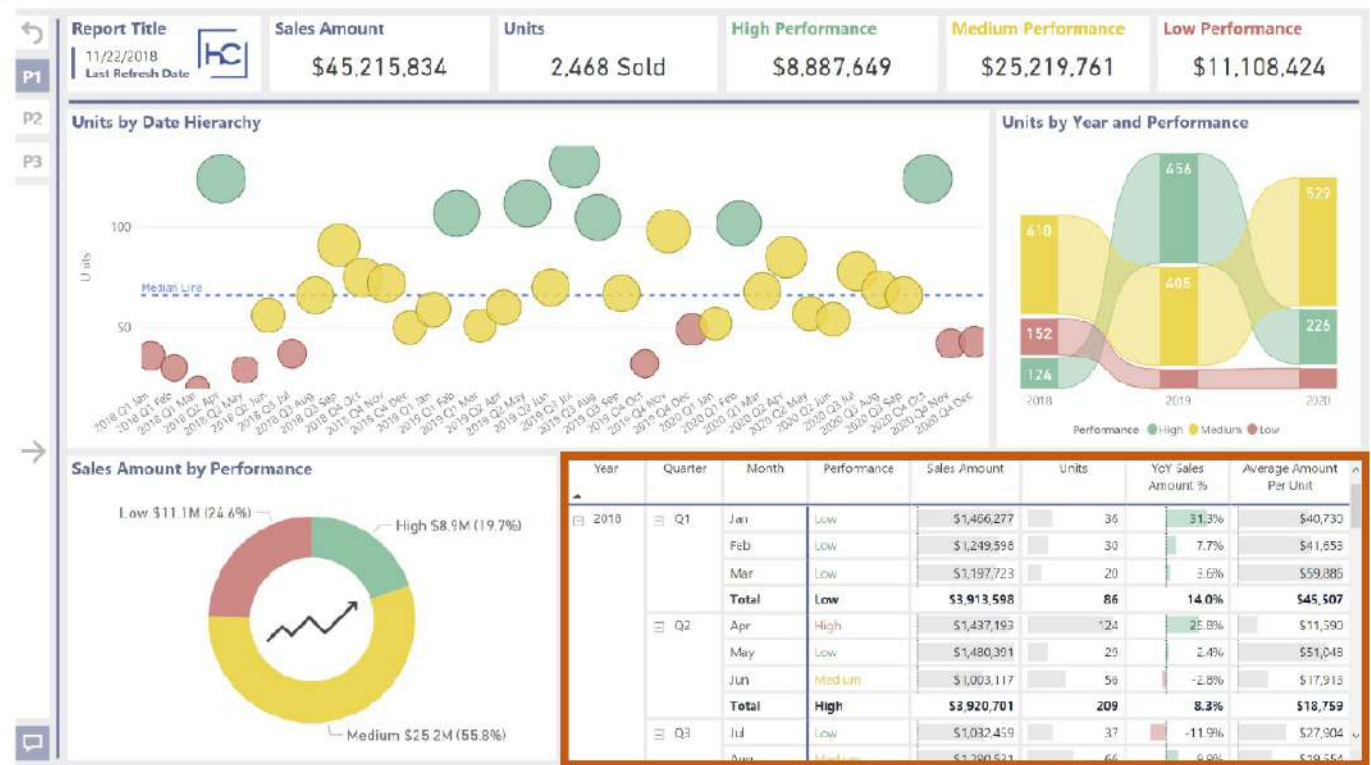


# Design Principles

## Information Processing ► Effective Report Organization

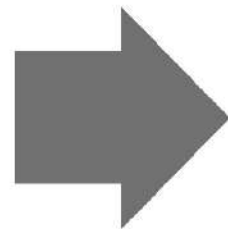
### The data processing flow

1. **Key Performance Indicators (KPI's)**
  - Information pertaining to the **status**, **performance**, or **health** of the organization
2. **Summarized Information**
  - Visuals displaying **patterns** or **trends** in the data. Allowing additional insights to the KPI's
3. **Detailed Information**
  - Tables containing **specific detail** about the patterns or trends. Providing **explanation** to variances in the data

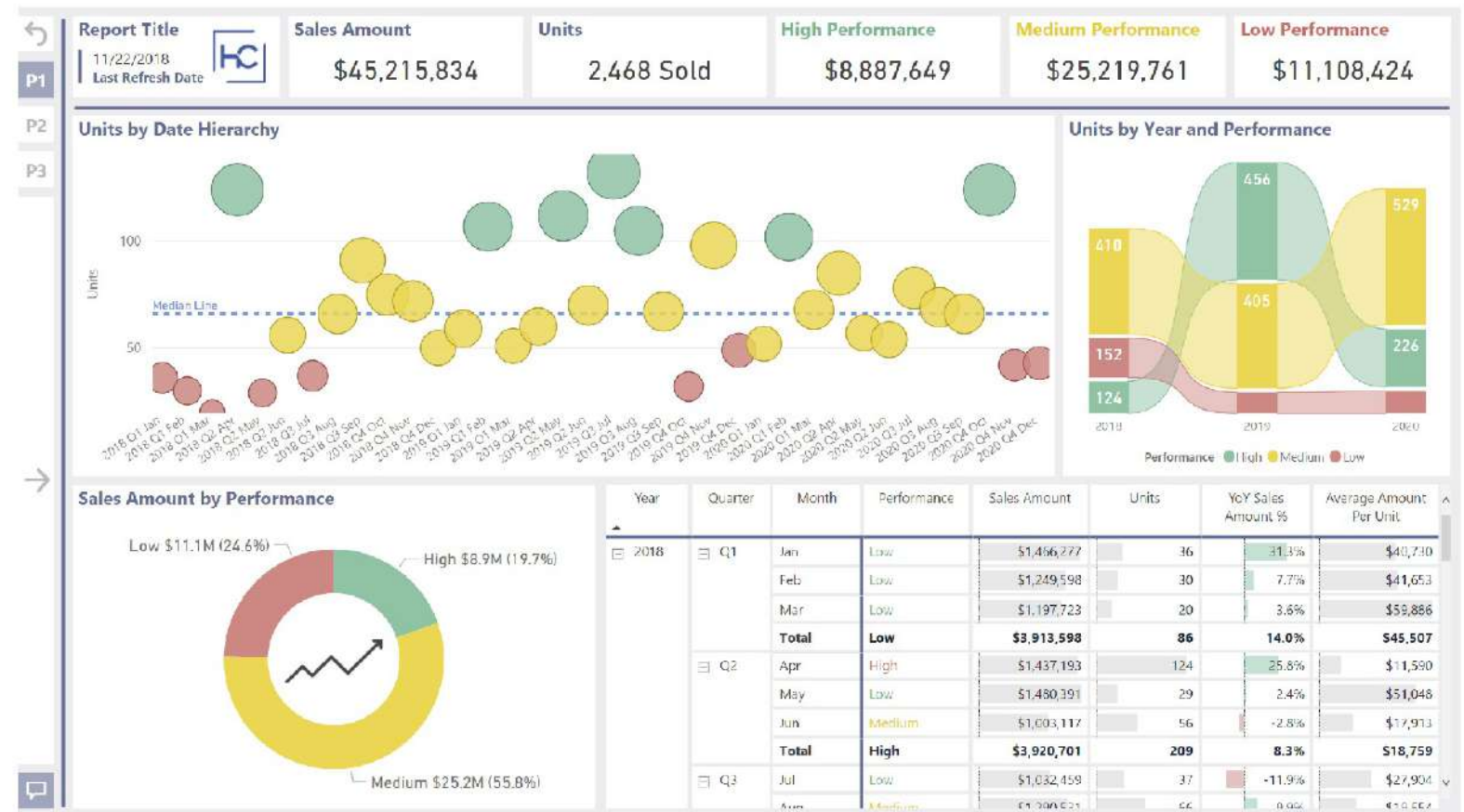


# Design Principles

## The S.C.R.A.P Methodology

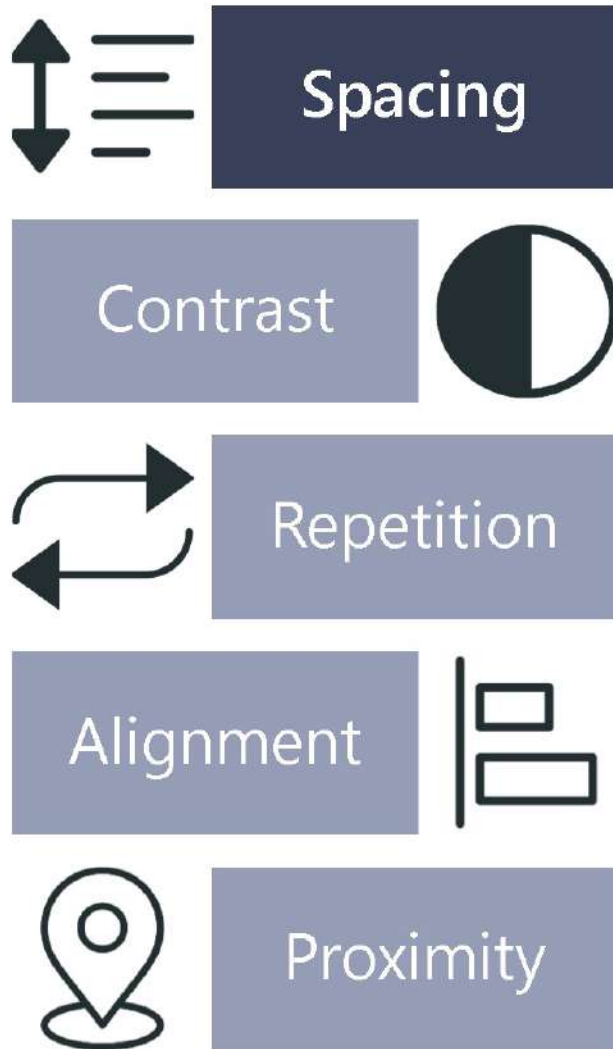


## Report with applied methodologies



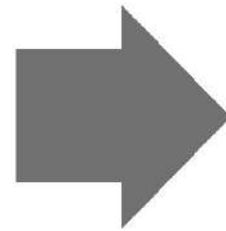
# Design Principles

## The S.C.R.A.P Methodology ▶ Spacing



### General concept

- **Space surrounding** or **between** the objects. Also known as **negative space**
- **Increases readability** by showing boundaries within objects



### Spacing

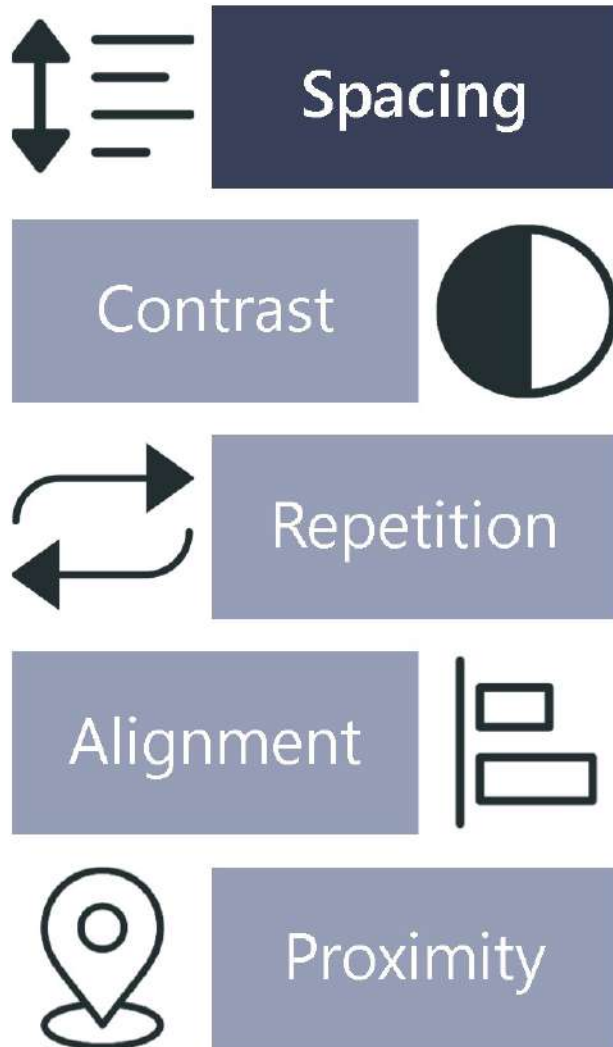


### No Spacing



# Design Principles

## The S.C.R.A.P Methodology ▶ Spacing



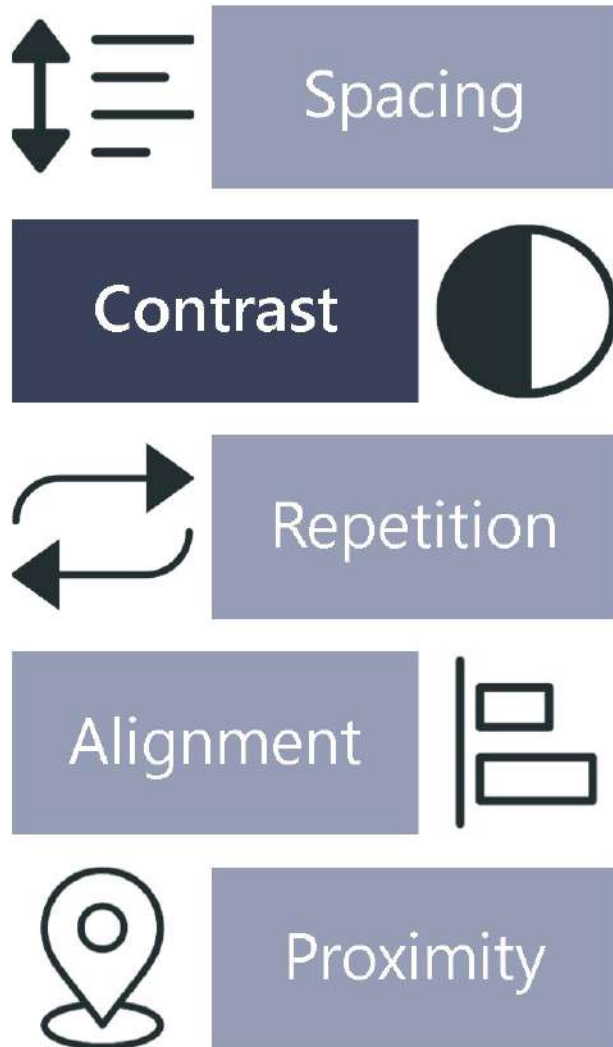
## General concept

- **Space surrounding** or **between** the objects. Also known as **negative space**
- **Increases readability** by showing boundaries within objects
- Creates **clear boundaries** between objects



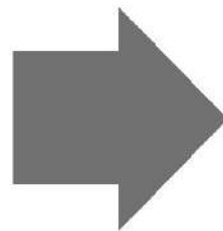
# Design Principles

## The S.C.R.A.P Methodology ▶ Contrast

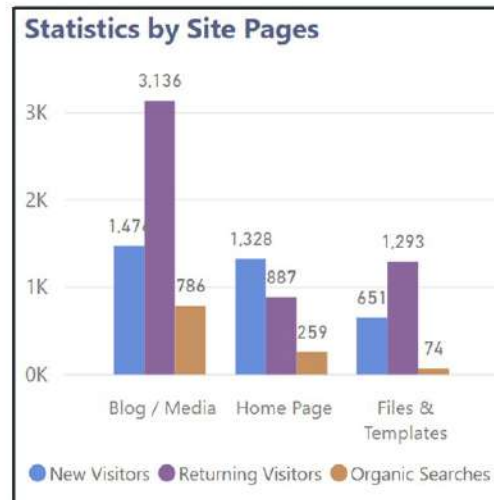


### General concept

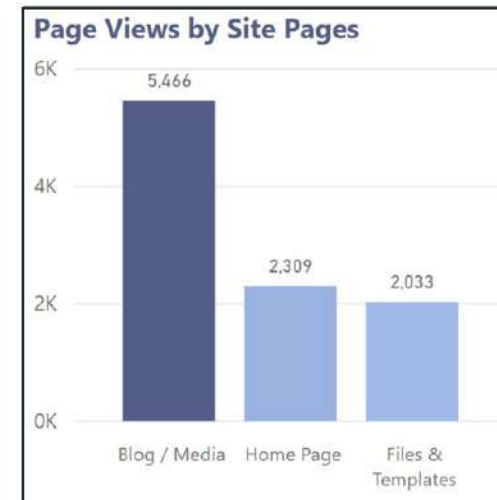
- Distinguishes elements to help **identify categories** or emphasize **key findings**



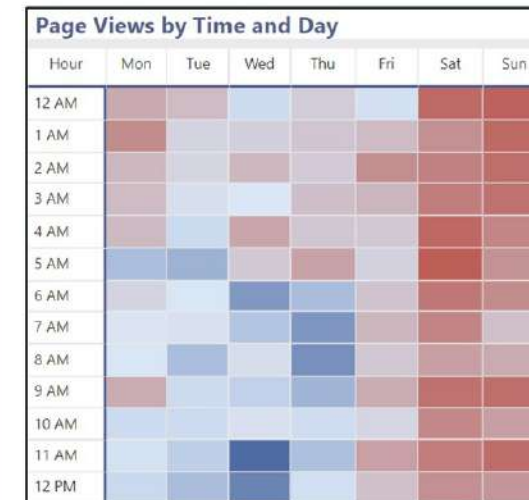
### Categorical Colors



### Sequential Colors

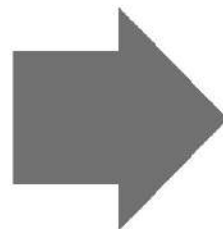
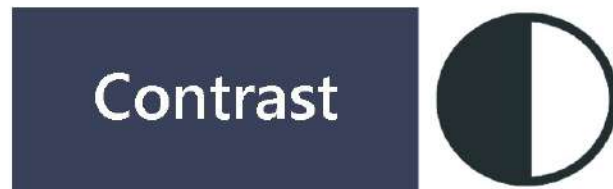


### Diverging Colors



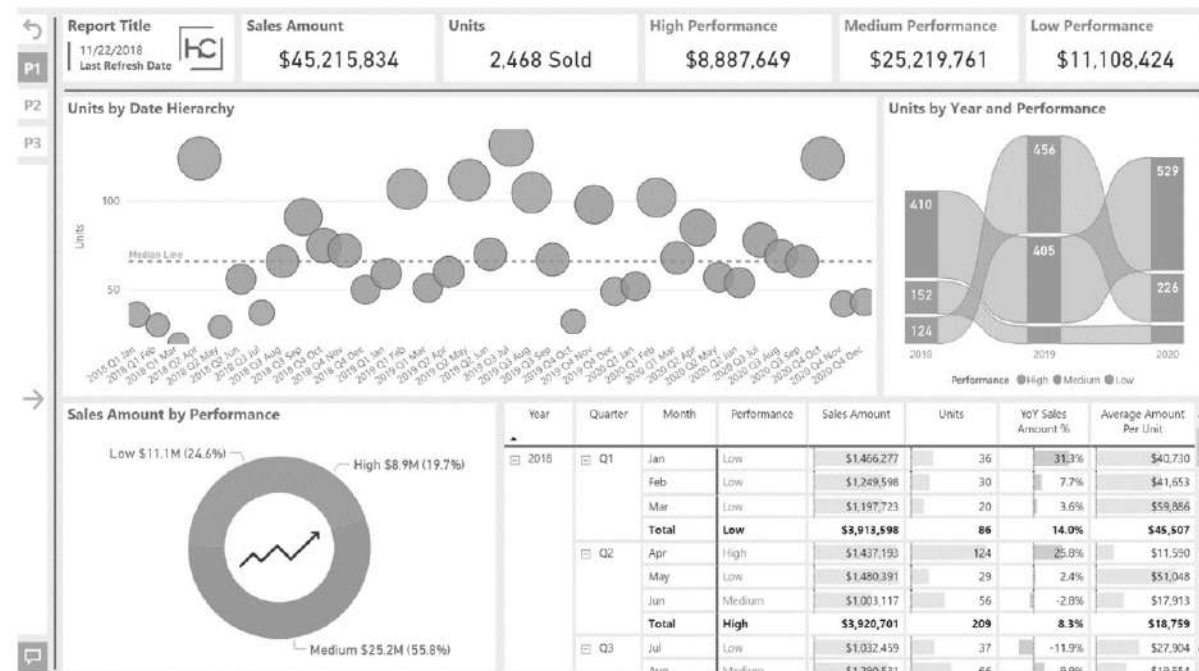
# Design Principles

## The S.C.R.A.P Methodology ▶ Contrast



## General concept

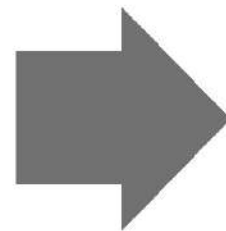
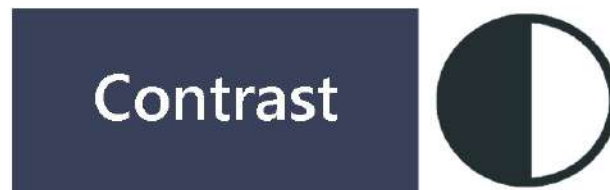
- Distinguishes elements to help **identify categories** or emphasize **key findings**
- **Color** is one of the most common forms of contrast





