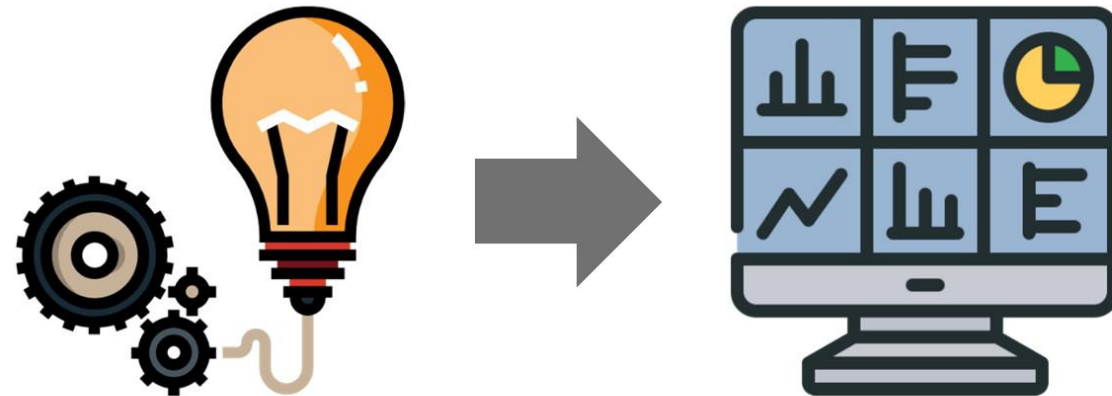


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Demystifying **Chart Types** and **Design Principles** in Power BI



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Most Valuable
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Presenter Introduction

- **Reid Havens**

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

<https://www.havensconsulting.net>

reid@havensconsulting.net

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Session Agenda



Defining a Report

- Descriptions of report components and characteristics



Design Principles

- Practices for designing more effective reports



Data Visualizations

- Methodologies for creating impactful visualizations



Apply Practices

- Implementation of principles on a Power BI report

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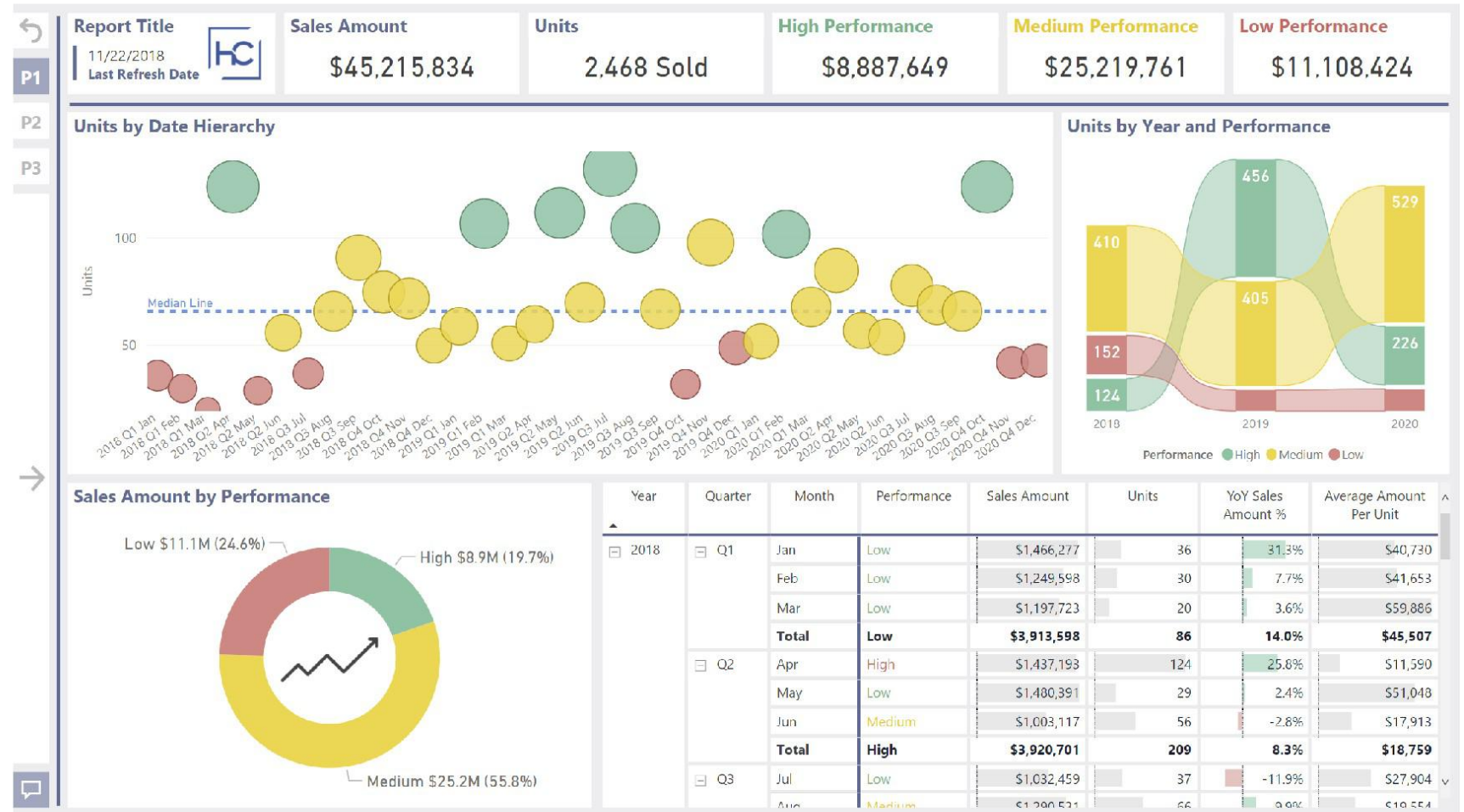


Defining a Report

- Descriptions of report components and characteristics

Defining a Report

“A report is a visual display of the most important information needed to achieve one or more objectives; consolidated and arranged...so the information can be monitored at a glance.”
~Stephen Few