# Design Principles

## The S.C.R.A.P Methodology ▶ Contrast



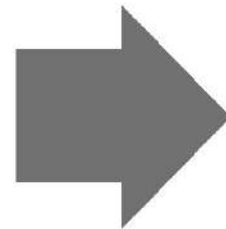
### General concept

- Distinguishes elements to help **identify categories** or emphasize **key findings**
- **Color** is one of the most common forms of contrast
- Contributes to the **squint test** requirements



# Design Principles

## The S.C.R.A.P Methodology ▶ Repetition



### General concept

- Applying a **consistent pattern** or elements throughout the report design

Repetition



Repetition

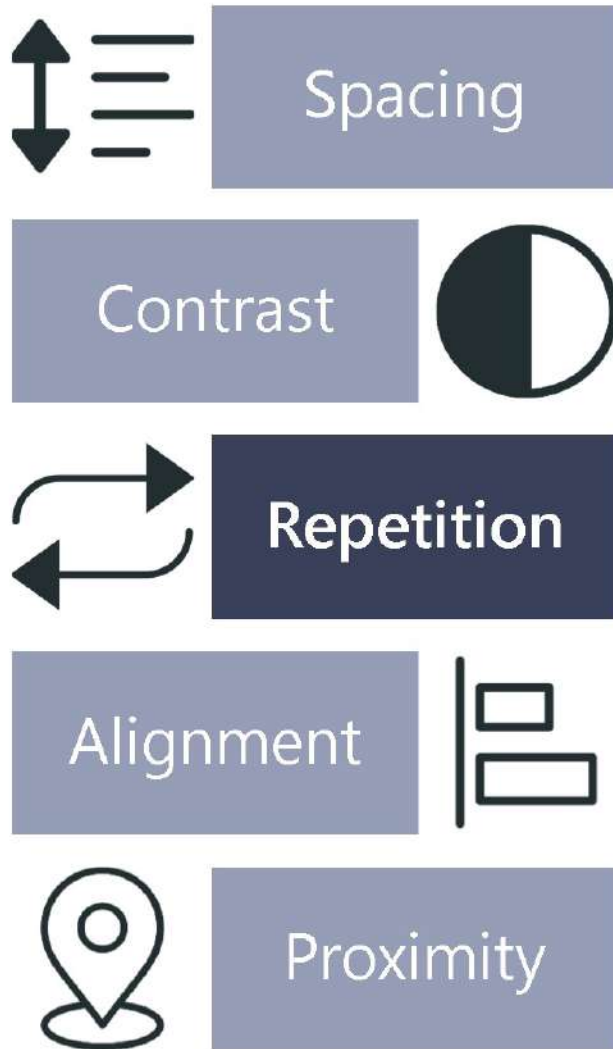


No Repetition



# Design Principles

## The S.C.R.A.P Methodology ▶ Repetition



### General concept

- Applying a **consistent pattern** or elements throughout the report design

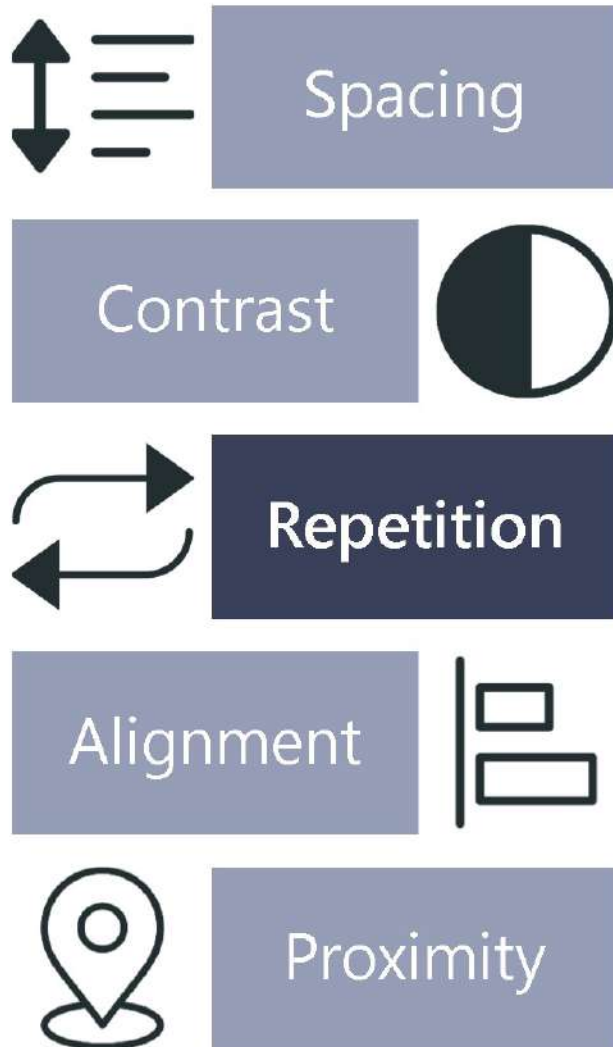
### No Repetition

The table displays various metrics across different site pages. The 'Searches' column is highlighted with an orange border, and an orange arrow points down to it from the 'No Repetition' header above. The data shows that the 'Searches' values are not consistent across the rows, illustrating a lack of repetition in the data presentation.

Site Pages	Page Views	Unique Views	Searches	New Visitors	Returning Visitors
Blog / Media	5,466	4,550	786.0	1,476	3,136
Home Page	2,309	1,932	259.0	1,328	887
Files & Templates	2,033	1,644	74.0	651	1,293
Power BI Vs. Excel	1,658	1,535	1,123.0	1,193	434
About Us	786	673	324.0	358	404
What Is Power BI?	501	412	129.0	178	300
Consulting Services	313	267	10.0	25	275
Contact & Support	210	187	2.0	18	184
Online Courses	129	120	1.0	13	116
<b>Total</b>	<b>13,405</b>	<b>11,320</b>	<b>2,708.0</b>	<b>5,240</b>	<b>7,029</b>

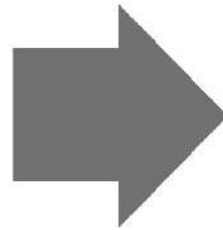
# Design Principles

## The S.C.R.A.P Methodology ▶ Repetition



### General concept

- Applying a **consistent pattern** or elements throughout the report design
- Repetition can also **increase readability** by applying a specific pattern to groups, categories, or areas of a report



#### Repetition

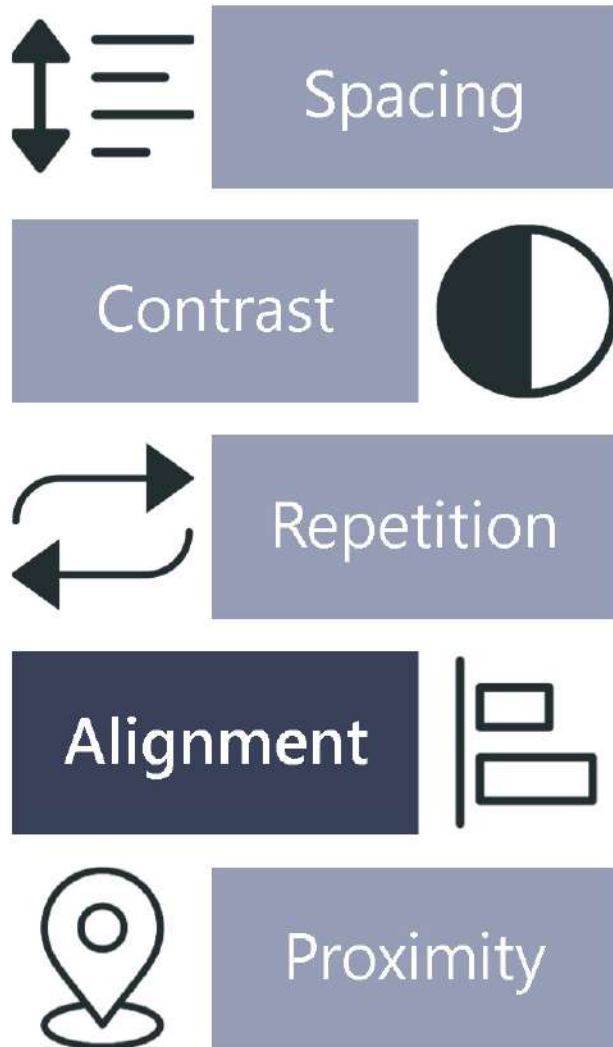
Year All	State All
Quarter All	City All

#### No Repetition

Year All	State All
Quarter All	City All

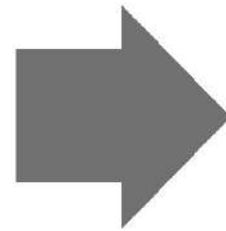
# Design Principles

## The S.C.R.A.P Methodology ▶ Alignment

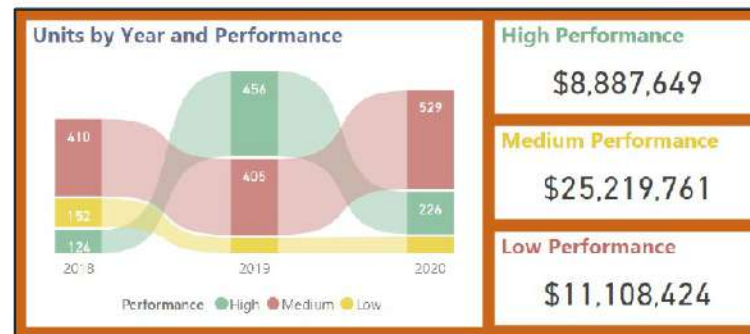


### General concept

- **Edges of objects** are aligned with the edges of other objects
- Creates the perception that every object is **connected via an invisible line**, and that nothing is placed at random



### Alignment

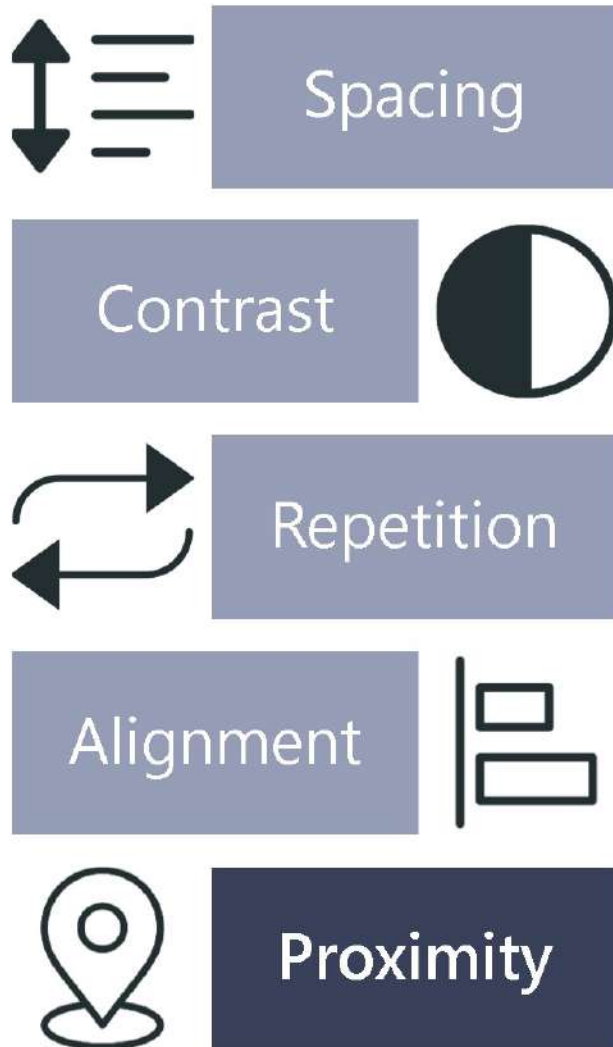


### No Alignment



# Design Principles

## The S.C.R.A.P Methodology ▶ Proximity



### General concept

- **Group related objects** together to show a relationship
- Applicable to **objects within a report**

### Proximity

New Site Visitors 5,268	Returning Visitors 7,317	<b>Total Visitors</b> 12,585	Organic Searches 2,712
----------------------------	-----------------------------	---------------------------------	---------------------------



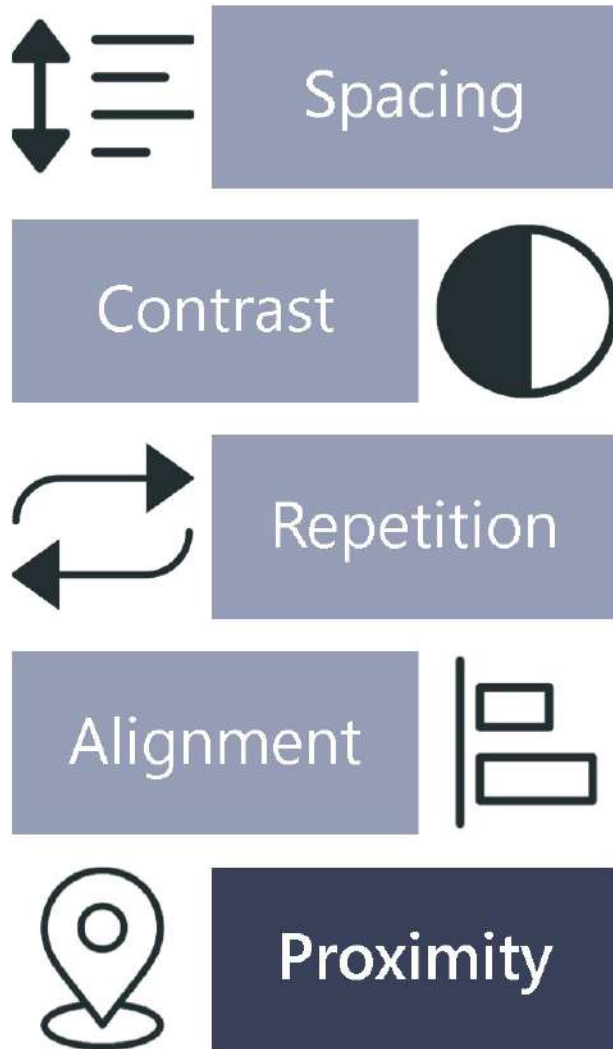
### No Proximity

New Site Visitors 5,268	Returning Visitors 7,317	Organic Searches 2,712	<b>Total Visitors</b> 12,585
----------------------------	-----------------------------	---------------------------	---------------------------------



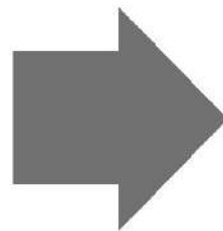
# Design Principles

## The S.C.R.A.P Methodology ▶ Proximity

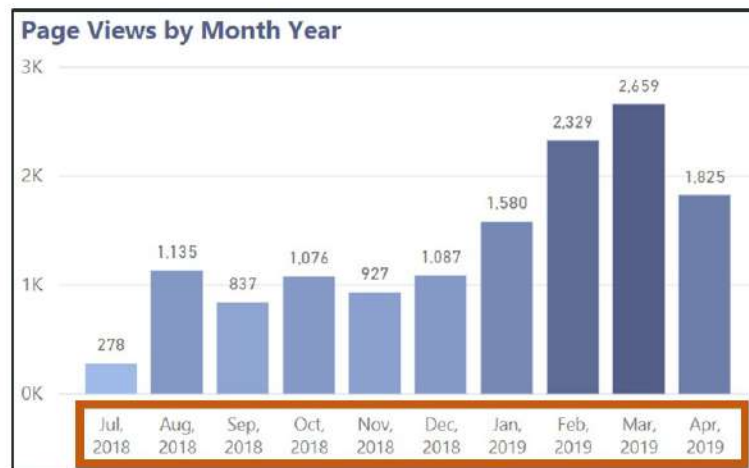


### General concept

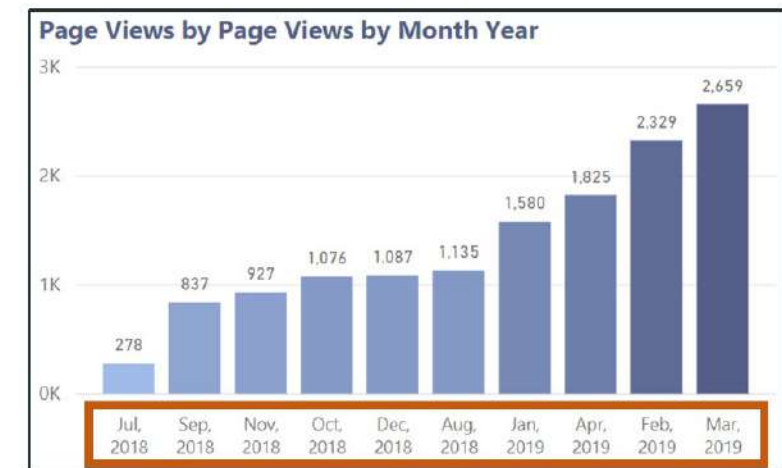
- **Group related objects** together to show a relationship
- Applicable to **objects within a report**
- Applicable to **elements within an object**



### Proximity



### No Proximity



# Design Principles

## Color Theory

### Color wheel definition

- Visual representation of **color hues** arranged according to their **chromatic relationship**

### The color wheel





# Design Principles

## Color Theory

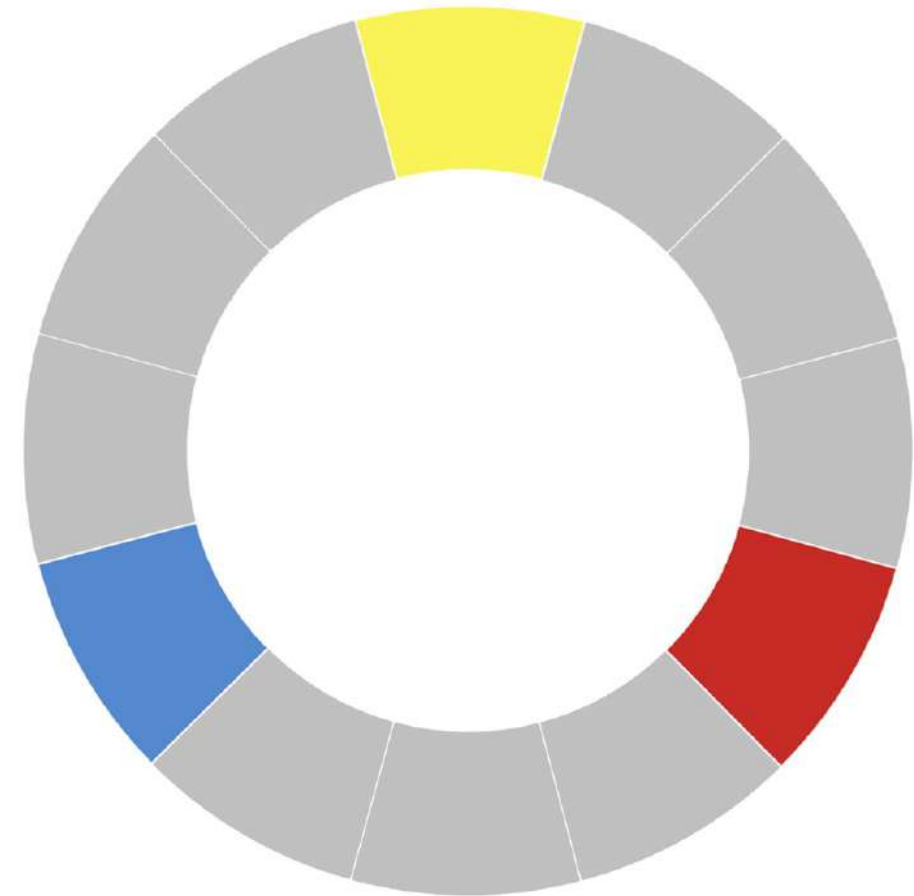
### Color wheel definition

- Visual representation of **color hues** arranged according to their **chromatic relationship**

### Primary vs. secondary colors

- Primary colors
  - **Cannot be created** by combining two or more colors together
  - All other colors are derived from these hues

### The color wheel



# Design Principles

## Color Theory

### Color wheel definition

- Visual representation of **color hues** arranged according to their **chromatic relationship**

### Primary vs. secondary colors

- **Primary colors**
  - **Cannot be created** by combining two or more colors together
  - All other colors are derived from these hues
- **Secondary colors**
  - Colors that are formed by **combining** the primary colors