Defining a Report

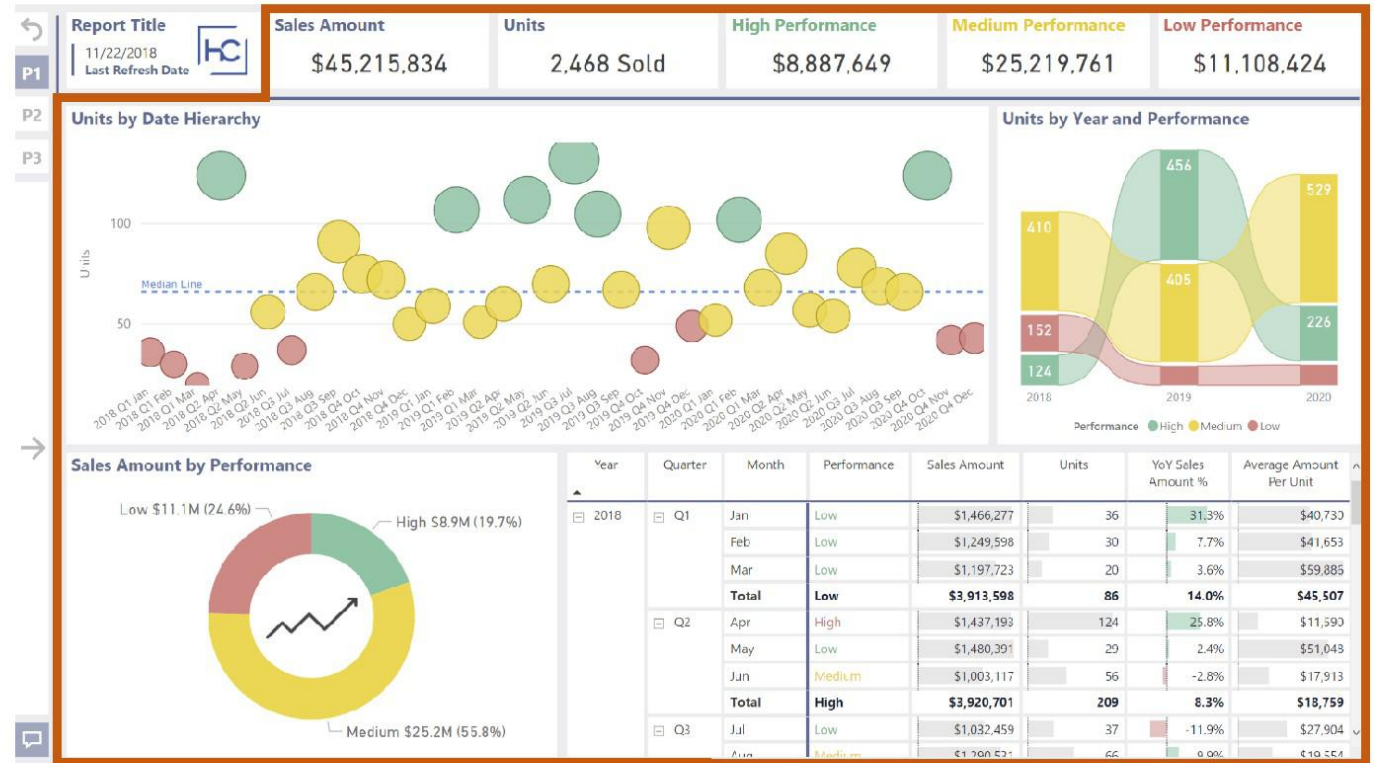
Essential Report Components

Three primary components of a report



Visualizations

- Displays patterns, trends, or outliers in the data



Defining a Report

Essential Report Components

Three primary components of a report



Visualizations

- Displays patterns, trends, or outliers in the data



Information

- Gives additional information about the data or report



Defining a Report

Essential Report Components

Three primary components of a report



Visualizations

- Displays patterns, trends, or outliers in the data



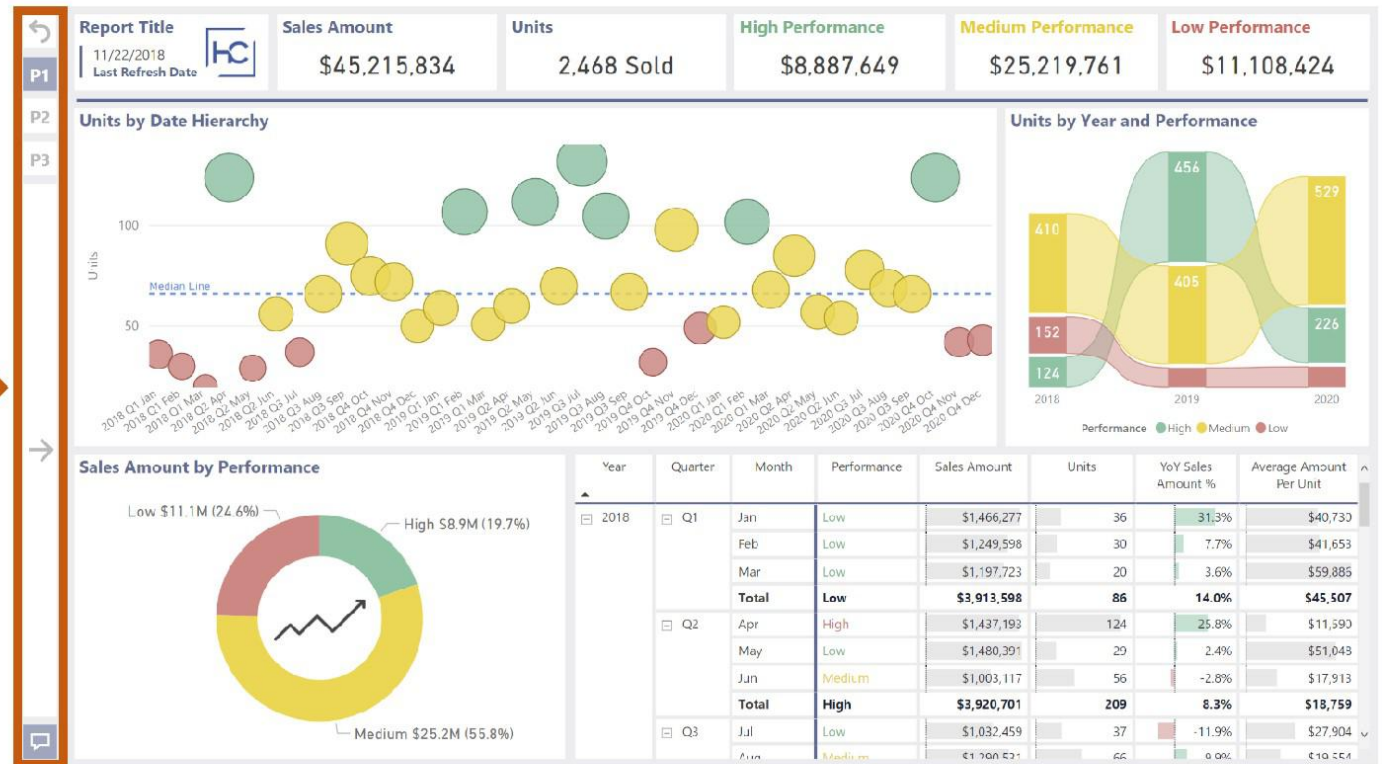
Information

- Gives additional information about the data or report



Filters / navigation

- Provides ways to interact with and drill into the data



ALL THREE ARE NEEDED TO CREATE AN EFFECTIVE REPORT



Defining a Report

Essential Report Components ► Visualizations

Defining visualizations

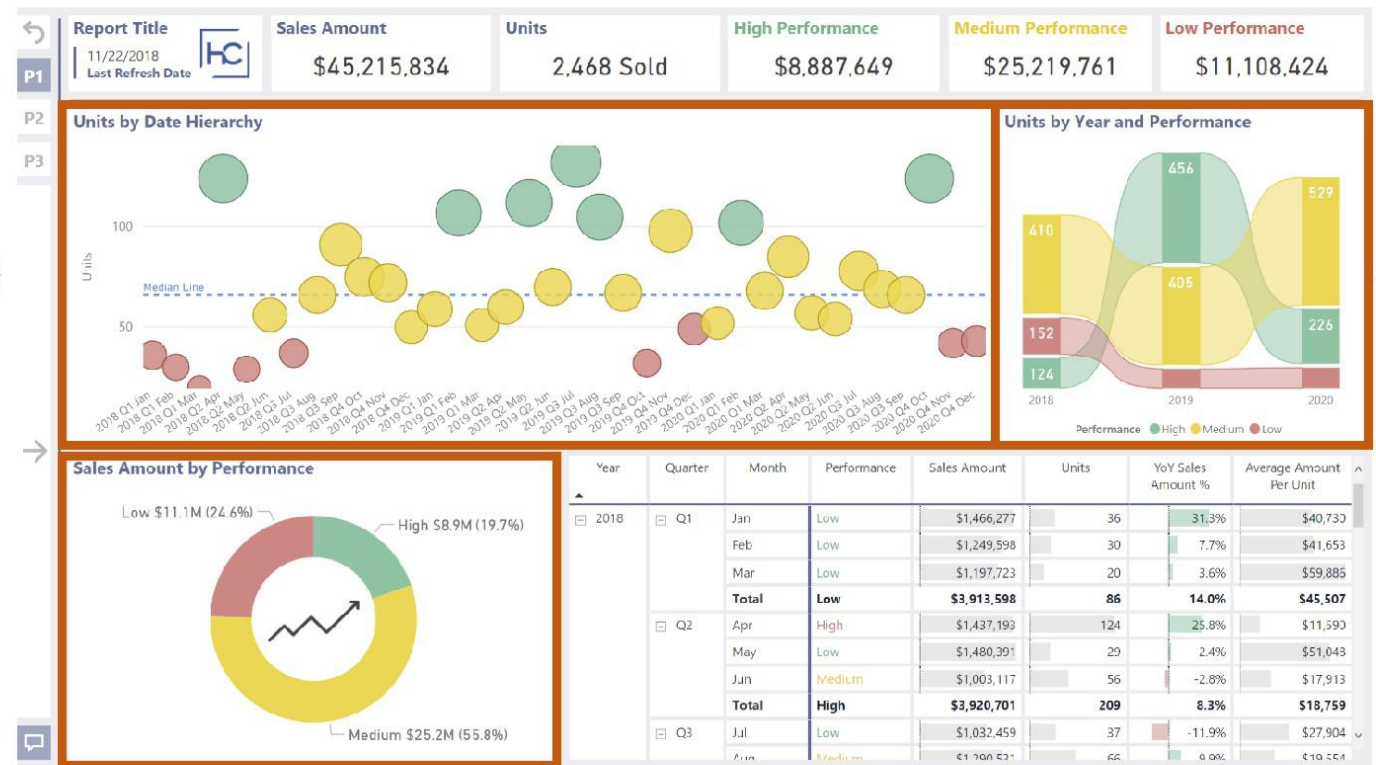
- Displays summarized data that has been categorized and sorted
- Tells a story about the data

Types of visuals



Charts / graphs

- Data represented graphically across time or categories



Defining a Report

Essential Report Components ► Visualizations

Defining visualizations

- Displays summarized data that has been categorized and sorted
- Tells a story about the data

Types of visuals



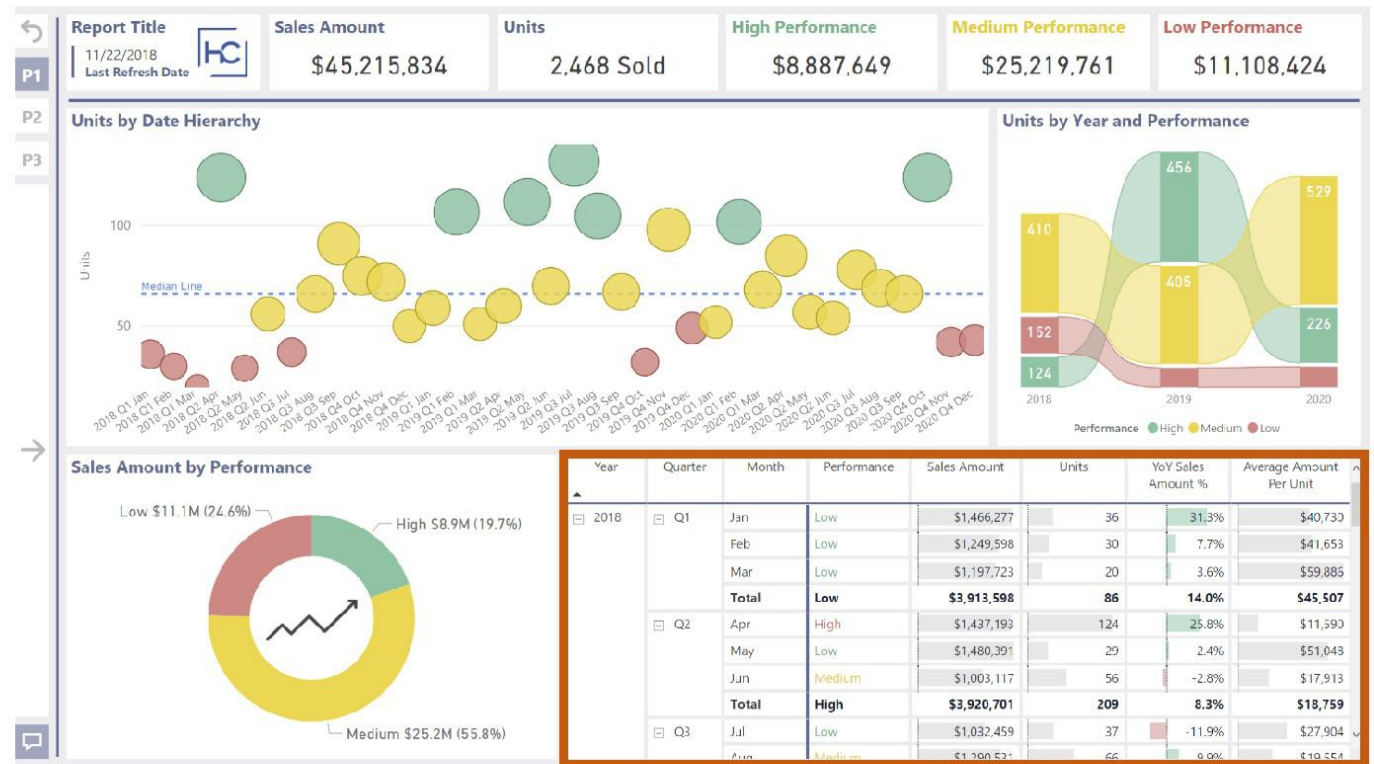
Charts / graphs

- Data represented graphically across time or categories



Tables

- Data displayed on columns and rows



Defining a Report

Essential Report Components ► Visualizations

Defining visualizations

- Displays summarized data that has been categorized and sorted
- Tells a story about the data

Types of visuals



Charts / graphs

- Data represented graphically across time or categories



Tables

- Data displayed on columns and rows



Key performance indicators (KPI's)

- Quantifiable values used to measure performance



Defining a Report

Essential Report Components ► Visualizations

Defining visualizations

- Displays summarized data that has been categorized and sorted
- Tells a story about the data

Types of visuals



Charts / graphs

- Data represented graphically across time or categories



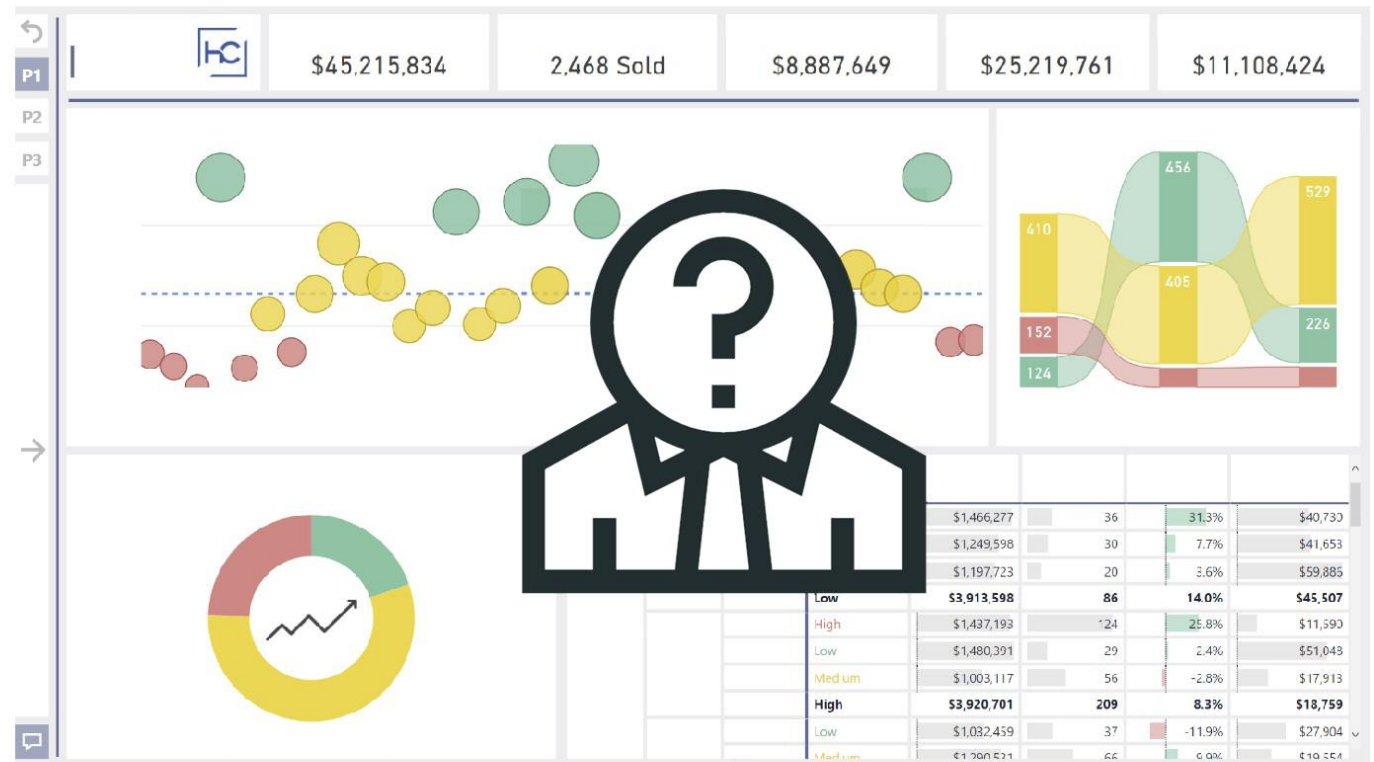
Tables

- Data displayed on columns and rows



Key performance indicators (KPI's)

- Quantifiable values used to measure performance



REPORTS NEED INFORMATION TO INTERPRET DATA



Defining a Report

Essential Report Components ► Information

Defining information

- Gives meaning to visualizations
- Provides context for the report

Types of information

- Visualization details
 - Axis
 - Data labels
 - Legend
 - Title
 - Row / column headers
- Report context
 - Report title
 - Refresh date(s)



VISUALS NEED INFO TO PROVIDE A COMPLETE STORY

Defining a Report

Essential Report Components ► Filters

Defining filters

- Allows users to filter on different data segments
- Provides report interactions to derive insights from data