### The color wheel



# Design Principles

Color Theory ► Color Harmony

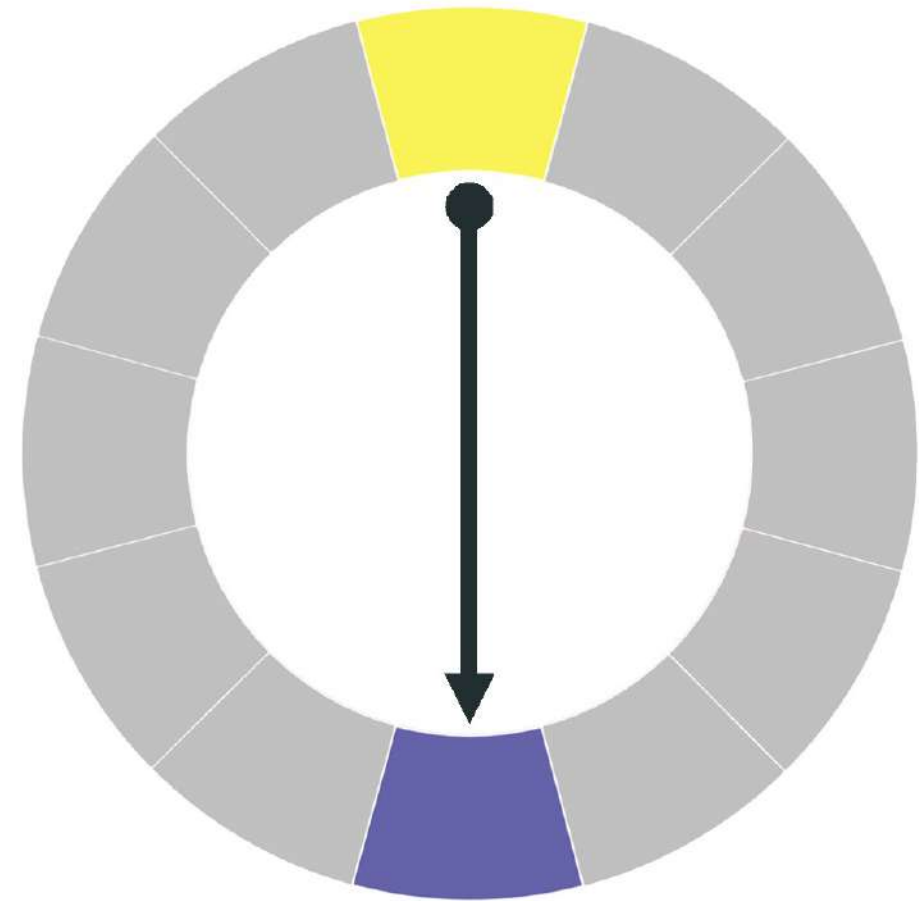
## Color harmony definition

- Using a **combination of colors** that is **harmonious** to the human eye

## Types of color harmony

- Complementary
  - Most basic type of harmony. It is the **opposite point** of the key color on the wheel.
  - Most other harmonies are **variations of this harmony** (apart from the analogous harmony)

## The color wheel



# Design Principles

Color Theory ► Color Harmony

## Color harmony definition

- Using a **combination of colors** that is **harmonious** to the human eye

## Types of color harmony

- Complementary
  - Most basic type of harmony. It is the **opposite point** of the key color on the wheel.
  - Most other harmonies are **variations of this harmony** (apart from the analogous harmony)

## The color wheel



# Design Principles

Color Theory ► Color Harmony

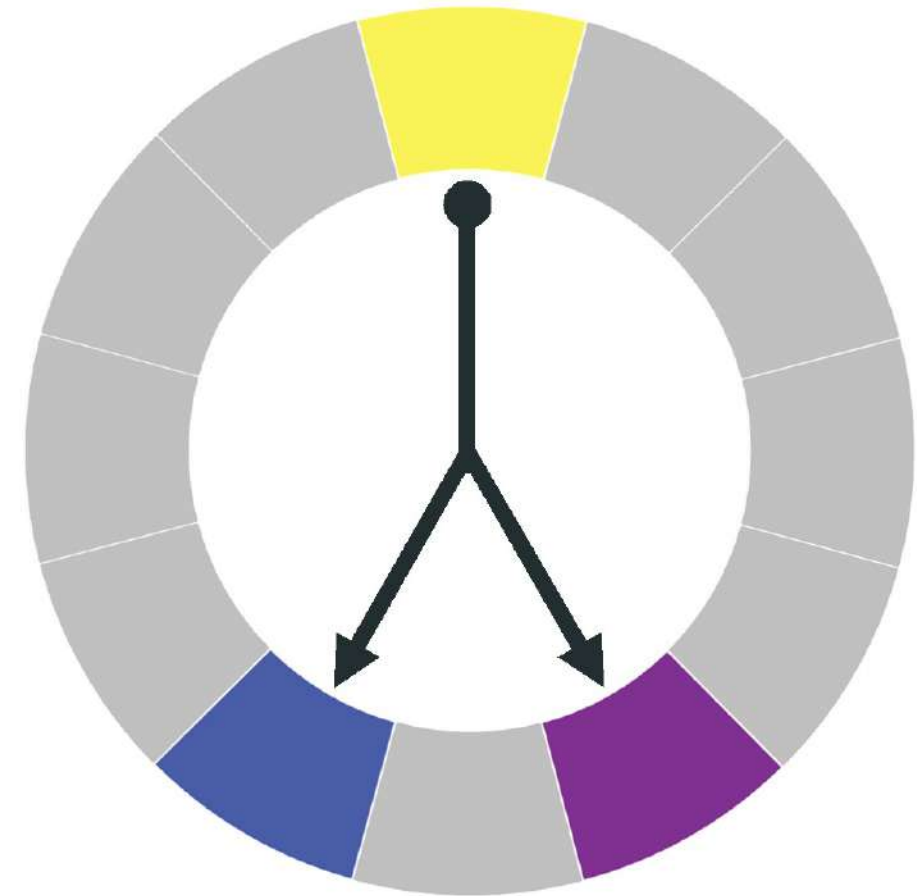
## Color harmony definition

- Using a **combination of colors** that is **harmonious** to the human eye

## Types of color harmony

- Split complementary
  - Uses the colors **one space away** from the key color.
  - Allows for a **broader range of colors**, while maintaining the basic harmony between the complementary colors

## The color wheel



# Design Principles

Color Theory ► Color Harmony

## Color harmony definition

- Using a **combination of colors** that is **harmonious** to the human eye

## Types of color harmony

- **Split complementary**
  - Uses the colors **one space away** from the key color.
  - Allows for a **broader range of colors**, while maintaining the basic harmony between the complementary colors

## The color wheel



# Design Principles

Color Theory ► Color Harmony

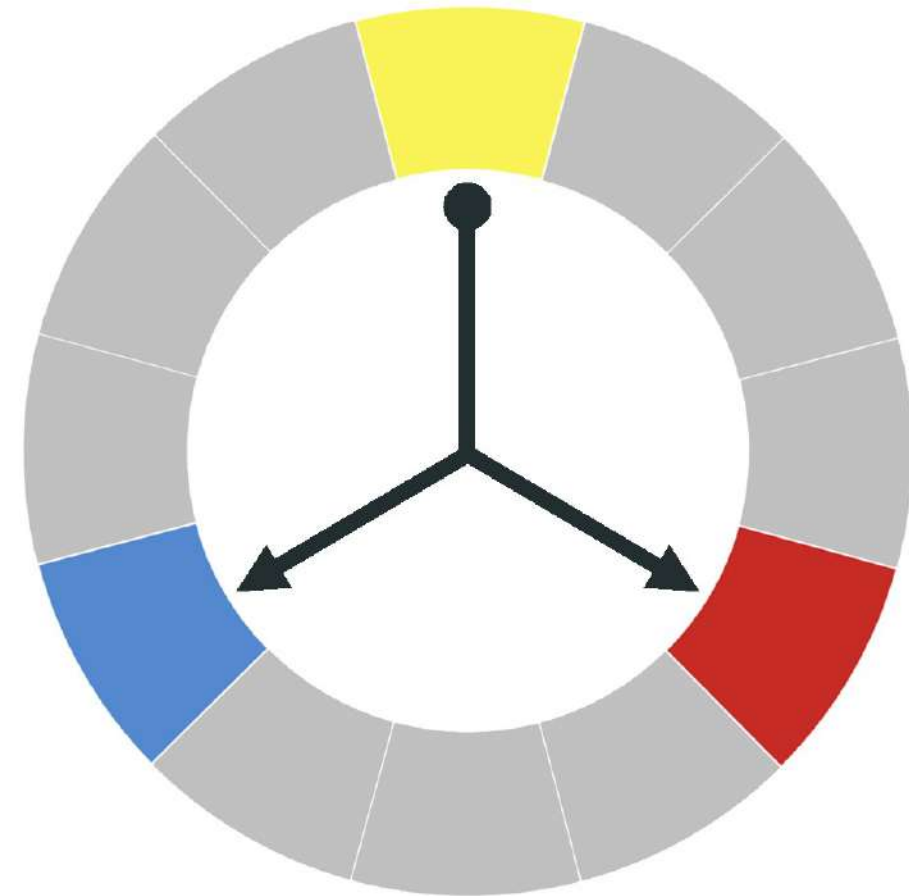
## Color harmony definition

- Using a **combination of colors** that is **harmonious** to the human eye

## Types of color harmony

- Triadic
  - Uses the colors **two spaces** away from the key color
  - Essentially allows the use of **three equidistant colors** on the wheel
  - Further apart, and therefore **less harmonious**

## The color wheel



# Design Principles

Color Theory ► Color Harmony

## Color harmony definition

- Using a **combination of colors** that is **harmonious** to the human eye

## Types of color harmony

- Triadic
  - Uses the colors **two spaces** away from the key color
  - Essentially allows the use of **three equidistant colors** on the wheel
  - Further apart, and therefore **less harmonious**

## The color wheel





# Design Principles

Color Theory ► Color Harmony

## Color harmony definition

- Using a **combination of colors** that is **harmonious** to the human eye

## Types of color harmony

- Triadic
  - Uses the colors **two spaces** away from the key color
  - Essentially allows the use of **three equidistant colors** on the wheel
  - Further apart, and therefore **less harmonious**



# Design Principles

Color Theory ► Color Harmony

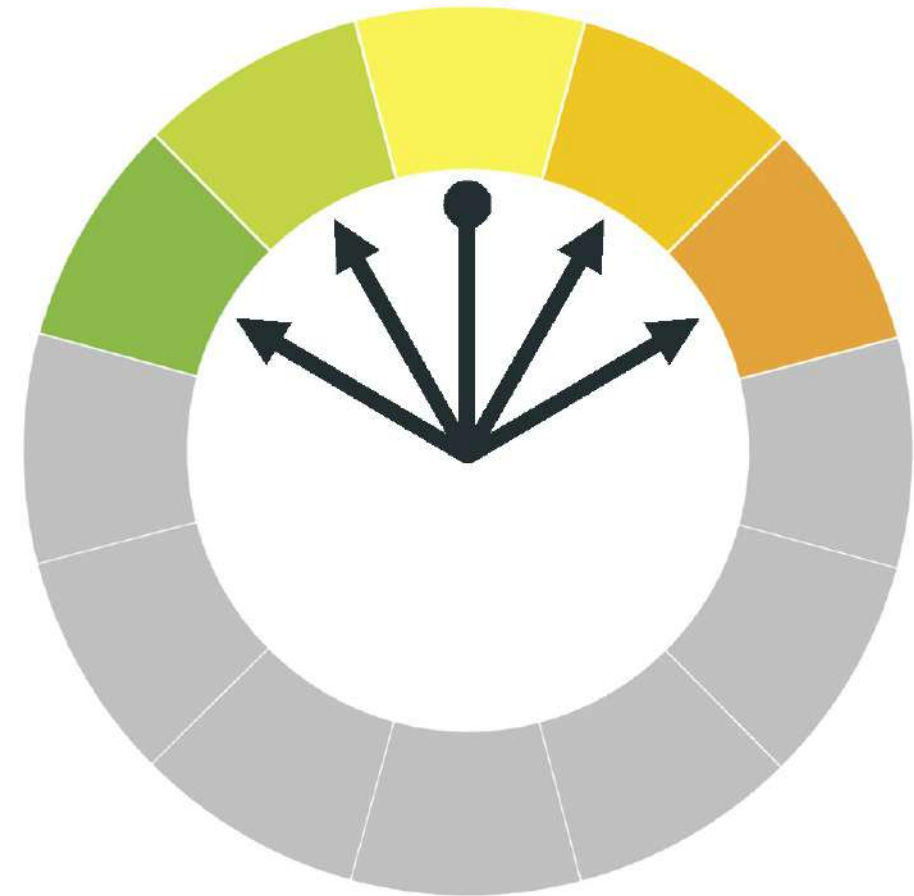
## Color harmony definition

- Using a **combination of colors** that is **harmonious** to the human eye

## Types of color harmony

- Analogous
  - Colors that are **directly** to the **left or right** of the key color
  - Also known as **related colors**
  - Closest together, with the **least color variation**

## The color wheel



# Design Principles

Color Theory ► Color Harmony

## Color harmony definition

- Using a **combination of colors** that is **harmonious** to the human eye

## Types of color harmony

- Analogous
  - Colors that are **directly** to the **left or right** of the key color
  - Also known as **related colors**
  - Closest together, with the **least color variation**

## The color wheel



# Design Principles

Color Theory ► Color Harmony

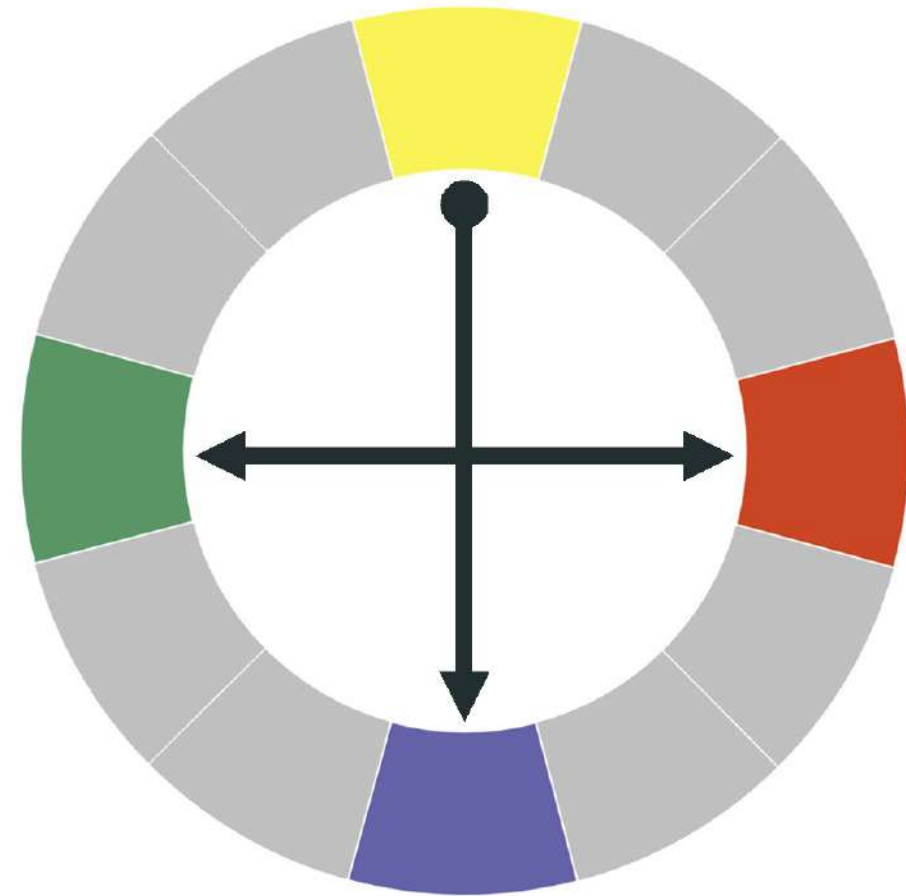
## Color harmony definition

- Using a **combination of colors** that is **harmonious** to the human eye

## Types of color harmony

- Tetradic
  - Similar to **triadic**, but with **four** colors all **equidistant** on the wheel
  - Essentially is using **two sets** of complementary colors
  - Greatest amount of **color variation**

## The color wheel



# Design Principles

Color Theory ► Color Harmony

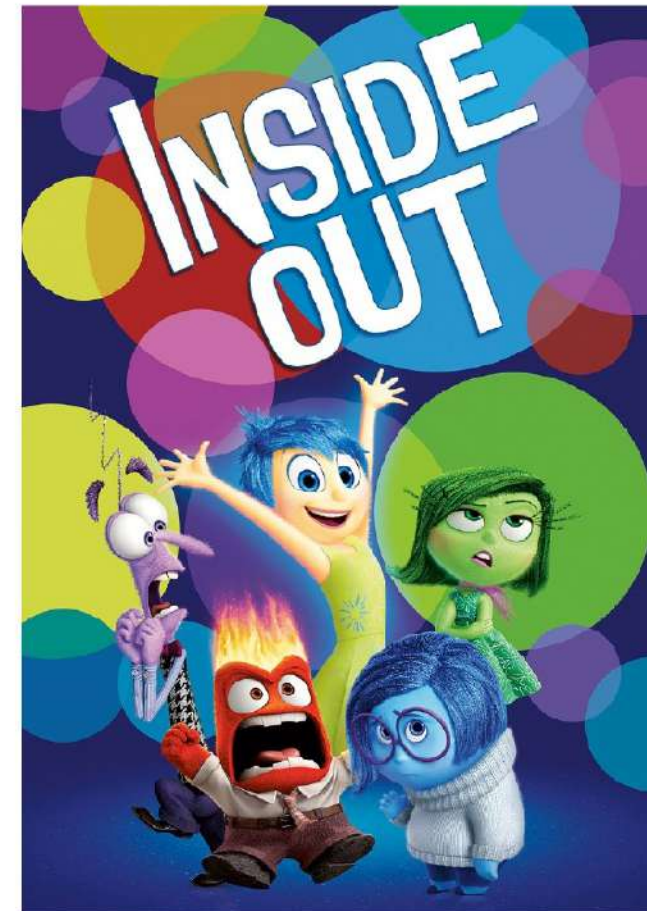
## Color harmony definition

- Using a **combination of colors** that is **harmonious** to the human eye

## Types of color harmony

- Tetradic
  - Similar to **triadic**, but with **four** colors all **equidistant** on the wheel
  - Essentially is using **two sets** of complementary colors
  - Greatest amount of **color variation**

## The color wheel



# Design Principles

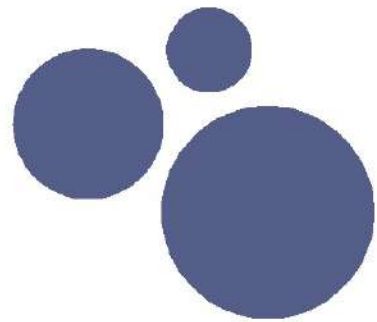
## Visual Cues

### General methodology

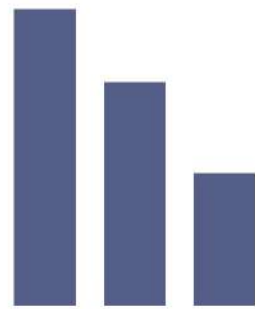
- Visualizations **translate** variances in data by utilizing different visual cues
- Each visual cue is **interpreted** differently by the human brain



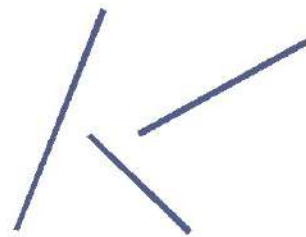
### Types of visual cues



Area



Length



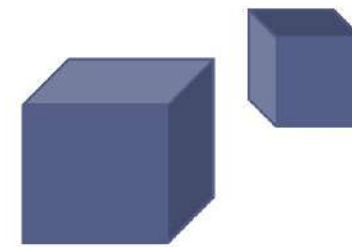
Slope



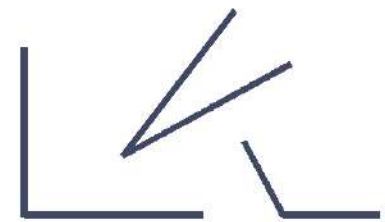
Color  
Hue



Color  
Intensity



Volume



Angle

**VISUAL CUES ARE NOT CREATED EQUAL**

# Design Principles

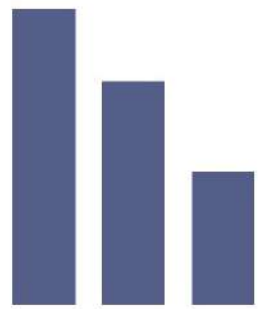
Visual Cues ▶ Ranked

## General methodology

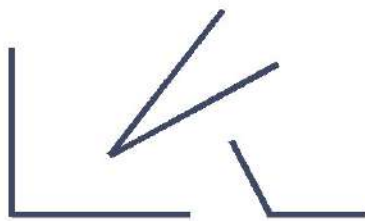
- Visualizations **translate** variances in data by utilizing different visual cues
- Each visual cue is **interpreted** differently by the human brain