Types of filters



Report slicers

- Objects that can filter in various ways based on data type



Defining a Report

Essential Report Components ► Filters

Defining filters

- Allows users to filter on different data segments
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Types of filters



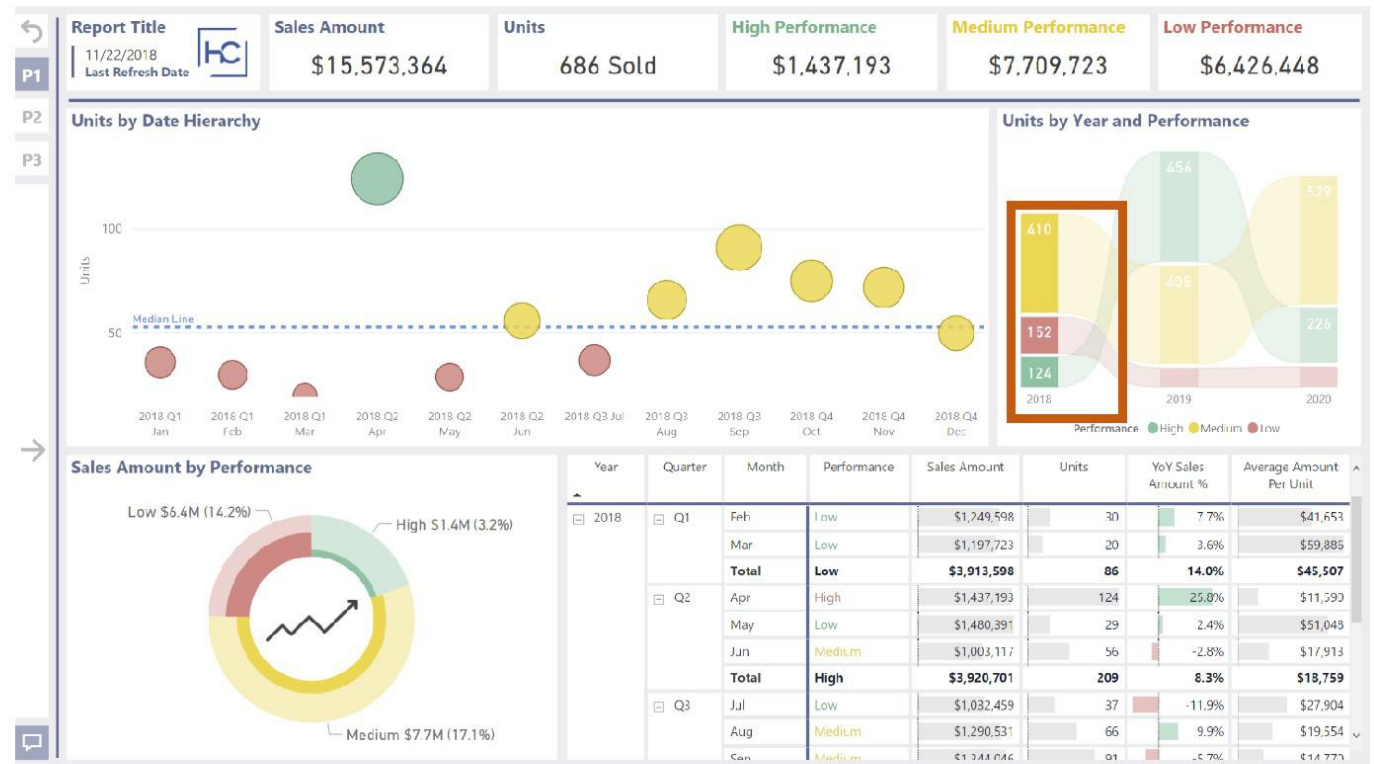
Report slicers

- Objects that can filter in various ways based on data type



Visual cross-filters

- Visual category selection that cross-filters other objects

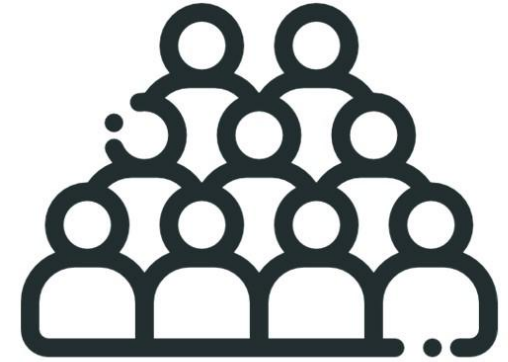


Defining a Report

Primary Report Types

Know your audience

- Audience determines the **type of report** to build, what to include, and what not to include
- There are different types of primary reports to build, and **levels of detail** to consider, depending on the audience



Types of reports



Operational

- Shows up-to-date metrics related to business process
- Notifies users when data deviates from acceptable standards



Strategic

- Shows key information to measure the health of the organization
- Helps identify areas for improvement or organizational changes



Analytical

- Provides data to identify patterns and trends across time or categories
- Contains larger datasets for discovery and analysis of the data

Less Detailed

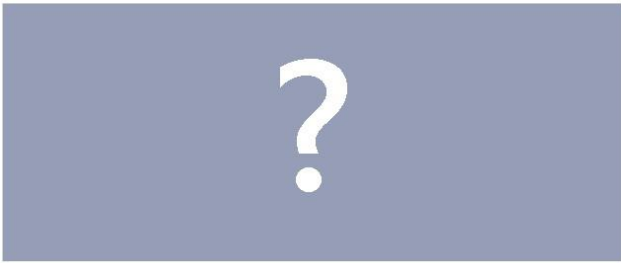
More Detailed



Three Primary Components of a Report



**Knowledge
Check**





Questions?



Design Principles

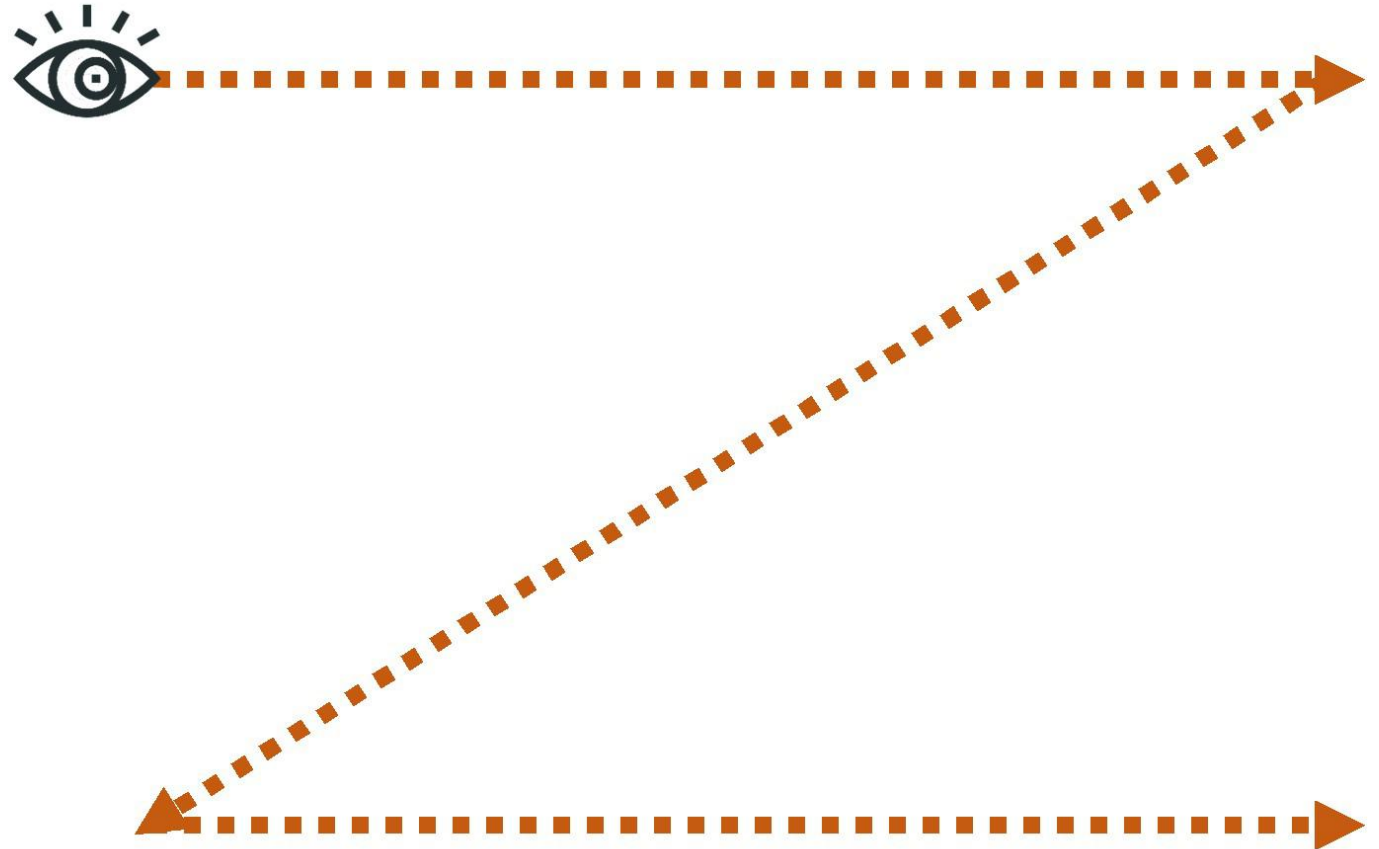
- Practices for designing more effective reports

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**.

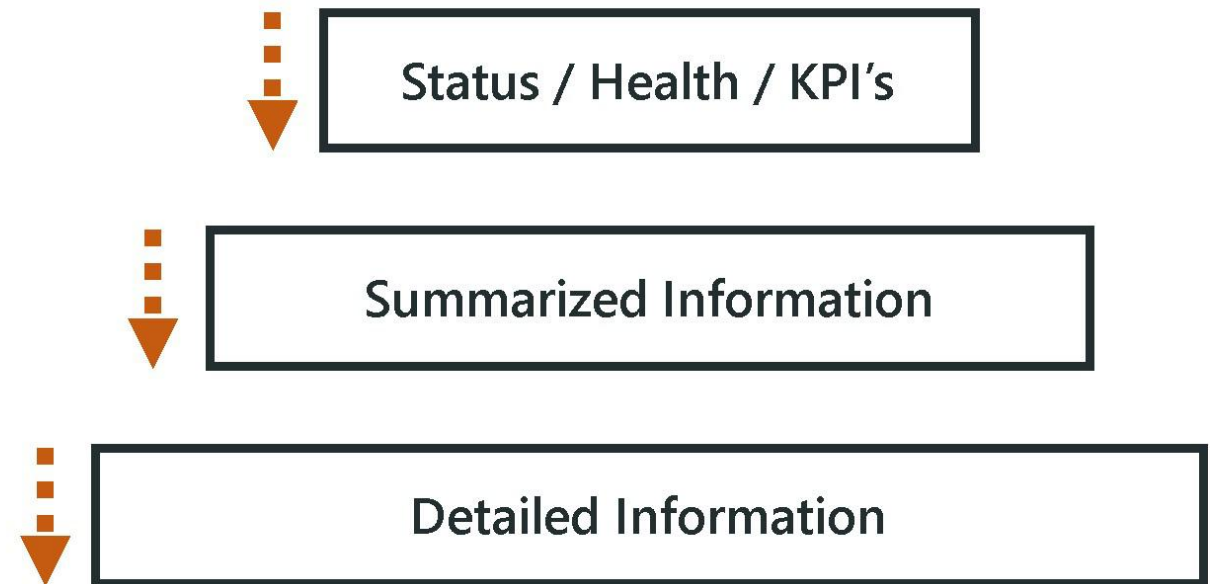


Design Principles

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**

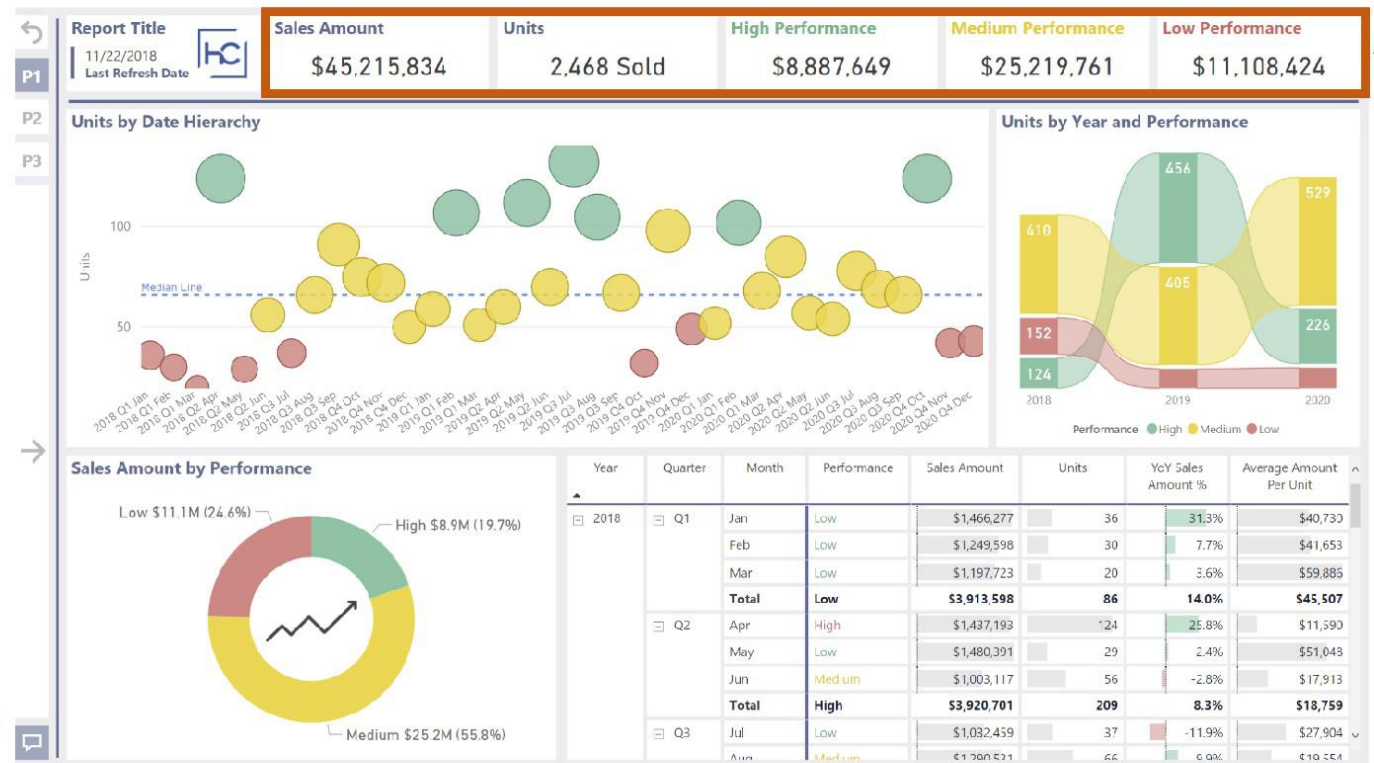


Design Principles

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

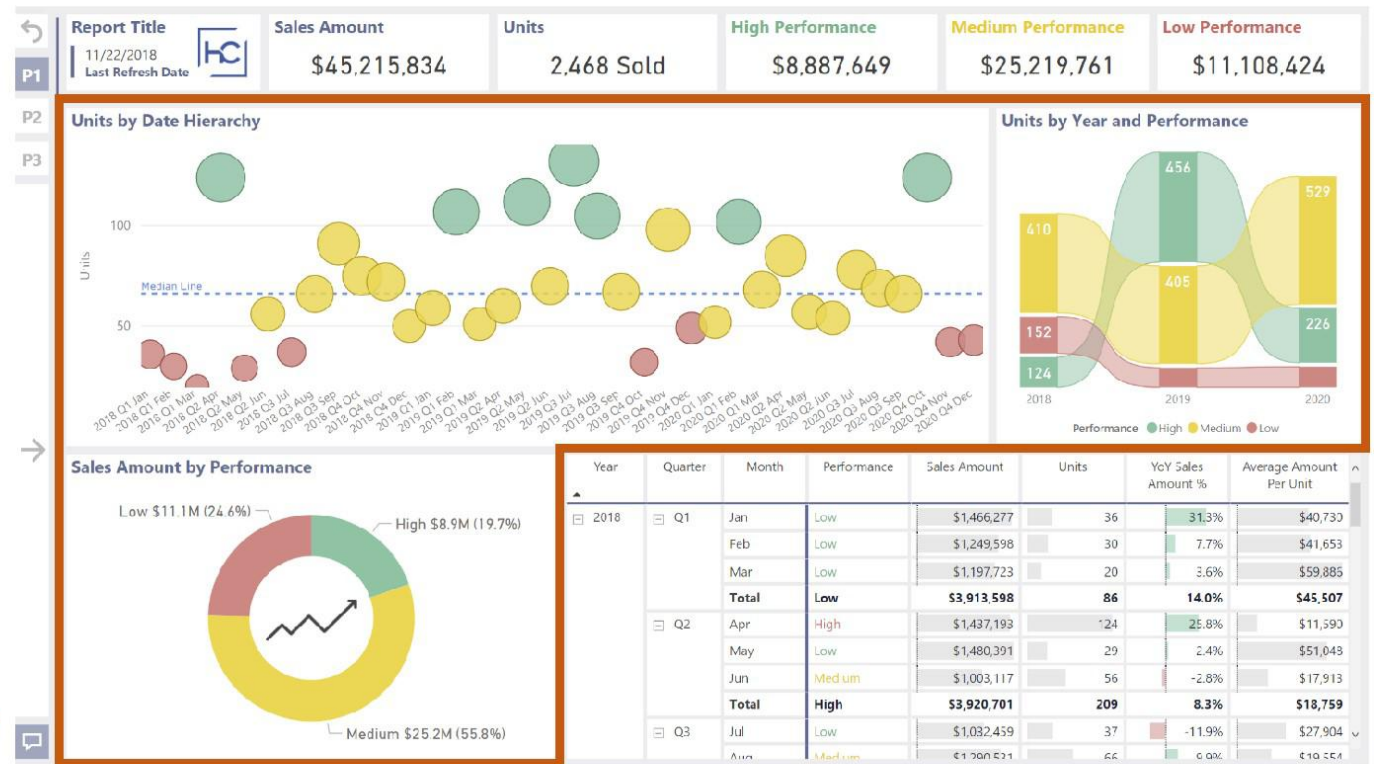


Design Principles