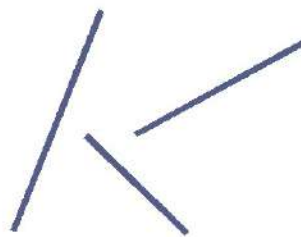
## Visual cues ranked by accuracy



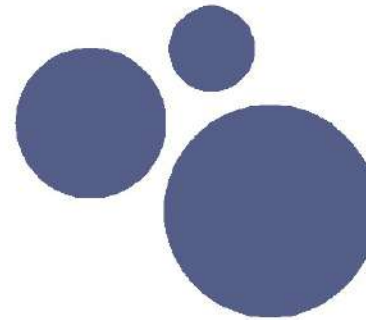
Length



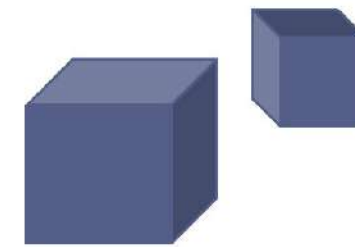
Angle



Slope



Area



Volume



Color  
Intensity



Color  
Hue

More Accurate

Less Accurate



# Design Principles

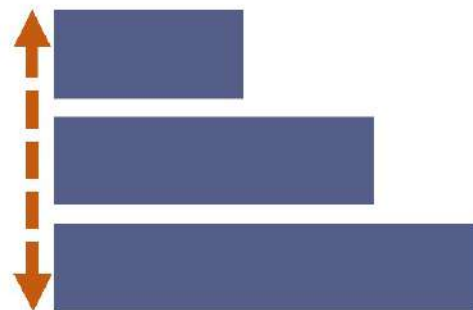
Visual Cues ► Accuracy Influencers

## What influences accuracy?

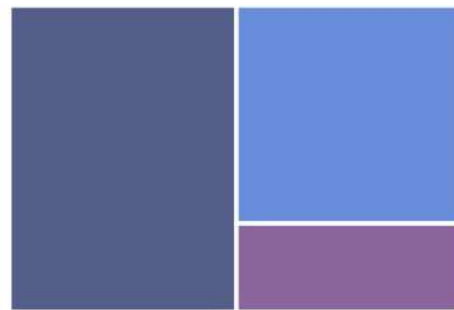


### Alignment

- Objects on an **aligned scale** increase accuracy when comparing values
- Studies show length aligned on a single axis is the most accurate representation of data



Length  
(Aligned)

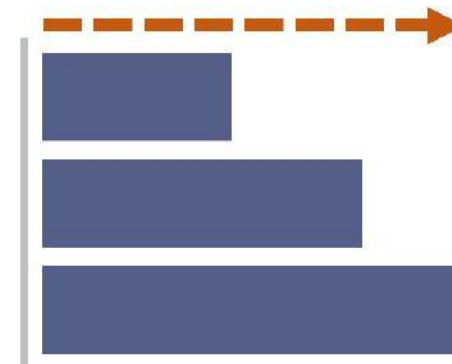


Tree Map

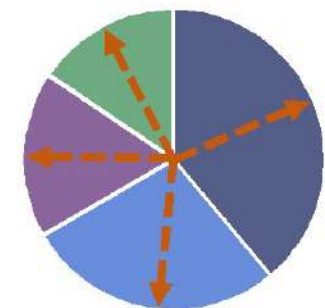


### Direction

- Objects on an axis that follow a **single direction** also increase accuracy, when comparing values



Bar  
Chart



Pie  
Chart



# Design Principles

## Visual Categories

### PART-TO-WHOLE

Display the parts of a measure

Cluttered bar chart	Cluttered column chart	100% Stacked bar chart	100% Stacked column chart	Stacked bar chart
Stacked column chart	Line & clustered column chart	Drill-down column chart	KPI Column by MAQ	KPI Chart by Akvelon
Rotating Chart by MAQ	Horizontal bar chart	Table Sorter	Line & stacked column chart	Ribbon chart
Waterfall chart	Stacked area chart	Treemap	Pie chart	Donut chart
Sunburst chart	Aster Plot	Ring Chart by MAQ	Drill-down donut chart	Brick Chart by MAQ
Enlighten Waffle Chart	Waffle Chart			

### DISTRIBUTION

Display the distribution of a measure

Cluttered column chart	Line chart	Histogram Chart	Box & Whisker chart by MAQ
Candlestick by QViz	Dot Plot by MAQ	Outliers Detection	Box and Whisker chart
Histogram with points by MAQ	Tornado chart		

### CORRELATION

Display relations between measures

Scatter chart	Enhanced Scatter	Line & clustered column chart	Quadrant Chart by MAQ
Venn Diagram by MAQ	Impact Bubble Chart	Correlation plot	Clustering
Clustering With Outliers	Funnel plot	Spline chart	KPI Chart by Akvelon
KPI Column by MAQ	Scatter Chart by Akvelon	Hexbin Scatterplot	Clustering using OPTICS
Line & stacked column chart	Cluster Map		

### SINGLE

Display single values

Card with States by QViz	Card	KPI	Multi-row card
Table	Matrix	KPI Ticker by MAQ	Scroller
User List by CloudScope	Timeline by CloudScope	Multi KPI	Collage by CloudScope
Count Down Timer	KPI Indicator	Advance Card	Rotation Tile by MAQ
Azbans Matrix Light	Data Insights by MAQ	Gauge	Tachometer
Dial Gauge	Circle KPI Gauge		

### FILTER

Control report filters

Slicer	Smart Filter Pro by QViz	Smart Filter by QViz	Chiclet Slicer
Timeline Slicer	Time Brush Slicer	Attribute Slicer	Facet Key
Play Axis (Dynamic Slicer)	Hierarchy Slicer	Enlighten World Flag Slicer	Text Filter
Enlighten Slicer	Image Grid	Image by CloudScope	Filter by List by Devscope
Pivot Slicer			

### NARRATIVE

Tell a story with data

Narrative for Business Int...	Timeline Storyteller	Add Natural Language So...	DataText Box
ChartAccent BarChart	ChartAccent LineChart	Snippets Browser	Card Browser
Overview by CloudScope	Enlighten Data Story		

### MISCELLANEOUS

PowerApps (Preview)	D3.js Visual	HTML Viewer	Dynamic Tooltip by MAQ
Text Wrapper by MAQ	Text Enhancer by MAQ		



Recommended

There is a better alternative

Don't use in the category

Built-in visual

Certified visual

R required



# Design Principles

## Visual Categories

### PART-TO-WHOLE

Display the parts of a measure

### DISTRIBUTION

Display the distribution of a measure

### CORRELATION

Display relations between measures

### SINGLE

Display single values

### FILTER

Control report filters

### NARRATIVE

Tell a story with data

### MISCELLANEOUS

Recommended

There is a better alternative

Don't use in the category

Built-in visual

Certified visual

R required

# Design Principles

## Visual Categories

### PART-TO-WHOLE

Display the parts of a measure

Clustered bar chart	Clustered column chart	100% Stacked bar chart	100% Stacked column chart	Stacked bar chart
Stacked column chart	Line & clustered column chart	Drill-down column chart	KPI Column by MAQ	KPI Chart by Akvelon
Rotating Chart by MAQ	Horizontal bar chart	Table Sorter	Line & stacked column chart	Ribbon chart
Waterfall chart	Stacked area chart	Treemap	Pie chart	Donut chart
Sunburst	Aster Plot	Ring Chart by MAQ	Drill-down donut chart	Brick Chart by MAQ
Enlighten Waffle Chart	Waffle Chart			

### DISTRIBUTION

Display the distribution of a measure

Clustered column chart	Line chart	Histogram Chart	Box & Whisker chart by MAQ
Candlestick by OKViz	Dot Plot by MAQ	Outliers Detection	Box and Whisker chart
Histogram with points by MAQ	Tornado chart		

### CORRELATION

Display relations between measures

Scatter chart	Enhanced Scatter	Line & clustered column chart	Quadrant Chart by MAQ
Venn Diagram by MAQ	Impact Bubble Chart	Correlation plot	Clustering
Clustering With Outliers	Funnel plot	Spline chart	KPI Chart by Akvelon
KPI Column by MAQ	Scatter Chart by Akvelon	Hexbin Scatterplot	Clustering using OPTICS
Line & stacked column chart	Cluster Map		

### SINGLE

Display single values

Card with States by OKViz	Card	KPI	Multi-row card
Table	Matrix	KPI Ticker by MAQ	Scroller
User List by CloudScope	Timeline by CloudScope	Multi KPI	Collage by CloudScope
Count Down Timer	KPI Indicator	Advance Card	Rotation Tile by MAQ
Matrix Light	Data Insights by MAQ	Gauge	Tachometer
Dial Gauge	Circle KPI Gauge		

### FILTER

Control report filters

Slicer	Smart Filter PRO by OKViz	Smart Filter by OKViz	Chiclet Slicer
Timeline Slicer	Time Brush Slicer	Attribute Slicer	Facet Key
Play Axis (Dynamic Slicer)	Hierarchy Slicer	Enlighten World Flag Slicer	Text Filter
Enlighten Slicer	Image Grid	Image by CloudScope	Filter by List by Devscope
Pivot Slicer			

### NARRATIVE

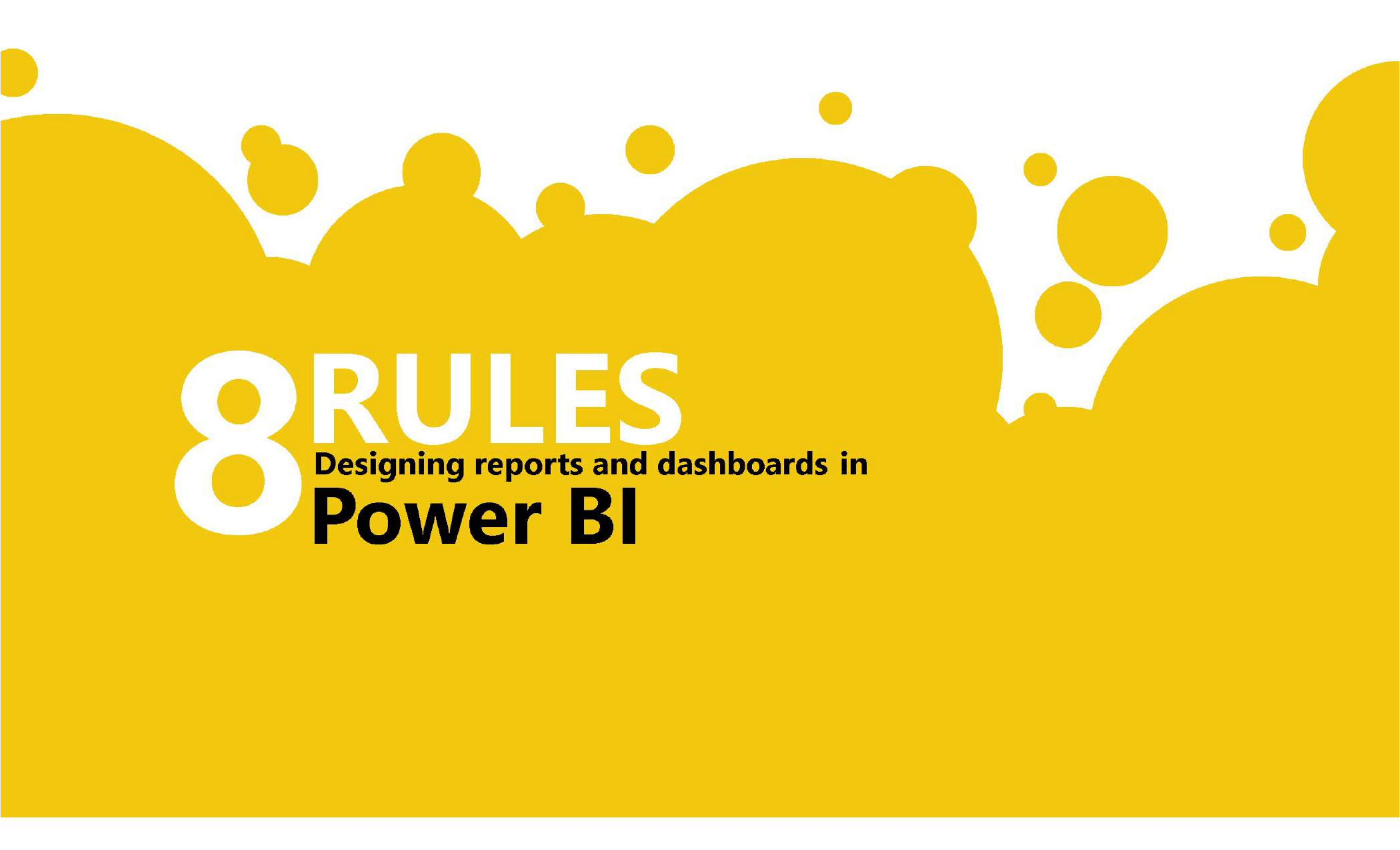
Tell a story with data

Narrative for Business Int...	Timeline Storyteller	Add Natural Language So...	DataText Box
ChartAccent BarChart	ChartAccent LineChart	Snippets Browser	Card Browser
Overview by CloudScope	Enlighten Data Story		

### MISCELLANEOUS

PowerApps (Preview)	D3.js Visual	HTML Viewer	Dynamic Tooltip by MAQ
AZ Text Wrapper by MAQ	T4 Text Enhancer by MAQ		

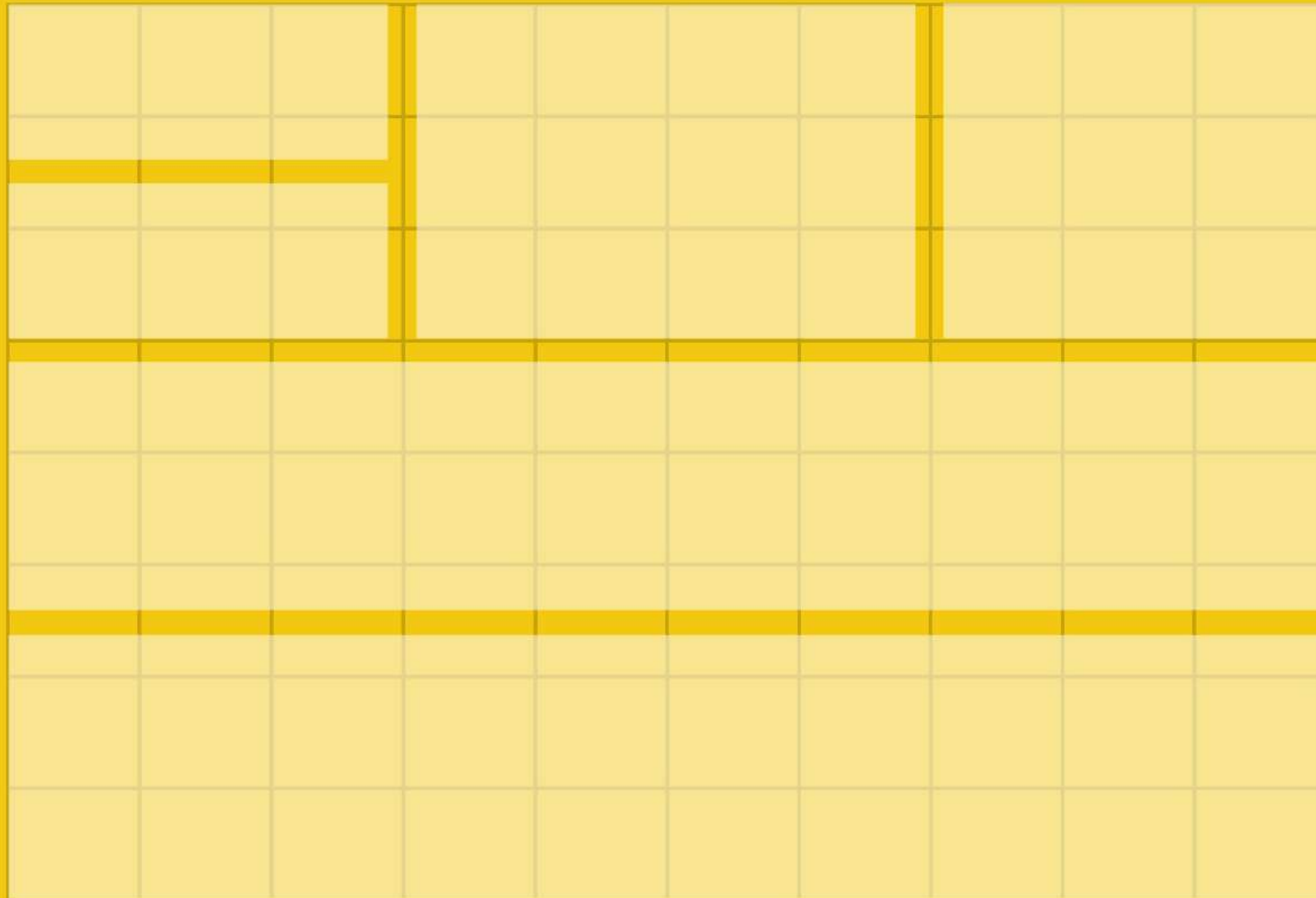
  Recommended  
   There is a better alternative  
   Don't use in the category  
 ■ Built-in visual  
 ■ Certified visual  
 R R required

The background is a solid yellow color. It features several abstract, organic shapes and circles of various sizes, some overlapping, creating a dynamic and modern aesthetic. The shapes are primarily in the upper half of the image, with some extending towards the center.