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

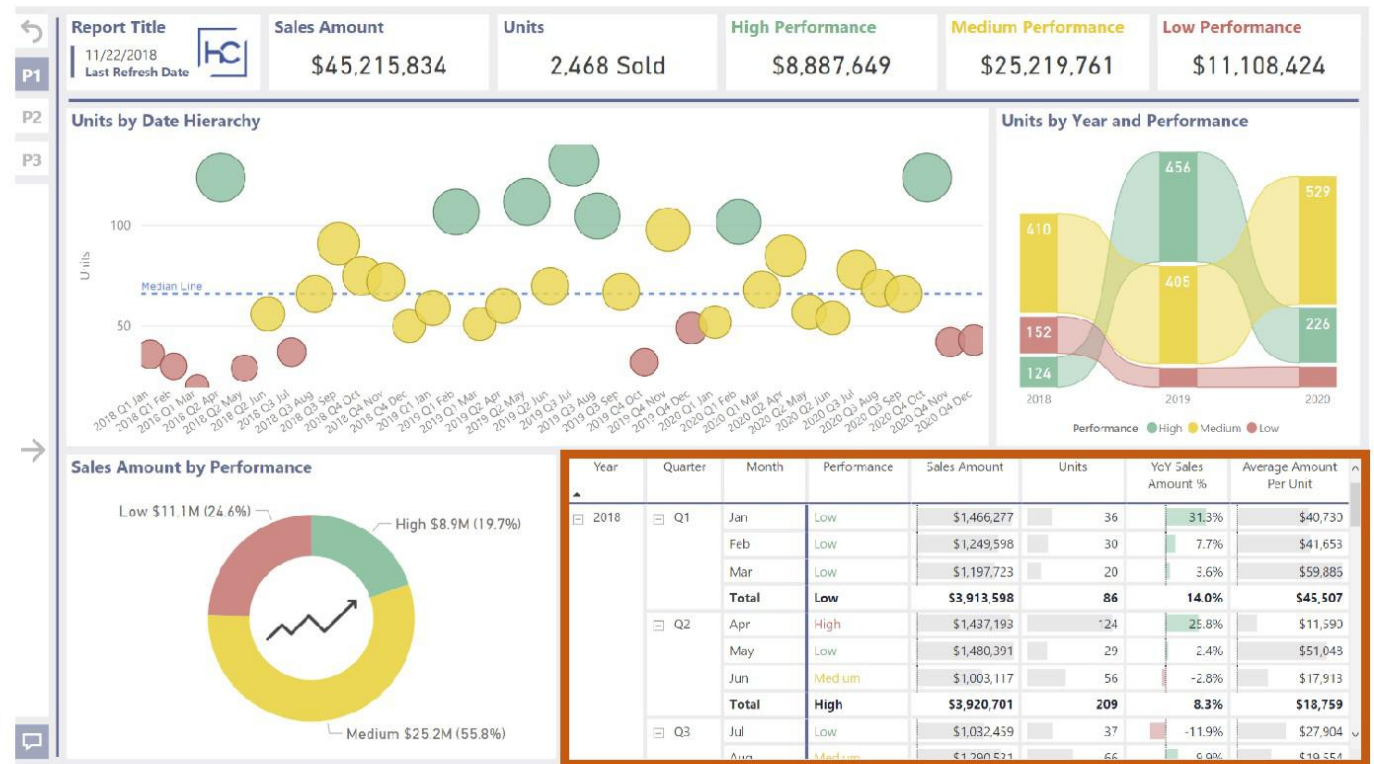


Design Principles

Information Processing ► Effective Report Organization

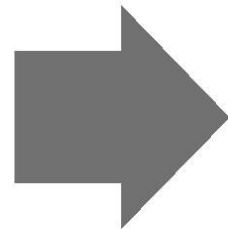
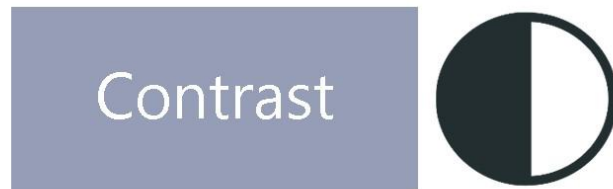
The data processing flow

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

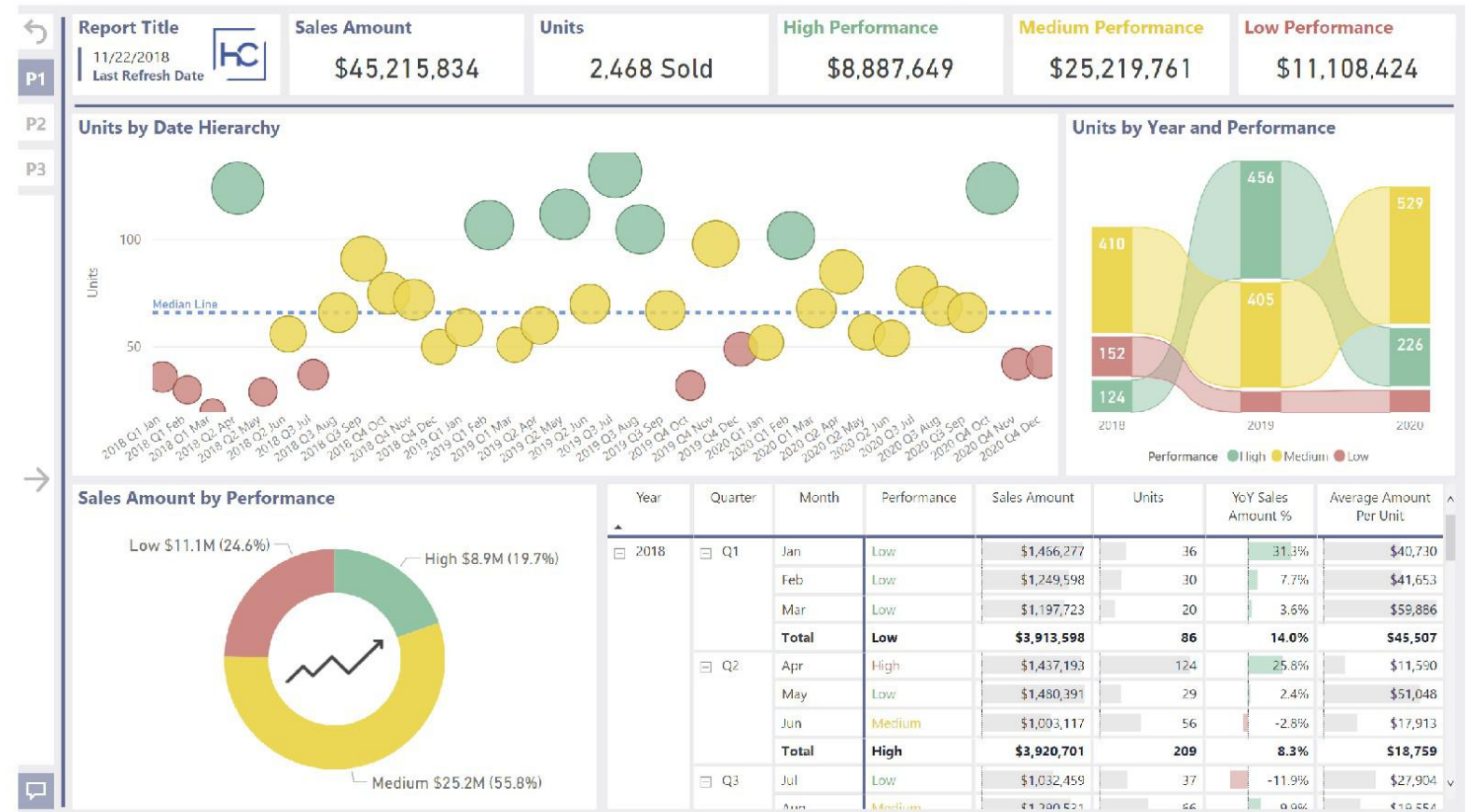


Design Principles

The S.C.R.A.P Methodology

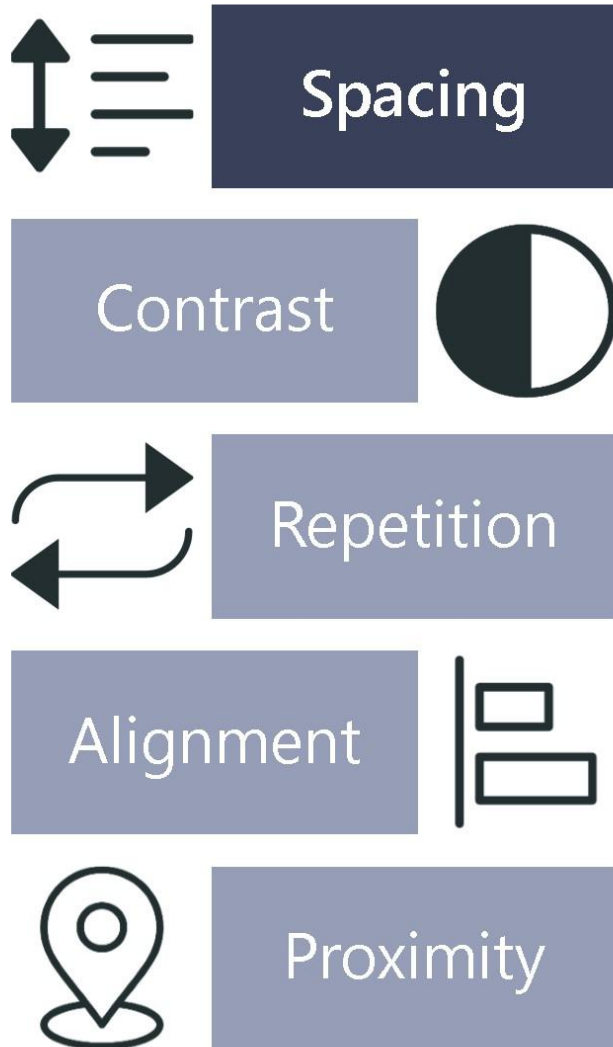


Report with applied methodologies



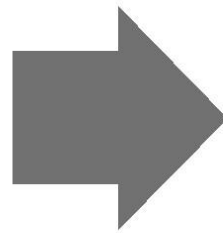
Design Principles

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

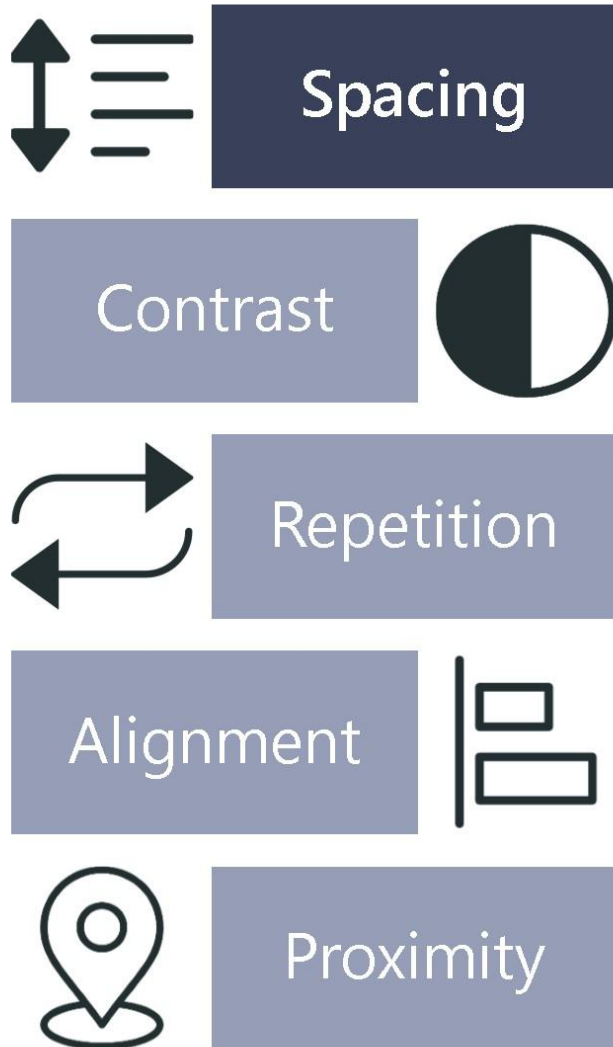


No Spacing



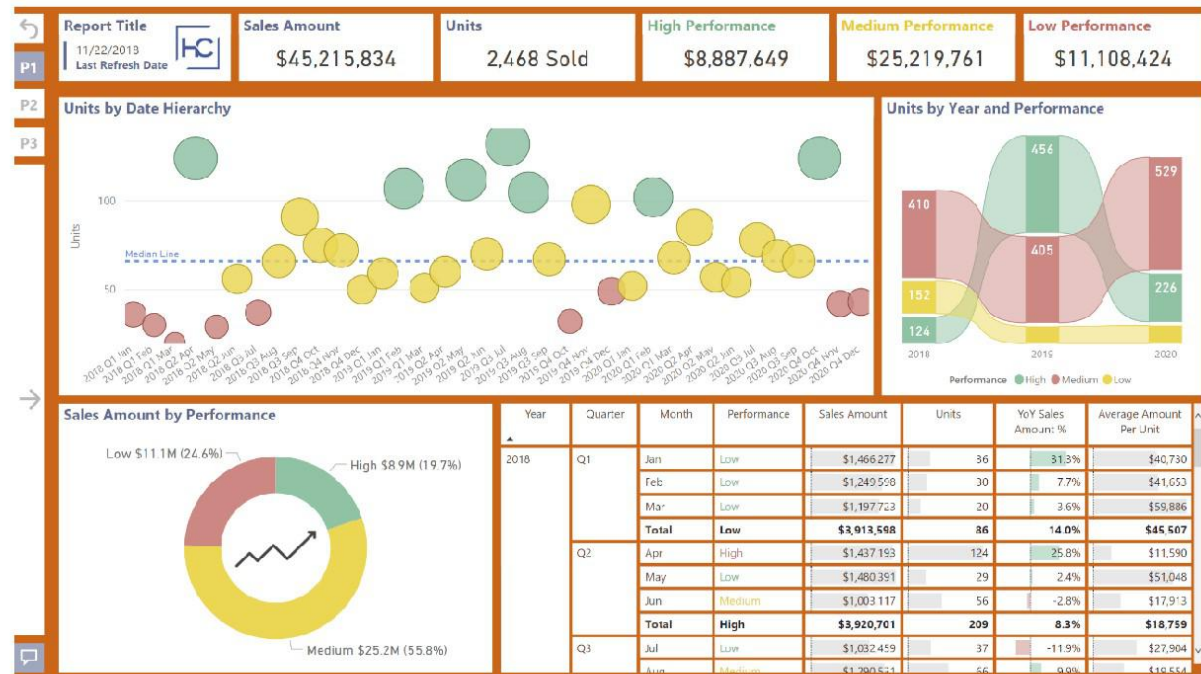
Design Principles

The S.C.R.A.P Methodology ▶ Spacing



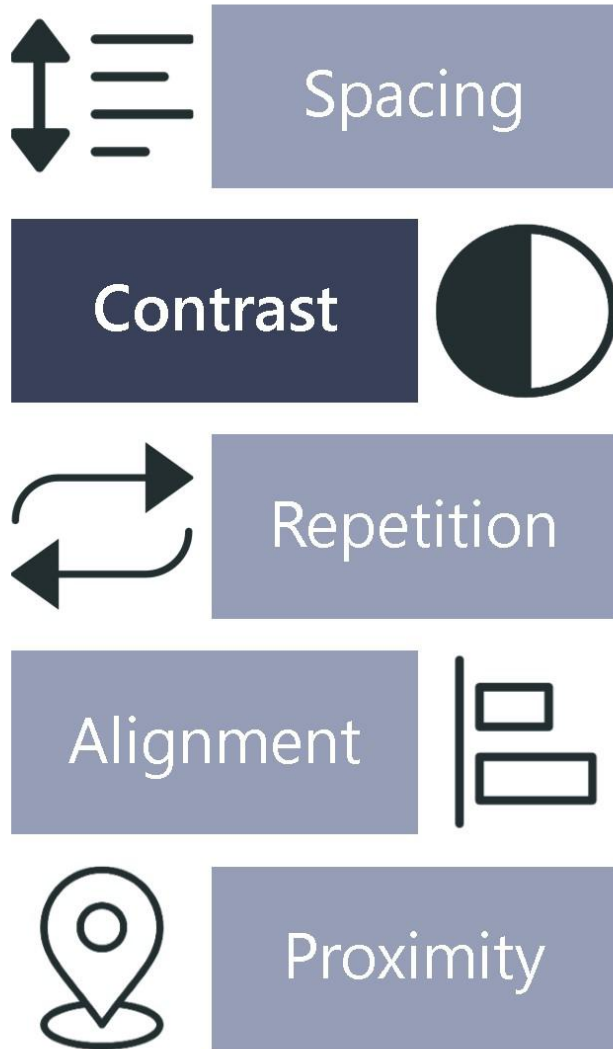
General concept

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



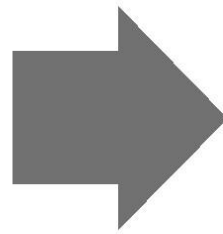
Design Principles

The S.C.R.A.P Methodology ▶ Contrast