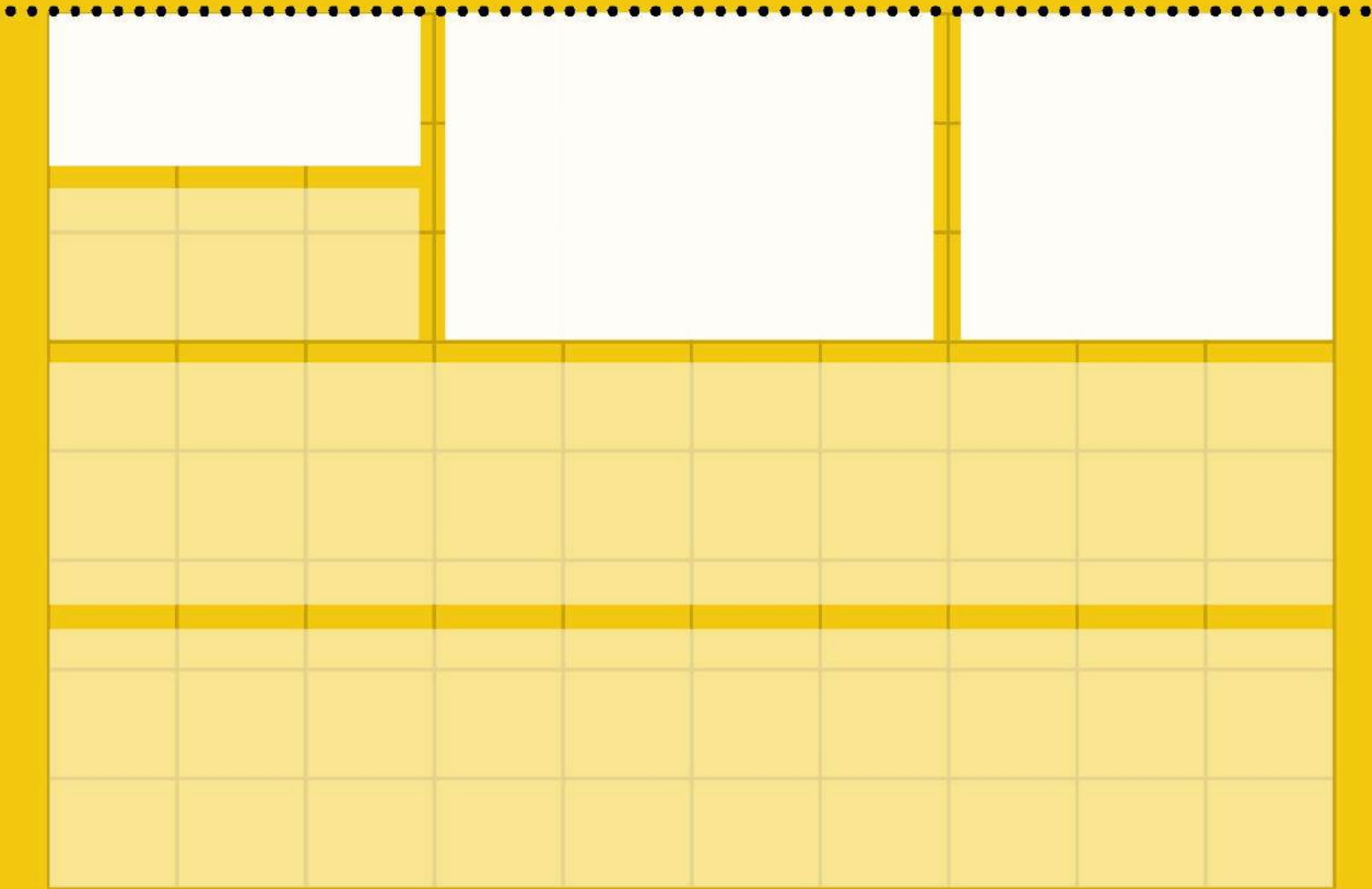
# 8 RULES

Designing reports and dashboards in

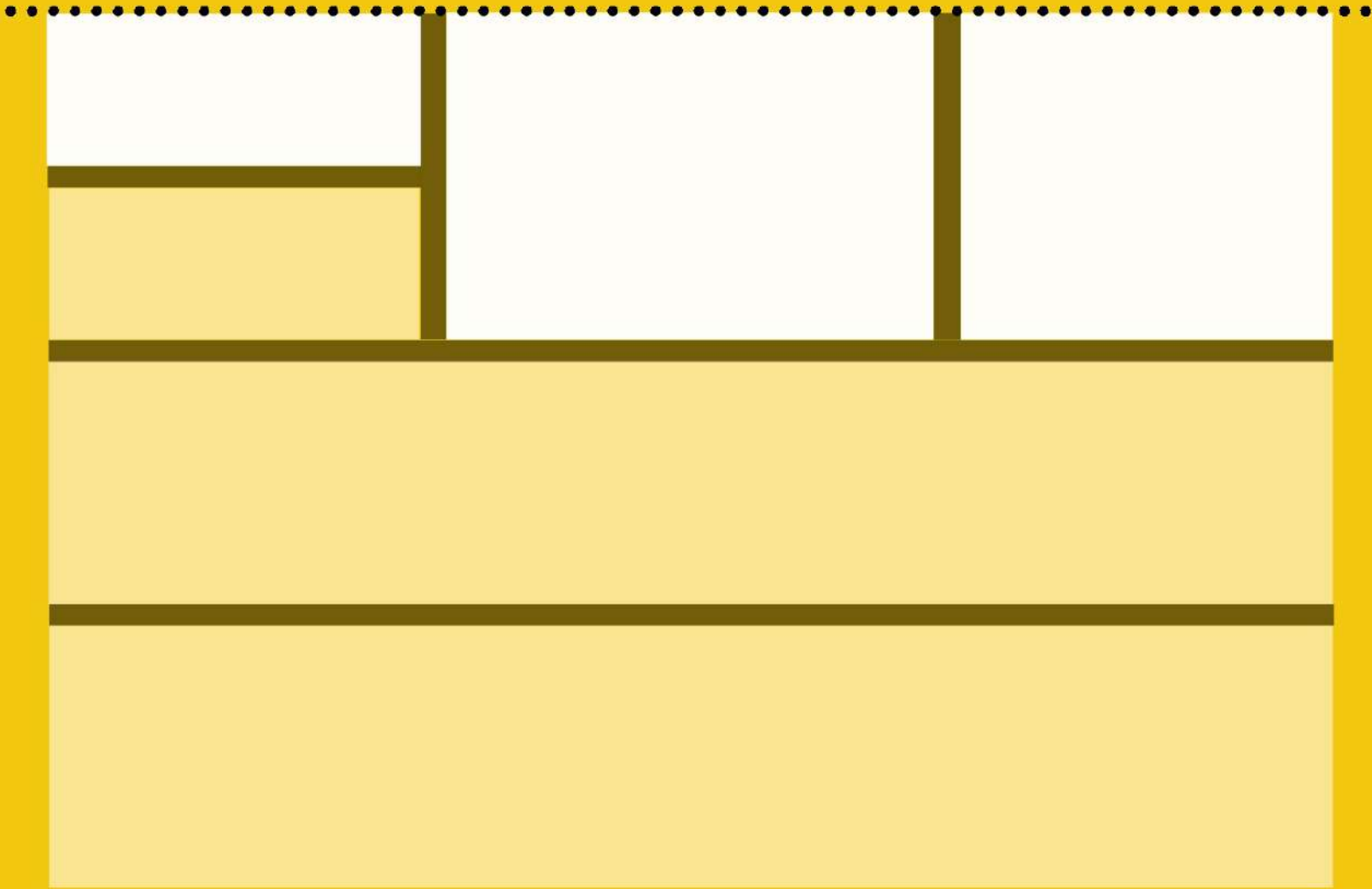
**Power BI**



**1.**  
**Always use a**  
**Grid**



**2.**  
Use a correct  
**Alignment**




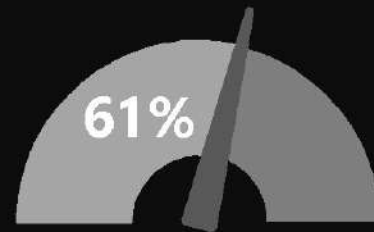
### **3.** **Appropriate** **Spacing**


**4.**  
**Select the right**  
**Background**

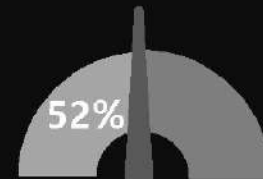


- consectetur
- consectetur
- consectetur
- consectetur

42  -30%

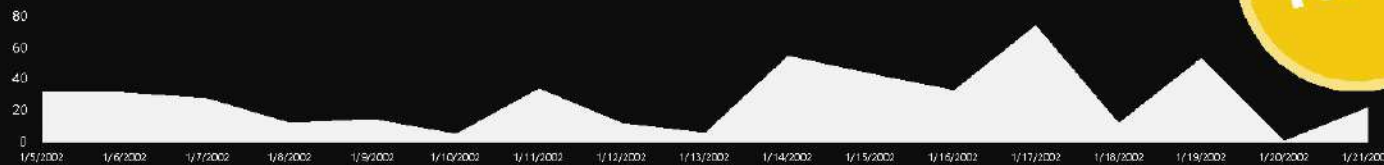


ADIPIBSCING  
Lorem ipsum dolor



ADIPIBSCING  
Lorem ipsum dolor

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod



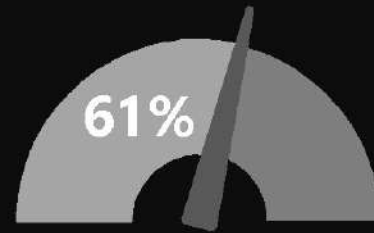
NICE

Category A	Category B	Category C	Category D	Category E
fugiat nulla	87	87	87	87
fugiat nulla	87	87	87	87
fugiat nulla	87	87	87	87
fugiat nulla	87	87	87	87

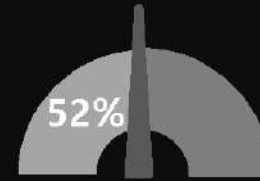
5.  
Simpler  
Is better!

- consectetur
- consectetur
- consectetur
- consectetur

42  -30%

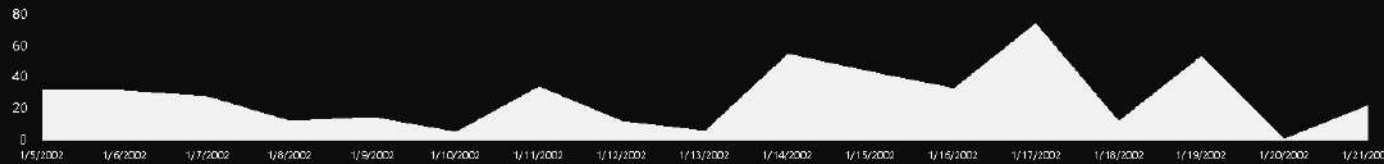


ADIPIBSCING  
Lorem ipsum dolor



ADIPIBSCING  
Lorem ipsum dolor

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod



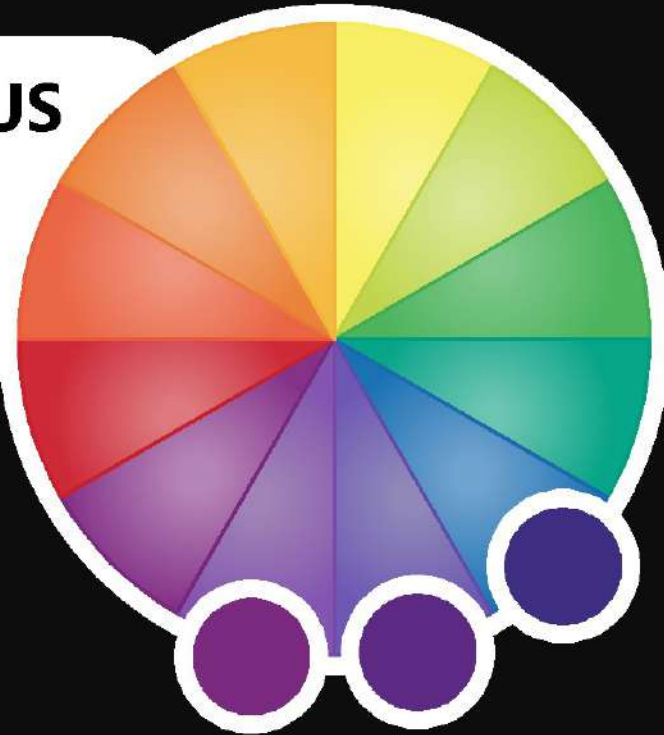
Category A	Category B	Category C	Category D	Category E
fugiat nulla	87	87	87	87
fugiat nulla	87	87	87	87
fugiat nulla	87	87	87	87
fugiat nulla	87	87	87	87

**6.**  
Use  
Negative Space  
wisely

## ANALOGOUS

Colors

<4



**7.**  
Choose your  
**Color**  
palette



## TRIADIC

Color

<4

## MONOCHROMATIC

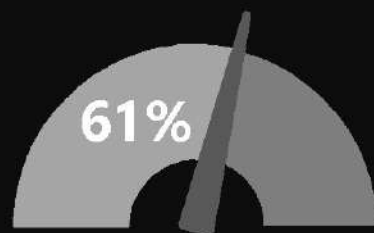
Color

<6

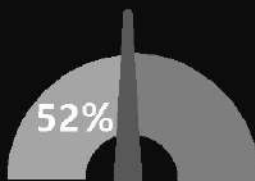


- consectetur
- consectetur
- consectetur
- consectetur

42  -30%

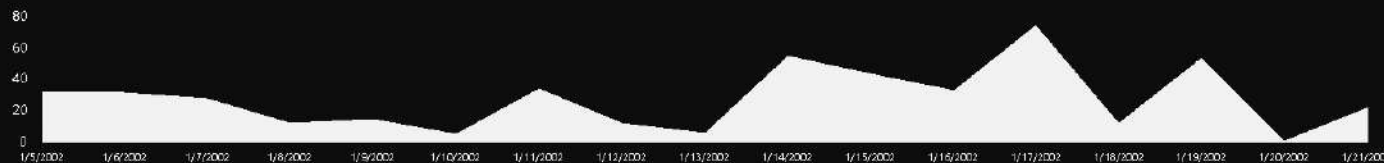


ADIPISCING  
Lorem ipsum dolor



ADIPISCING  
Lorem ipsum dolor

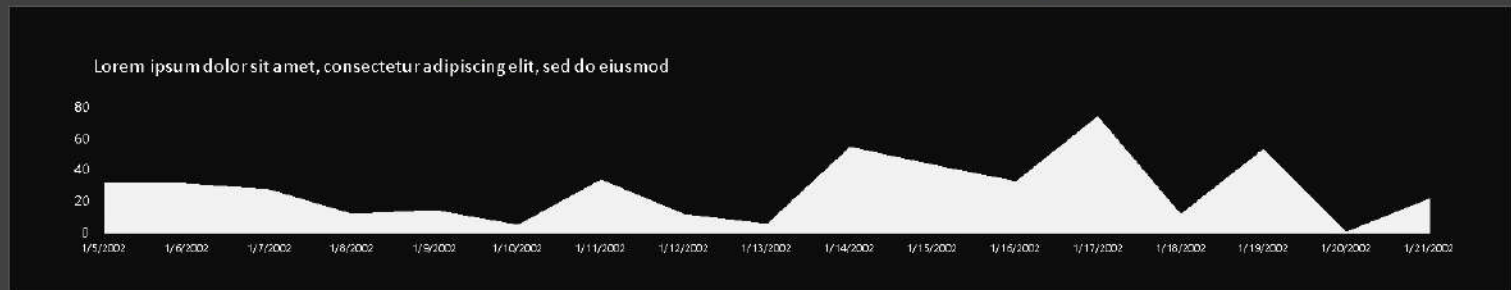
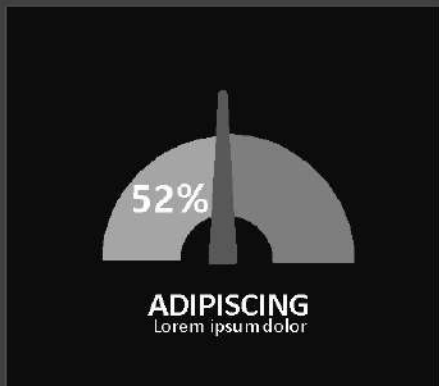
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod



Category A	Category B	Category C	Category D	Category E
fugiat nulla	87	87	87	87
fugiat nulla	87	87	87	87
fugiat nulla	87	87	87	87
fugiat nulla	87	87	87	87

8.  
Enhance  
the important  
parts of a page

- consectetur
- consectetur
- consectetur
- consectetur



Category A	Category B	Category C	Category D	Category E
fugiat nulla	87 ↑	87 ↓	87 ↑	87 ↑
fugiat nulla	87 ↑	87 ↑	87 ↑	87 ↓
fugiat nulla	87 ↓	87 ↑	87 ↓	87 ↓
fugiat nulla	87 ↑	87 ↓	87 ↓	87 ↓

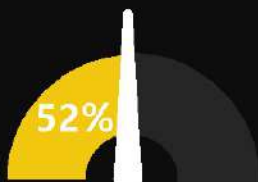
**8.**  
Enhance  
the important  
parts of a page

- consectetur
- consectetur
- consectetur
- consectetur

42  
Lorem ipsum  
-30%

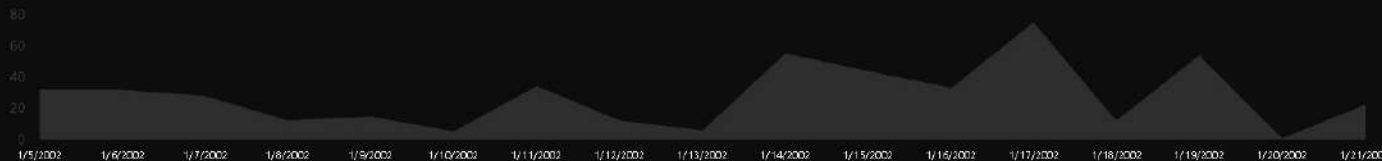


ADIPIRING  
Lorem ipsum dolor



ADIPIRING  
Lorem ipsum dolor

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod



Category A	Category B	Category C	Category D	Category E
fugiat nulla	87 ↑	87 ↓	87 ↑	87 ↑
fugiat nulla	87 ↑	87 ↑	87 ↑	87 ↓
fugiat nulla	87 ↓	87 ↑	87 ↓	87 ↓
fugiat nulla	87 ↑	87 ↓	87 ↓	87 ↓

Success!!!

Thanks!

# Slides

By Miguel Myers

Questions? @HavensBI



# Design Principles

How do we **process** information?

Left to Right

Top to Bottom



What does **S.C.R.A.P** stand for?



Spacing

Contrast



Repetition

Alignment



Proximity



## Knowledge Check



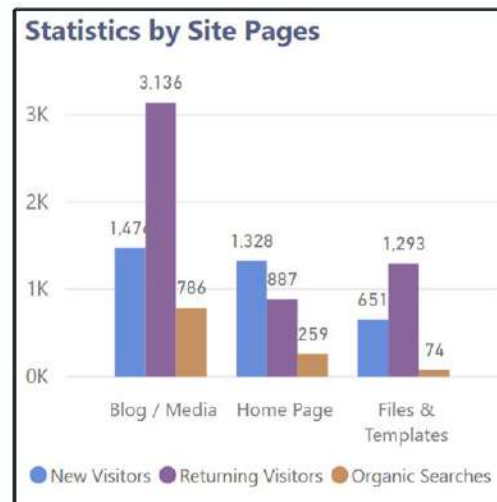
# S.C.R.A.P Methodology

What are the **three types** of **color contrast** that can be used to distinguish elements?

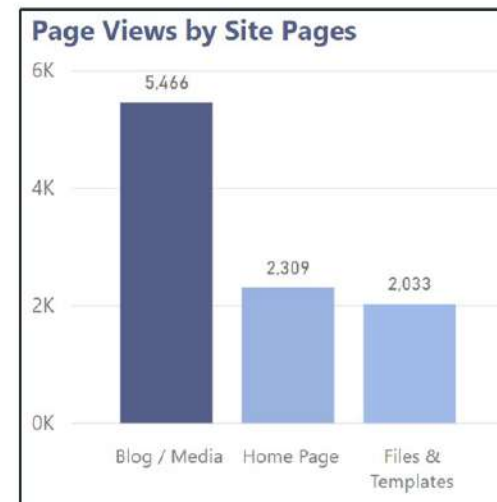


## Knowledge Check

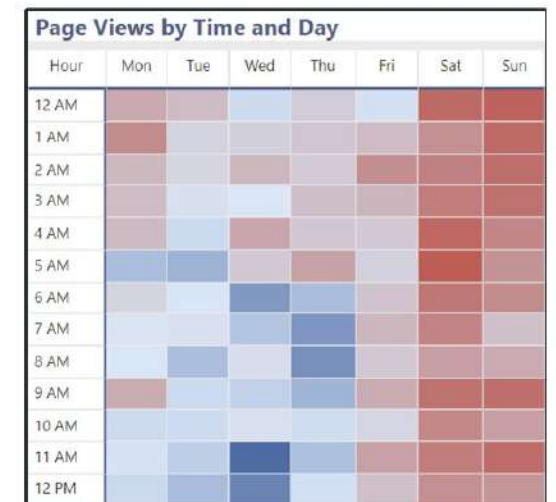
Categorical



Sequential



Diverging



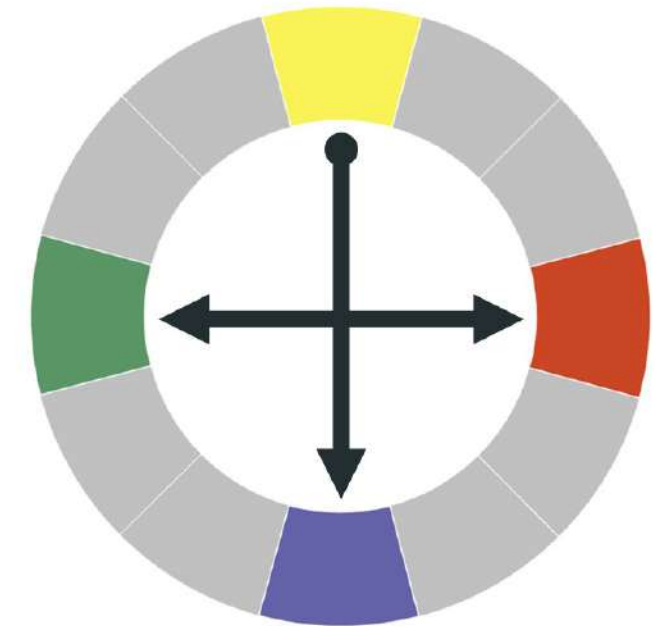
# Design Principles

What type of **color harmony** is implemented in this report?



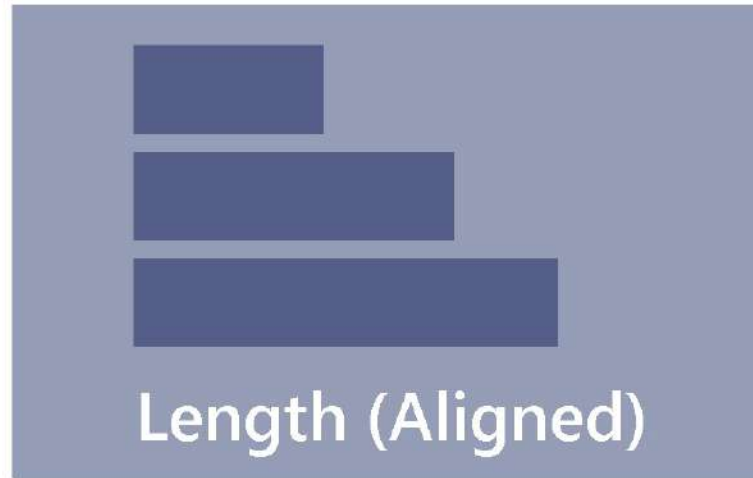
## Knowledge Check

Tetratic

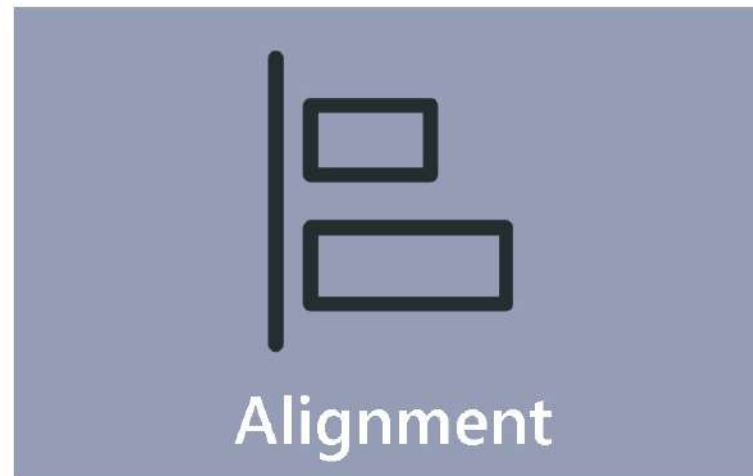


# Visual Cues

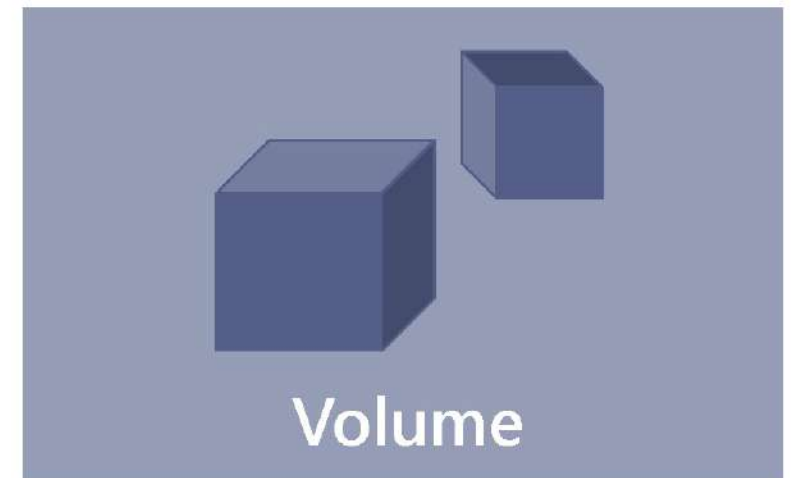
**Easiest** visual cue to process?



What influences **accuracy**?



**Hardest** visual cue to process?



What influences **accuracy**?



## Knowledge Check



# Demonstration

## Applying Report Design Principles

- Exercise 1 – Background Color
- Exercise 2 – Alignment and Spacing
- Exercise 3 – Removing Object Elements
- Exercise 4 – Selecting Visual Types



# Recommended Practices

- **Design principle practices:**

- Commonly, people look at the *upper-left of report* pages first – consider carefully what to place there as that is the first thing users will see
- Develop reports from a *blank canvas perspective* – start with nothing and add one element at a time until requirements are met
  - This will help minimize unnecessary elements and prevent the report from becoming “noisy”
- Consider using a *light page background* and *white backgrounds for objects* – this creates soft borders between page elements
- Choose carefully the type of color contrast (*categorical, sequential, diverging*) applied to visuals – as each one tells a different story with the data
- Repetition (*e.g. font, color, location, naming, etc.*) can be used to indicate relationships or *lack thereof* – so choose carefully when to apply



# Recommended Practices

- **Design principle practices:**

- Apply alignment to *every object* – no exceptions
  - Borders between objects should be able to follow a *natural line* throughout the report page
  - Enable *gridlines* and *snap-to-grid* on the view tab to assist with alignment and spacing
- Have feedback sessions with users to determine *logical proximity* of report objects and the “flow” of the report page
- Reports should be built to *minimize eye and mouse travel* on the screen



# Recommended Practices

- **Data visualization practices:**

- Have feedback sessions with users to determine what type of story needs to be told for each visualization – and make a visual type selection based on this
  - E.g. Part-to-whole, correlation, distribution, etc.
- *Forced variation* between visual types does not always add value – choose carefully the type of visual if *data accuracy* is important



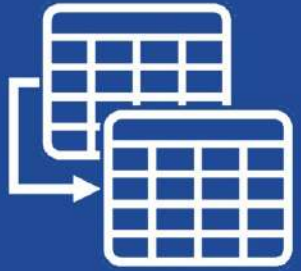
# References

- Power BI Visualization Best Practices
  - <https://docs.microsoft.com/en-us/power-bi/visuals/power-bi-visualization-best-practices>
- Design Concepts for Better Power BI Reports
  - <https://datasavvy.me/design-concepts-for-better-power-bi-reports>
- Adobe Color Wheel
  - <https://color.adobe.com>
- Color Blindness Resources
  - <https://www.color-blindness.com/>
- Visuals Reference
  - <https://www.sqlbi.com/ref/power-bi-visuals-reference>





Questions?



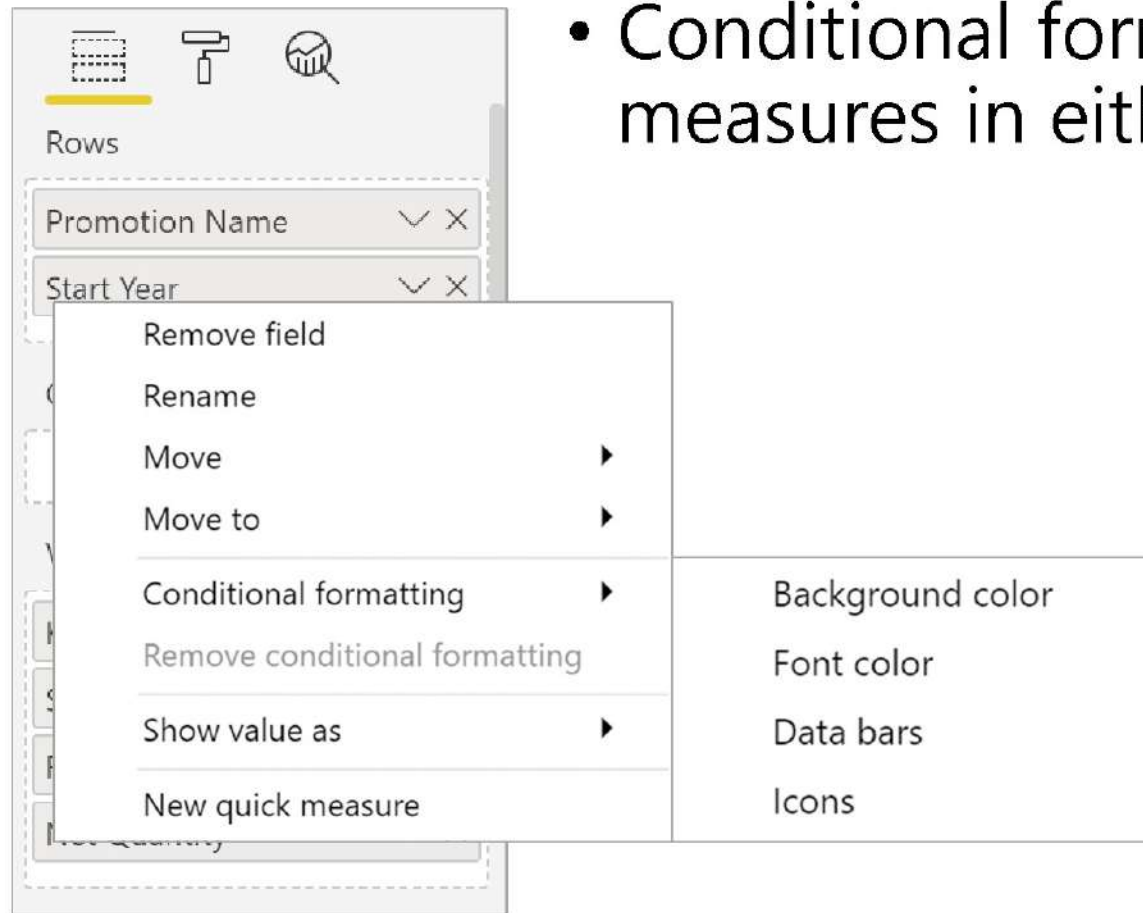
# Designing Advanced Reports

- Conditional formatting
- Drillthrough filters
- Visual interactions
- Sync slicers
- Report tooltips
- Bookmarks
- Custom Visuals
- Recommended Practices

# Designing Advanced Reports

## Conditional Formatting

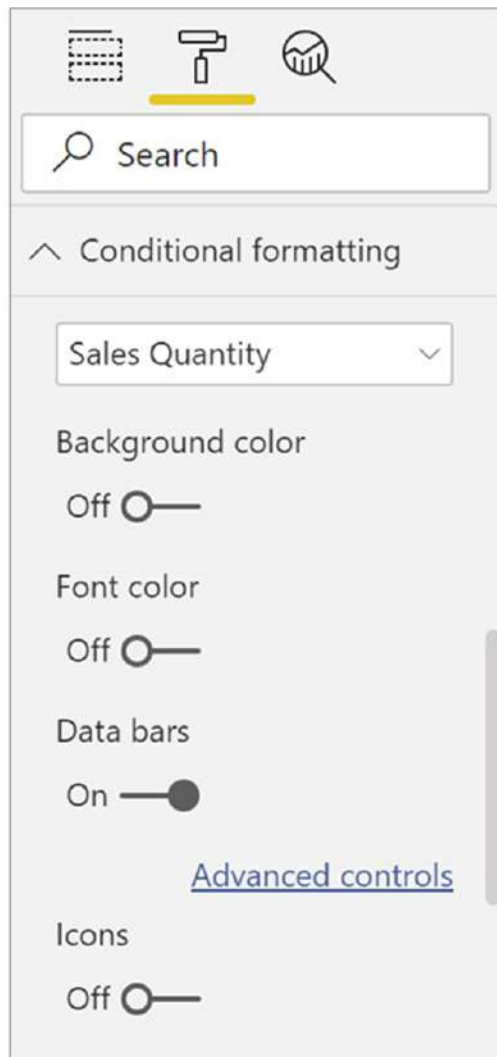
- Conditional formatting can be applied to calculated measures in either the *table* or *matrix* visuals



Page Title & Geo	Page Views	Unique Views	Searches	Bounce Rate
Havens Consulting	4,326	3,587	546	47.6%
Files & Templates — Hav...	4,270	3,424	225	72.8%
Blog / Media — Havens ...	3,464	2,921	35	73.2%
Blog Posts — Havens Co...	2,695	2,050	33	63.6%
Power BI Vs. Excel — Hav...	2,367	2,202	1,540	91.2%
Havens Consulting — Se...	1,403	1,034	0	37.9%
About Us — Havens Con...	1,226	1,049	455	47.1%
What Is Power BI? — Hav...	855	723	241	57.5%
Creating a Slicer Pop-Out...	800	679	9	80.1%
Google Analytics Report	786	710	20	80.8%
<b>Total</b>	<b>29,936</b>	<b>24,836</b>	<b>4,512</b>	<b>70.0%</b>

# Designing Advanced Reports

## Conditional Formatting



- Conditional formatting can be applied to calculated measures in either the *table* or *matrix* visuals
- Settings can be accessed:
  - In the **Fields** well of the **Visualizations** pane<sup>1</sup>
  - From the sub-menu under the Formatting pane

# Designing Advanced Reports

## Conditional Formatting ► Background and Font Colors

- **Background** and **font color** share the same *format by* settings
- Formatting logic can be based on:
  - **Color scale**
    - Applies a gradient between *min* and *max*
    - Min/Max can be set to *lowest value* or *fixed absolute value*
    - *Diverging* enables a third middle color

The screenshot shows the 'Conditional Formatting' dialog box for a 'Color scale'. The 'Format by' dropdown is set to 'Color scale'. The 'Based on field' dropdown is set to 'Total Sales Quantity'. The 'Minimum' dropdown is set to 'Lowest value' with a red color swatch. The 'Maximum' dropdown is set to 'Highest value' with a teal color swatch. A horizontal color gradient bar is visible below the 'Diverging' checkbox, which is currently unchecked. The 'Default formatting' dropdown is set to 'As zero'. The 'OK' button is highlighted in yellow, and the 'Cancel' button is greyed out.

# Designing Advanced Reports

## Conditional Formatting ► Background and Font Colors

- **Background** and **font color** share the same *format by* settings
- Formatting logic can be based on:
  - **Rules**
    - Applies colors based on one or more value ranges, each with a set color
    - Each value range starts with:
      - An **If** value condition
      - An **and** value condition
      - And a **color**

Format by: Rules [Learn more](#)

Based on field: Total Sales Quantity

Rules

If value	is greater than or equal to	Percent	and	is less than	Percent	then	Color	↑ ↓ ×
	0	Percent	and	33	Percent	then	Red	↑ ↓ ×
	33	Percent	and	66	Number	then	Orange	↑ ↓ ×
	66	Percent	and	100	Number	then	Green	↑ ↓ ×

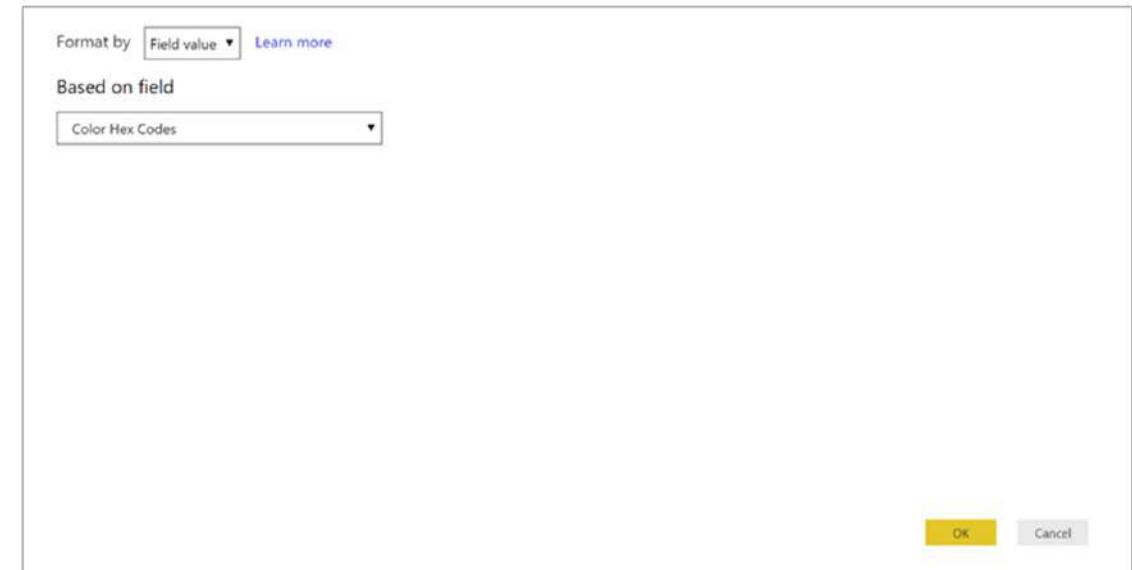
Reverse color order + New rule

OK Cancel

# Designing Advanced Reports

## Conditional Formatting ► Background and Font Colors

- **Background** and **font color** share the same *format by* settings
- Formatting logic can be based on:
  - **Field value**
    - Applies colors by using a *calculated measure* or a *column* that specifies a color – either using a *text value* or a *hex code*
    - Custom logic can be created inside a calculated measure to apply the desired color



Format by: Field value [Learn more](#)

Based on field:

Color Hex Codes

OK Cancel

Field value formatting will be outside the scope of this pre-con

# Designing Advanced Reports

## Conditional Formatting ► Data Bars

- **Data bars** can be set to *lowest value* or *fixed absolute value*
- **Other data Bar properties:**
  - Positive/negative bar (*color*)
  - Axis (*color*)
  - Bar direction
  - Show bar only – *hides the value*

Data bars

Format cells with bars based on their values.

Base value  
Sales Quantity

Show bar only

Minimum: Lowest value  
Maximum: Highest value

(Lowest value) (Highest value)

Positive bar: [Teal color]  
Negative bar: [Red color]

Bar direction: Left to right  
Axis: [Black color]

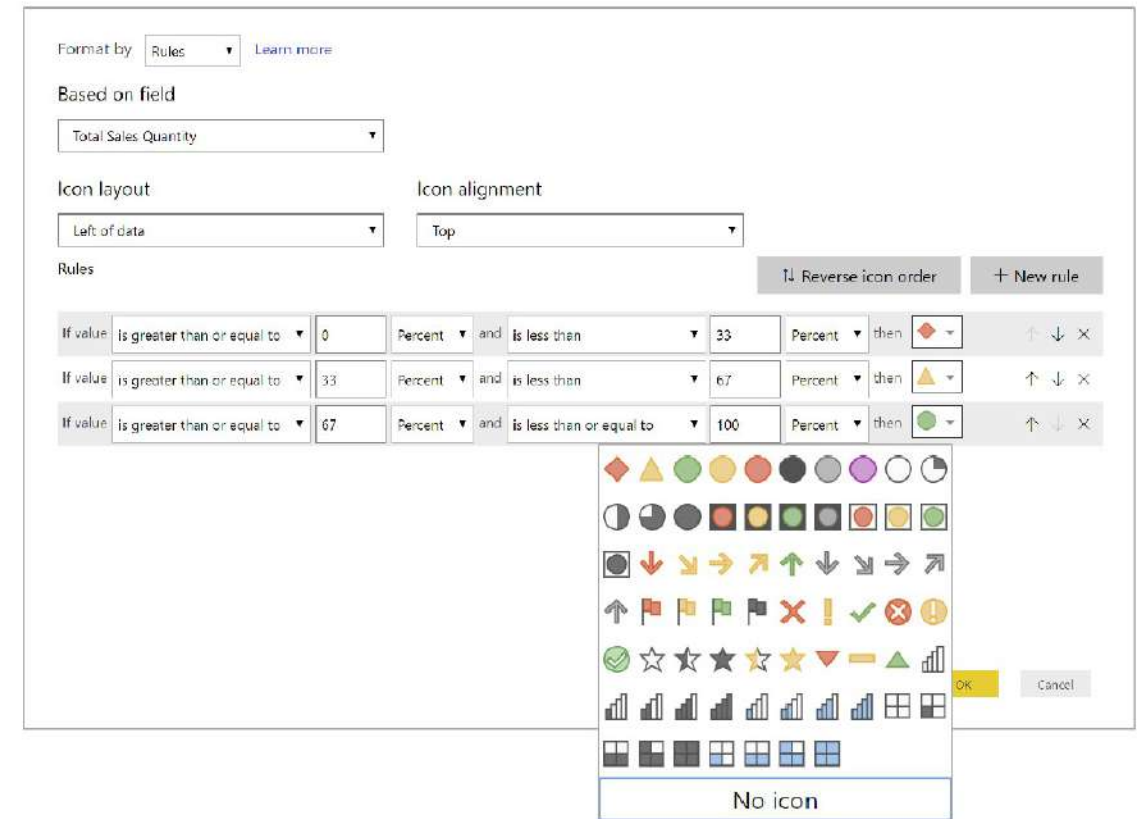
OK Cancel



# Designing Advanced Reports

## Conditional Formatting ► Icons

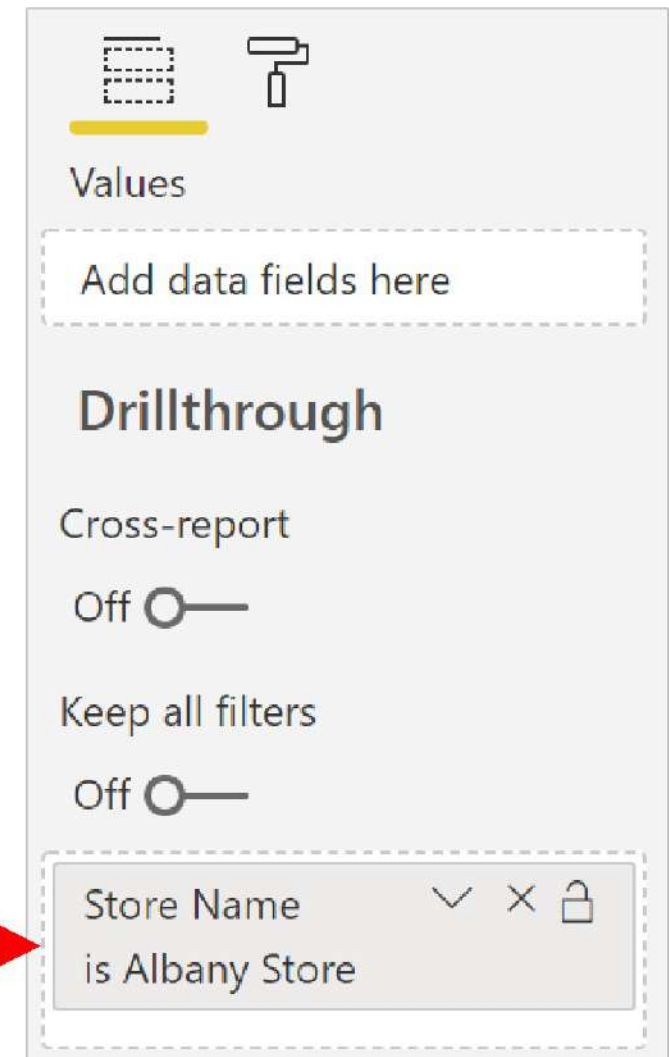
- **Icon sets** in Power BI are *very similar* to the ones found in *Excel*
- Formatting logic can be based on **Rules** or **Field Value**
- By default, icon rules will apply:
  - Red diamond to the *lower 33%*
  - Yellow triangle to the *middle 33%*
  - Green circle to the *upper 33%*
- *Custom* icon sets can be imported using Power BI Desktop



# Designing Advanced Reports

## Drillthrough Filters

- Pages with a **drillthrough filter** can be used as the *navigation target* of a visual drillthrough from a *different page*
  - User's right-click on a data category of a visual – and a *context menu* appears offering drillthrough options
- A *back button* is automatically added to the drillthrough page
- **Cross-report** allows filters to be passed between reports in the same workspace or app
- **Keep all filters** passes all applied filters from a visual to the drillthrough page



# Designing Advanced Reports

## Visual Interactions

- By default, *licer* and *visual cross-filtering* is active for all page visuals
- Use **Editing Interactions** to disable/re-enable filtering for a specific pair of visuals
  - Select the source visual
  - Configure settings for target visual(s)

Highlight filtering enabled



Non-highlight filtering enabled



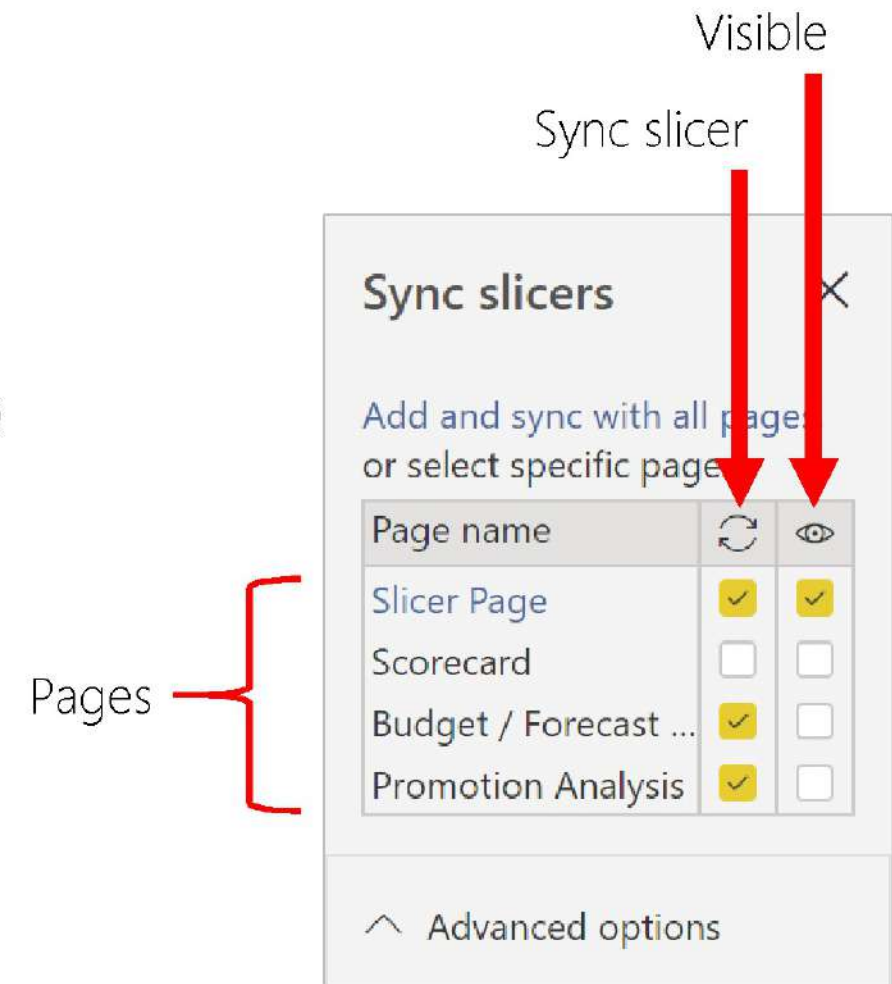
Filtering disabled



# Designing Advanced Reports

## Sync Slicers

- Use the **Sync Slicers** pane to configure the following for a *selected slicer*:
  - Which pages to sync
  - Whether to display the slicer
- All slicer interactions are synced – to provide *synced filtering across pages*
- Syncing a slicer can pass additional filter context to a *drillthrough page*



# Designing Advanced Reports

Sync Slicers ► Advanced Options

- **Advanced Options** lets you create a *custom group* of slicers to provide *additional synchronization* flexibility
- A default name is provided – but *any name* can be used
- You can sync slicers that use the same field, or put slicers that use different fields into the same group
- Within custom groups slicers can:
  - **Sync field changes**
    - Updates slicer field if another synced slicer field is changed
  - **Sync filter changes**
    - Updates slicer filter if filters from the fields pane are applied

^ Advanced options

Enter a group name to sync selection to any other visuals with that group name

- Sync field changes to other slicers
- Sync filter changes to other slicers

# Designing Advanced Reports

## Tooltips

- Tooltips can be configured by adding fields to the **Tooltips** well of most visuals
- Fields added to this well display filtered data when hovering over any data points on the visual

Tooltips can also be disabled for specific visuals

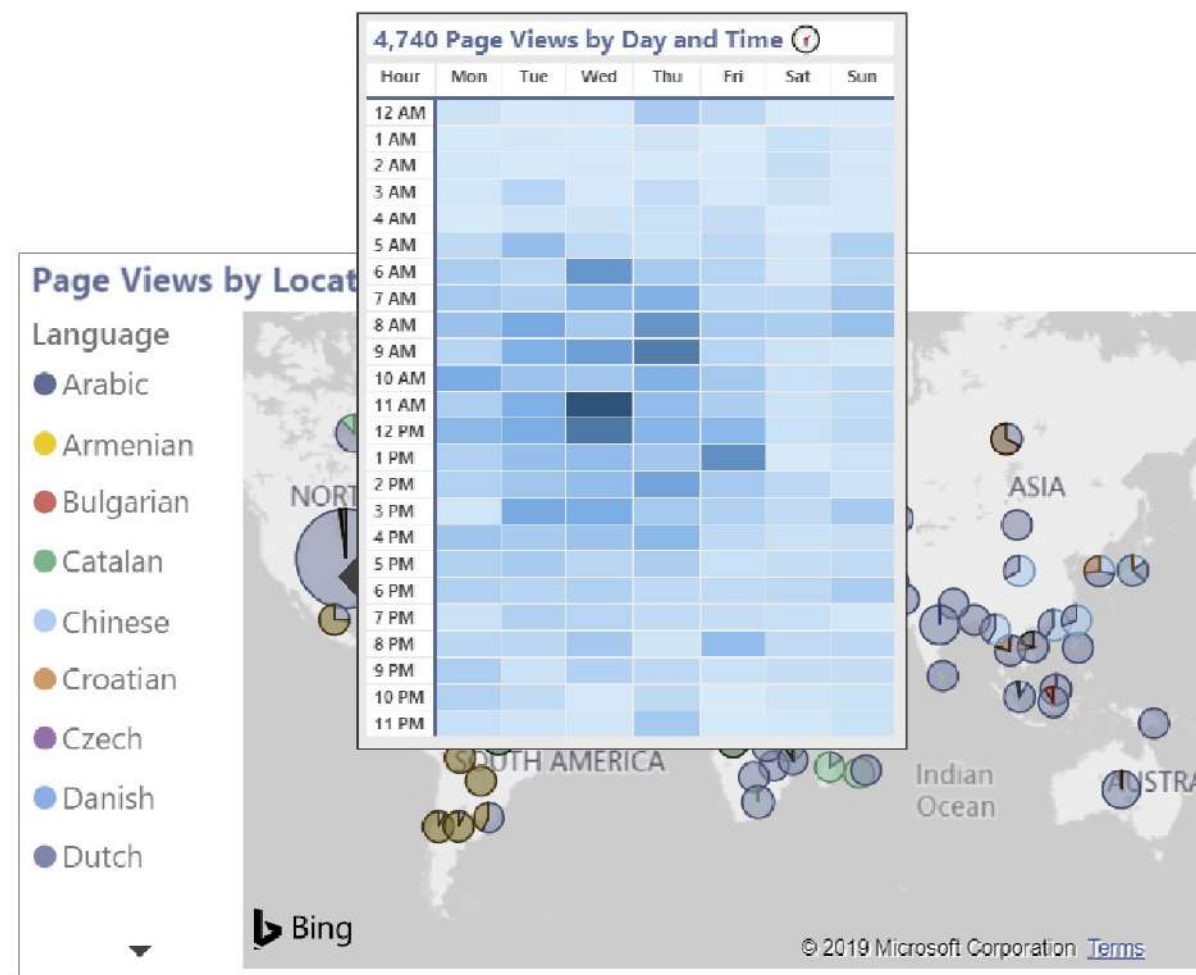


# Designing Advanced Reports

## Tooltips ► Report Tooltips

- Additionally, **report tooltip pages** can be created to display visuals as a tooltip
- Tooltip pages:
  - Can be set to any height or width
  - Can include any visual or object
  - Cannot be interacted with inside the tooltip<sup>1</sup>

**1:** Elements such as slicers, hierarchy controls, drillthrough, etc. cannot be clicked



# Designing Advanced Reports

Tooltips ► Report Tooltips ► Configuration

- Configurations for report tooltips are accessed in the *format pane* for the *report page*<sup>1</sup>
- **Report tooltip settings:**
  - Tooltip (*toggle*) – enables this page to be used as a tooltip by other page visuals

A screenshot of a configuration pane for a report page. At the top, there are two icons: a grid and a tooltip icon, with the tooltip icon highlighted by a yellow underline. Below the icons is a search bar with a magnifying glass icon and the text 'Search'. Underneath is a section titled 'Page information' with an expand/collapse arrow. The 'Name' field contains the text 'Website Summary'. Below that is the 'Tooltip' section, which includes a toggle switch currently set to 'On'. At the bottom, there is a 'Q&A' section with a toggle switch currently set to 'Off'.

**1:** page formatting is only accessible if there is not an active page visual selected

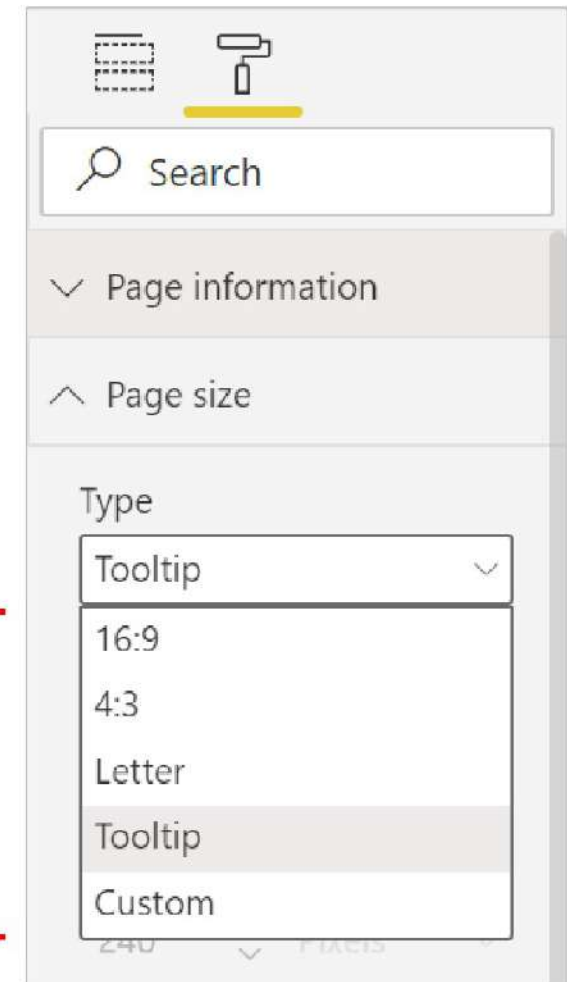


# Designing Advanced Reports

Tooltips ► Report Tooltips ► Configuration

- Configurations for report tooltips are accessed in the *format pane* for the *report page*<sup>1</sup>
- **Report tooltip settings:**
  - **Tooltip** (*toggle*) – enables this page to be used as a tooltip by other page visuals
  - **Page size** – configuration of the pixel size and width, common configurations include:
    - *Tooltip* – 320 x 240 pixels
    - *Custom* – User defined pixel width and height

Page sizes

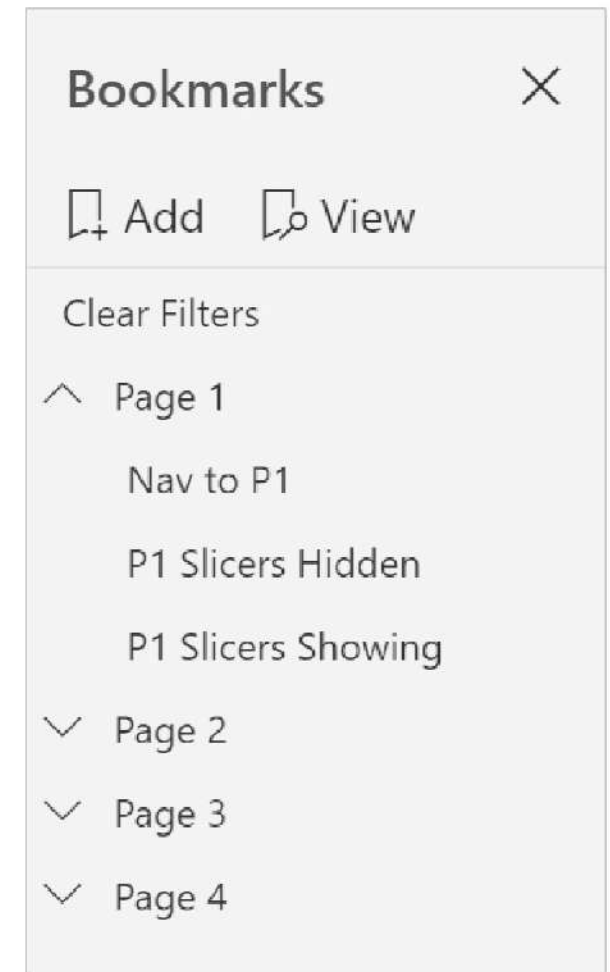


**1:** page formatting is only accessible if there is not an active page visual selected

# Designing Advanced Reports

## Bookmarks

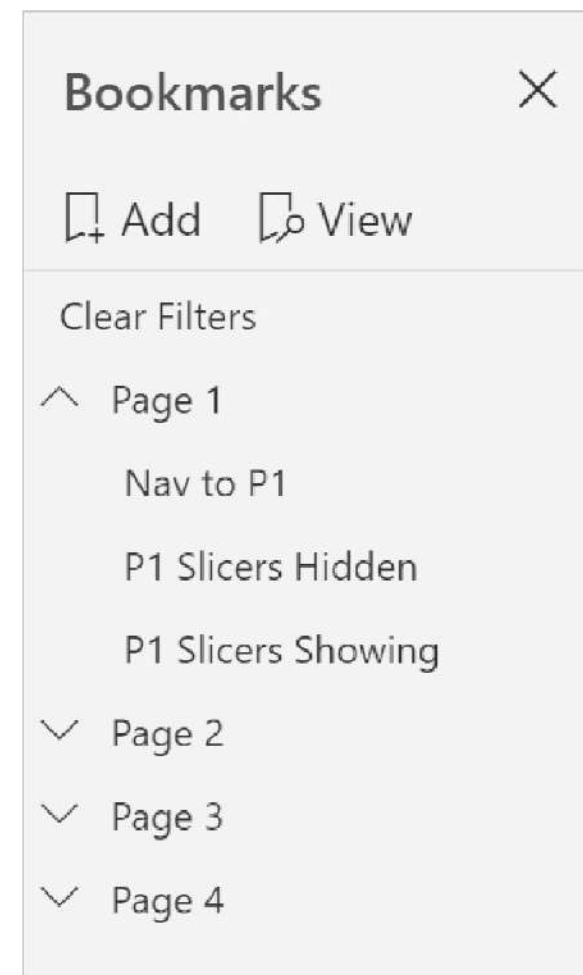
- The **Bookmarks** pane captures the *currently configured view* of a report page at *design-time*
- **Common uses:**
  - Create an ordered list of bookmarks, then click **View** to replay them as a story
  - Create advanced report interaction by assigning bookmarks to buttons and/or images
  - Select a bookmark to return to a previously captured state
- Report users can open the pane at view-time



# Designing Advanced Reports

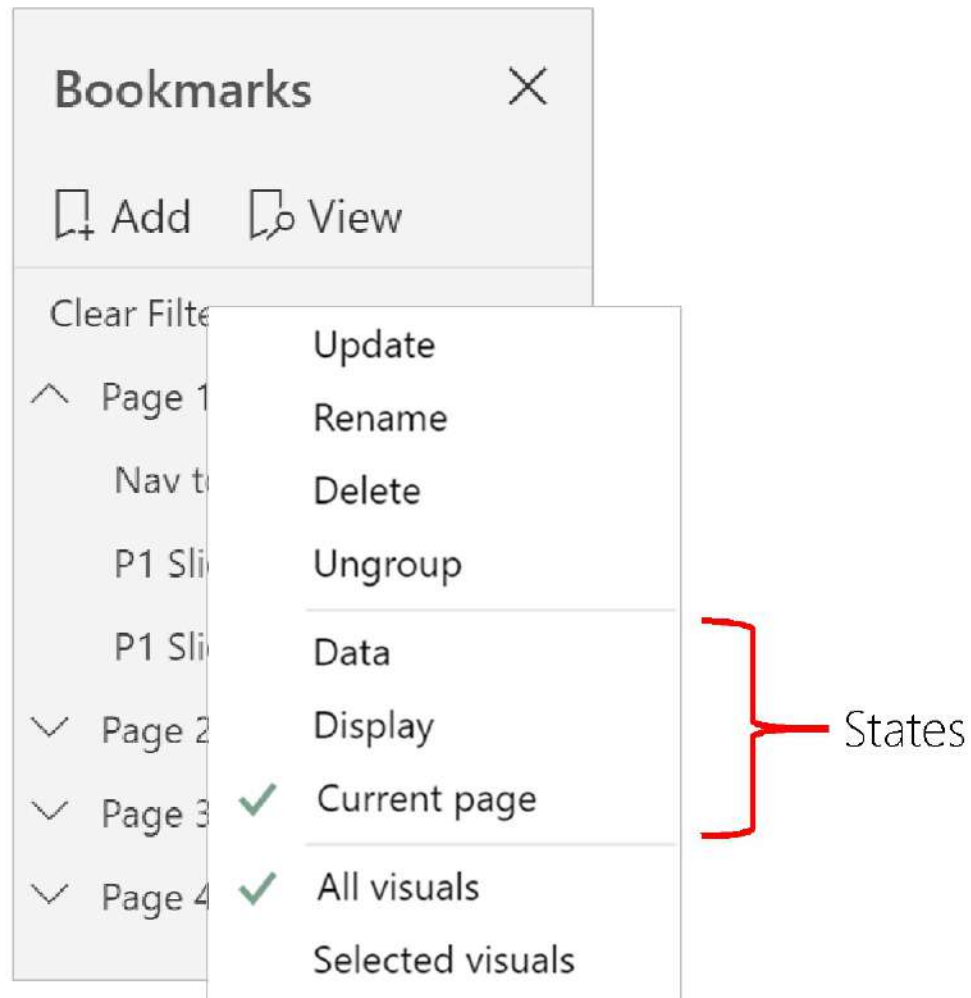
Bookmarks ► Capture States

- Bookmarks can save the *following states*:
  - Current page
  - Filters and slicers
  - Sort order
  - Drill mode
  - Drill location
  - Visibility of objects (as configured in the **Selections** pane)
  - Spotlight set on an object
  - Focus set on an object
- Bookmarks do not capture cross-highlight state



# Designing Advanced Reports

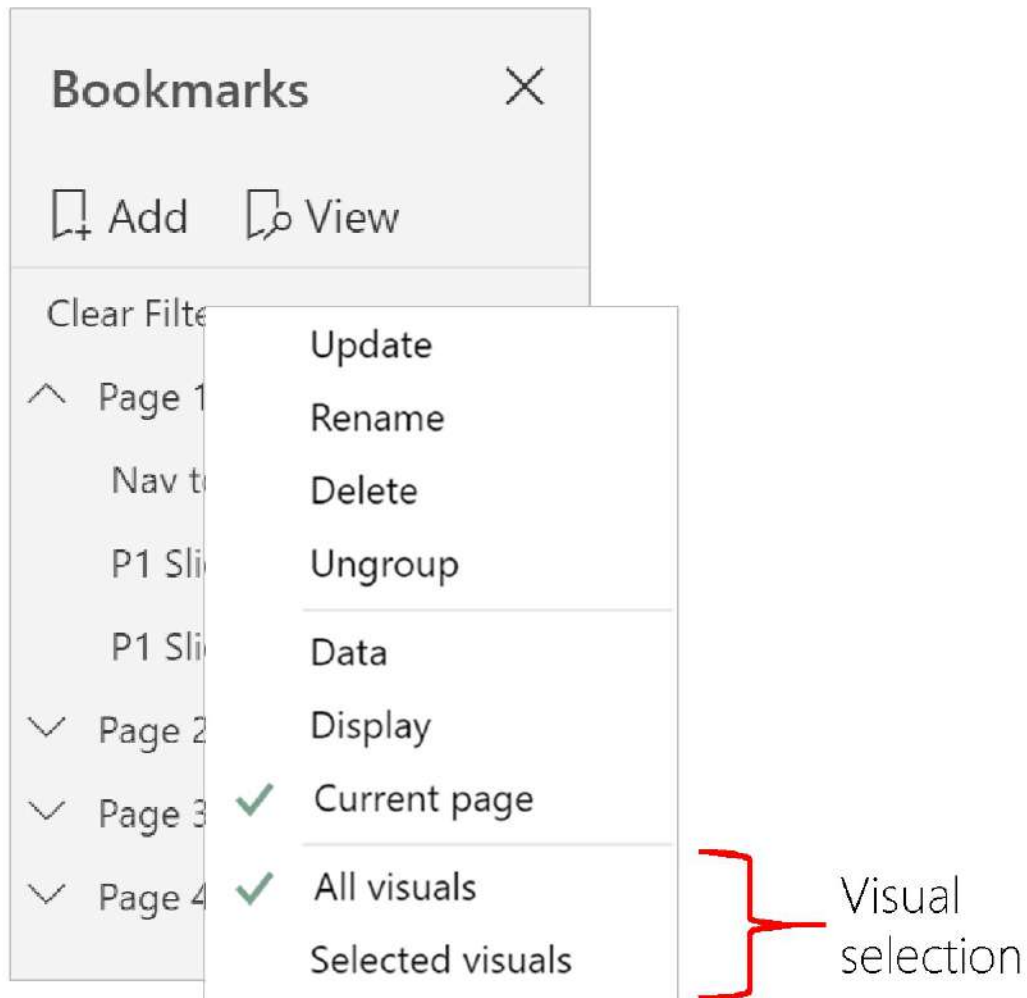
Bookmarks ► Settings



- State capture can *include/exclude*:
  - **Data**: Filter state
  - **Display**: Object visibility state
  - **Current page**: Current page

# Designing Advanced Reports

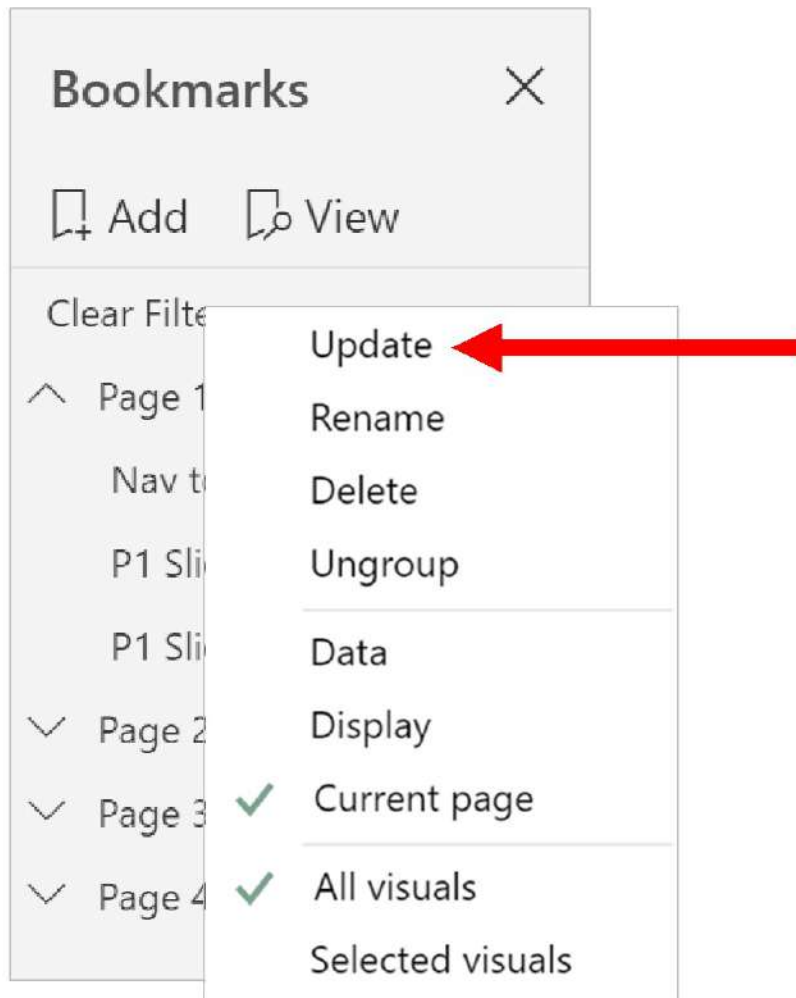
Bookmarks ► Settings



- State capture can *include/exclude*:
  - **Data**: Filter state
  - **Display**: Object visibility state
  - **Current page**: Current page
- State capture can apply to:
  - All visuals
  - Selected visuals

# Designing Advanced Reports

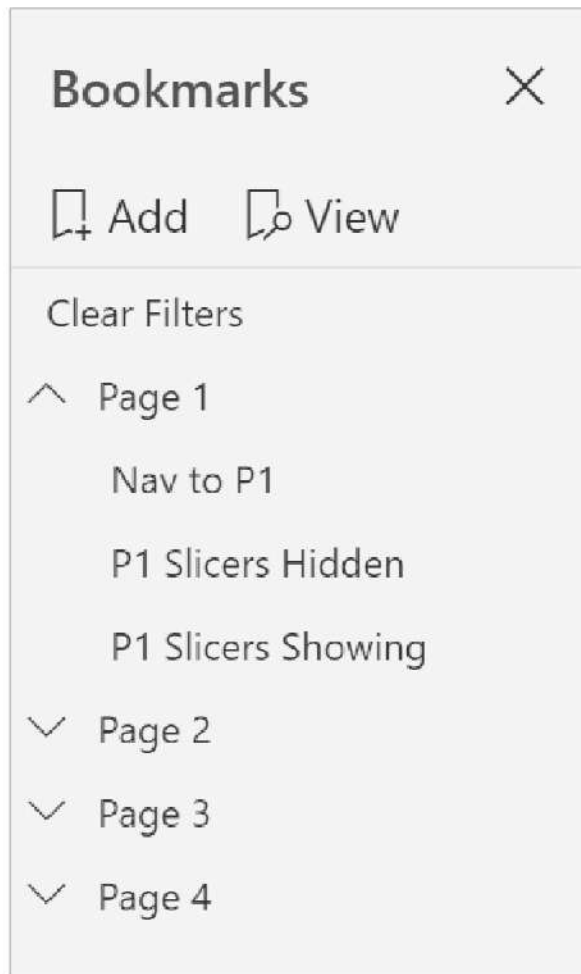
Bookmarks ► Settings



- State capture can *include/exclude*:
  - **Data**: Filter state
  - **Display**: Object visibility state
  - **Current page**: Current page
- State capture can apply to:
  - All visuals
  - Selected visuals
- Select **Update** to re-capture state

# Designing Advanced Reports

Bookmarks ► Settings



- State capture can *include/exclude*:
  - **Data**: Filter state
  - **Display**: Object visibility state
  - **Current page**: Current page
- State capture can apply to:
  - All visuals
  - Selected visuals
- Select **Update** to re-capture state
- Bookmarks can also be organized by named **Groups**

# Designing Advanced Reports

Bookmarks ► Selection Pane

- Use the **Selection** pane at design-time to:
  - Order overlapping report objects
  - Toggle visibility state of report objects
- **Common uses:**
  - Appropriately order visuals so *visual headers* and other *visual pop-ups* don't display behind other visuals
  - Hide/display objects when updating a bookmark
- Report users can open the pane at view-time
- It is a recommended practice to give each object a unique name

Visible



Hidden

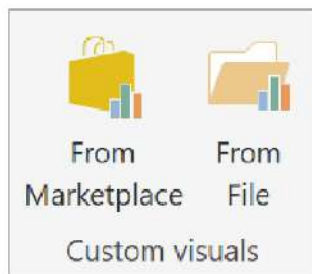
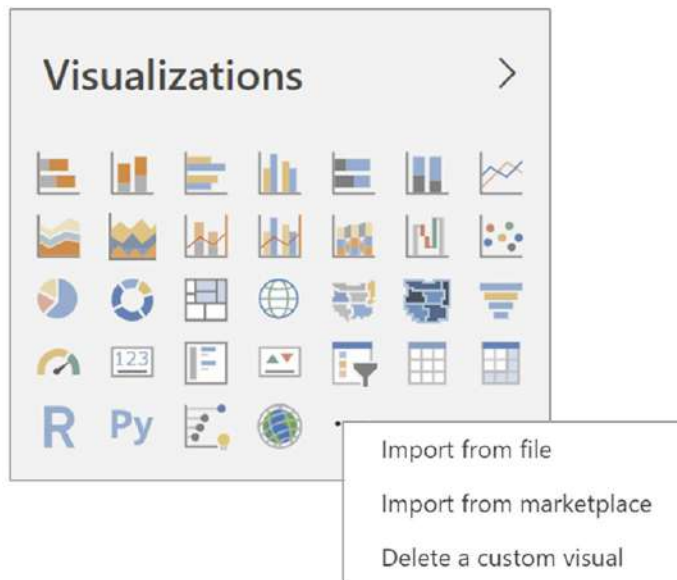


Layer order	Tab order
▲ ▼	Show Hide
Visible	Hidden
Clear Slicers Window	☉
Slicer Window Info	☉
Hide Slicers Button	☉
Slicers	☉
Continent Slicer	☉
Country Slicer	☉
State/Region Slicer	☉
City Slicer	☉



# Designing Advanced Reports

## Custom Visuals



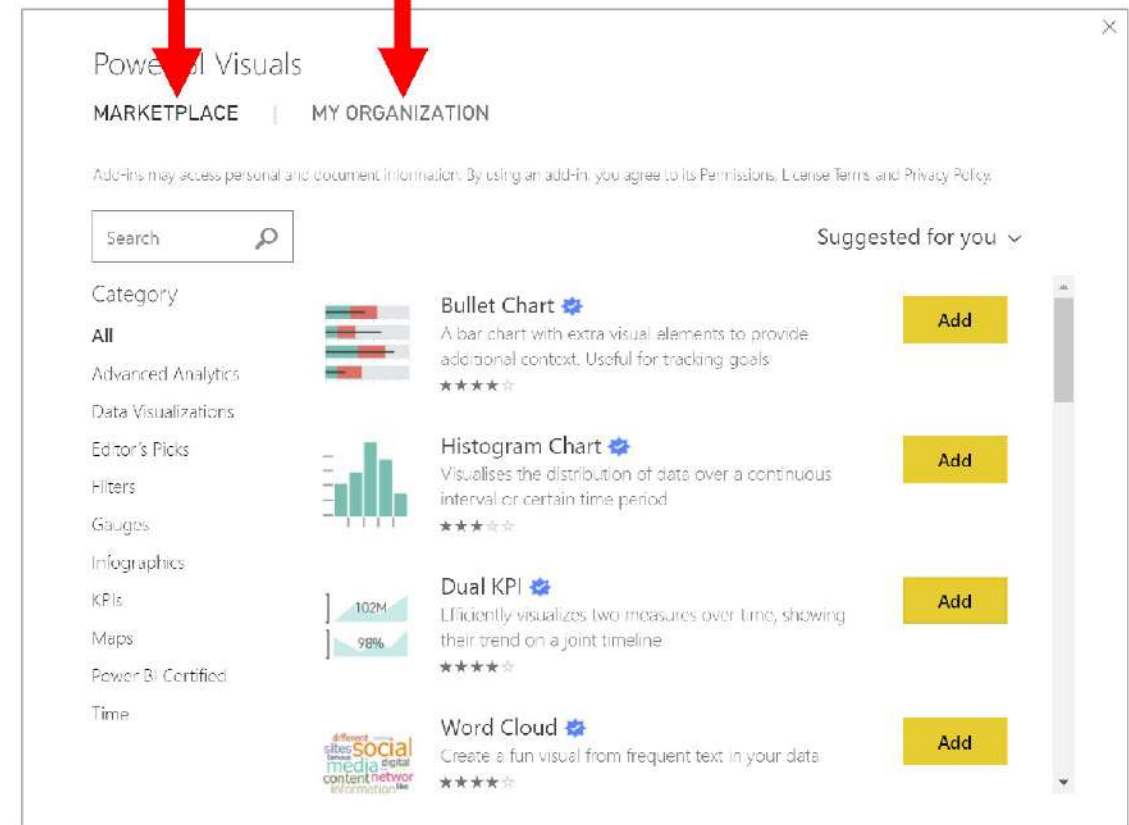
- Microsoft *open sourced* the code for visuals – allowing report developers to create custom visuals that can be used by report authors
- A custom visuals **Marketplace** exists that contains custom visuals that have been tested and certified
- Custom visuals can be added either through the marketplace or from a file:
  - By selecting the *ellipses* in the Visualizations pane
  - By selecting these commands on the Home ribbon:
    - *From Marketplace*
    - *From File*

# Designing Advanced Reports

Custom Visuals ► Marketplace

- The marketplace lets report authors *search for* and *add* visuals directly from within the Power BI report
- Authors can choose visuals from:
  - **Marketplace** – Contains all marketplace custom visuals
  - **My Organization** – Contains custom visuals *approved* within the organization

Marketplace    My Org



# Designing Advanced Reports

Custom Visuals ► File

- Authors can also download custom visual files (**PBVIZ**) and import them into the Power BI report
- Commonly, custom visual files can be downloaded from the **Microsoft AppSource** store under Power BI visuals
- Microsoft certified custom visual partners also provide (PBVIZ) files for purchase and download directly from their websites

The screenshot displays the Microsoft AppSource interface. At the top, there are navigation links for Microsoft, AppSource, Apps, and Consulting Services. Below this, there are filters for Products (Web Apps, Add-Ins, Dynamics 365, Office 365, Power BI apps, Power BI visuals, Dynamics NAV), Categories (Analytics, Filters, Gauges, Infographics, KPI, Time), and Industries (Agriculture, Education, Distribution, Financial services). The main content area shows search results for 'Power BI visuals' and 'Add-Ins'. Two specific visualizations are highlighted: 'KPI Ticker by MAQ Software' and 'Dynamic Tooltip by MAQ Software'. Both are listed as 'Free' and have 'Get it now' buttons. The KPI Ticker has a 4.5-star rating (12 reviews) and a description: 'Display multiple key performance indicators (KPIs) in an automatically rotating visual.' The Dynamic Tooltip has a 4.5-star rating (23 reviews) and a description: 'Enhance readability of reporting charts by providing additional data points as tooltips.'



# Demonstration

Four

User Group  
**Summit**  
NORTH AMERICA

## Designing Advanced Reports

- Exercise 1 – Developing a Drillthrough Page
- Exercise 2 – Configuring Visual Interactions
- Exercise 3 – Configuring Sync Slicers
- Exercise 4 – Customizing Tooltips
- Exercise 5 – Applying Conditional Formatting
- Exercise 6 – Utilizing Bookmark Features
- Exercise 8 – Adding a Custom Visual



# Recommended Practices

- Consider the *audience* and their *needs*
- Just because a *feature exists* does not mean it has to be used in a report
- Use *conditional formatting* to draw attention to *important data*
- *Leverage tooltips* to provide additional relevant information to visuals
- Configure *drillthrough* and *bookmarks* to reduce the number of mouse clicks and mouse travel for users – enabling a more intuitive report experience



# References

- Power BI service reports
  - <https://docs.microsoft.com/power-bi/service-reports>
- Power BI service features by license type
  - <https://docs.microsoft.com/en-us/power-bi/service-features-license-type>
- Power BI performance best practices
  - <https://docs.microsoft.com/power-bi/power-bi-reports-performance>
- Show Visualization Categories with No Data in Power BI
  - HC Video – [https://youtu.be/Js5z\\_JrWS4A](https://youtu.be/Js5z_JrWS4A)
- Naming Objects in the Power BI Selection Pane
  - HC Video – <https://youtu.be/SSdD0bGF48o>



# References

- Guide Users With Power BI Bookmark Button Tooltips
  - HC Video – <https://youtu.be/dZ2cdWpAsi4>
- Customizing the Hierarchy Controls and Visual Header
  - HC Video – <https://youtu.be/zqztkG-wS4->
- SVG Image Sparklines on Rows in Power BI Tables
  - HC Video – <https://youtu.be/xLD8HKwPWHE>
- SVG and GIF KPI's on Rows in Power BI Tables
  - HC Video – <https://youtu.be/zDpD016Eebg>
- Changing Font Size with Bookmark Buttons in Power BI
  - HC Video – <https://youtu.be/w94s6LSuv6M>



# References

- Creating Report Tooltips in Power BI
  - HC Video – <https://youtu.be/epDb9ruV0bU>
- Creating a Pareto Chart Using DAX and Native Visuals in Power BI
  - HC Video – <https://youtu.be/bzF5kN2BQ60>
- Creating a Dynamic Chart Title with WhatIf Parameters in Power BI
  - HC Video – <https://youtu.be/ZoPZjtNnriU>
- Custom KPI Card With Sparklines in Power BI
  - HC Video – [https://youtu.be/3lja\\_5afjBA](https://youtu.be/3lja_5afjBA)
- Creating Table Heatmap in Power BI
  - HC Video – [https://youtu.be/aCq9Nz8K\\_Cs](https://youtu.be/aCq9Nz8K_Cs)





# References

- Creating a Stacked Column Chart with Grand Total Data Label
  - HC Video – [https://youtu.be/B\\_pv0HmBi8o](https://youtu.be/B_pv0HmBi8o)
- Creating a Slicer Pop Out Window with Bookmark Buttons in Power BI
  - HC Video – <https://youtu.be/5TaZQFc-t58>
- Creating Dynamic Titles for Report Tooltips in Power BI
  - HC Video – <https://youtu.be/SrKSZNzqrNk>
- Dynamic URL's for Images and Bookmark Buttons in Power BI
  - HC Video – <https://youtu.be/4WOuLNvldSg>
- Visual Header Tooltips in Power BI
  - HC Video – <https://youtu.be/mtt8fR54Agg>



# References

- Native and Custom KPI Icons in Power BI
  - HC Video – <https://youtu.be/NzUVUaev8IA>
- Applying Field Based Conditional Formatting as a Best Practice
  - HC Video – <https://youtu.be/xsHnz1mc9mw>
- Conditional Formatting for Single Value Cards
  - HC Video – <https://youtu.be/74vPHPEb7OY>
- Conditional Formatting for Line Values in Power BI
  - HC Video – [https://youtu.be/2\\_2rGxA6PKQ](https://youtu.be/2_2rGxA6PKQ)



Questions?

# Online Resources



Presentation PDF

- <http://www.havensconsulting.net/speaking-events>



Consulting Services

- <http://www.havensconsulting.net/consulting-services>



Files & Templates

- <http://www.havensconsulting.net/files-and-templates>



30% Discount Code

- PUG\_SUMMIT\_OCT\_2019



YouTube Channel

- <https://www.youtube.com/c/HavensConsulting>



LinkedIn Page

- <https://www.linkedin.com/in/reidhavens>



# Company Website



# Blog Signup Raffle