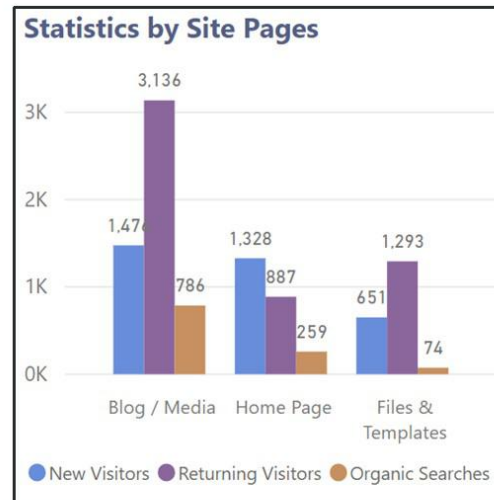


General concept

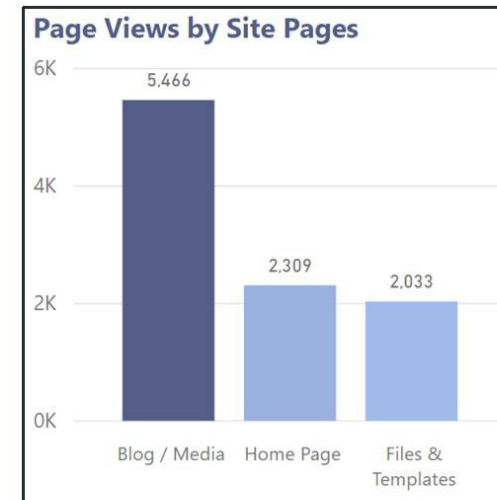
- Distinguishes elements to help **identify categories** or emphasize **key findings**



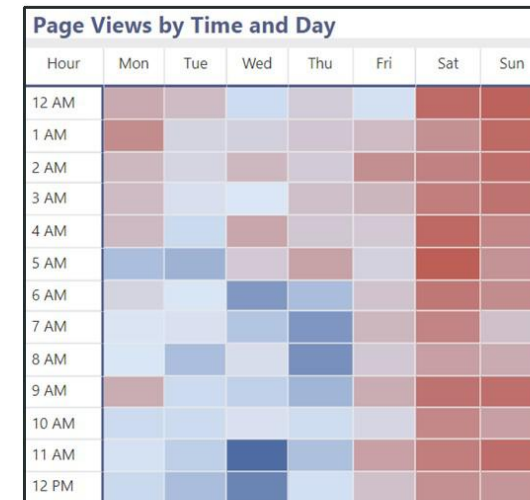
Categorical Colors



Sequential Colors



Diverging Colors



Design Principles

The S.C.R.A.P Methodology ▶ Contrast



Spacing



Contrast



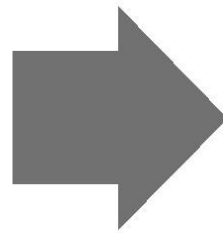
Repetition



Alignment

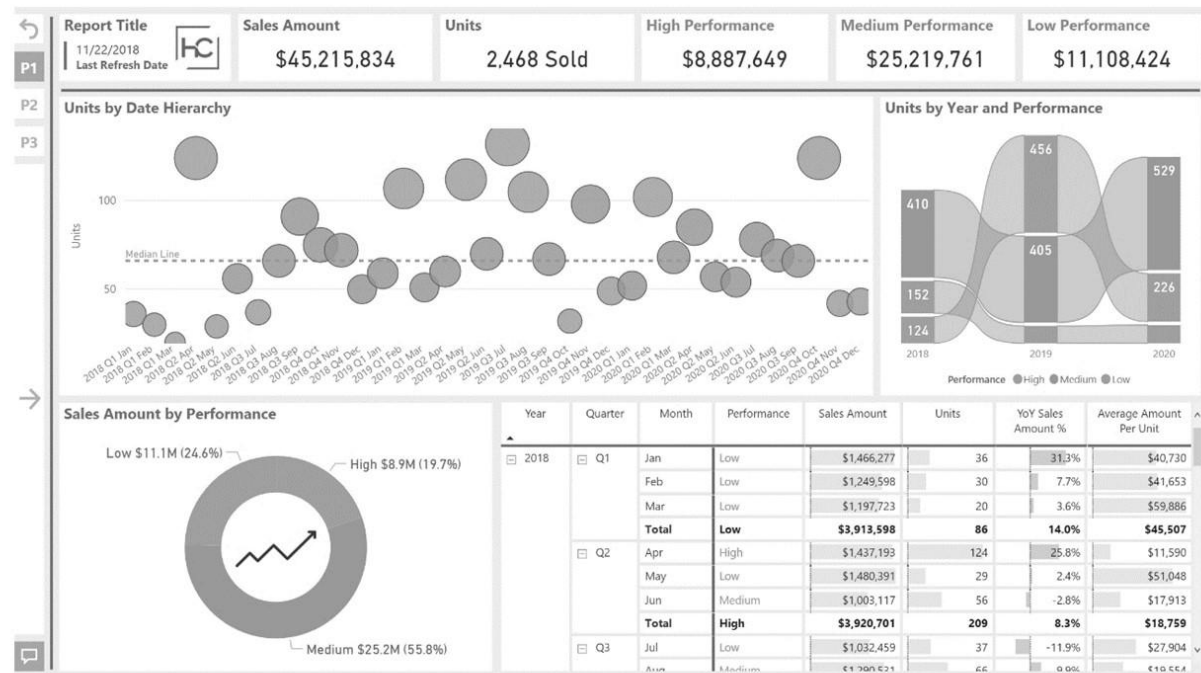


Proximity



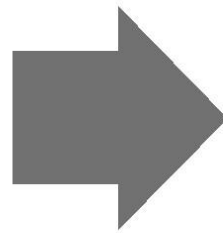
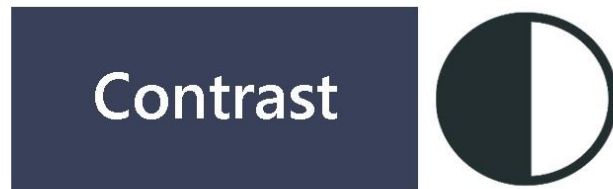
General concept

- 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



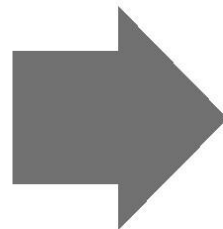
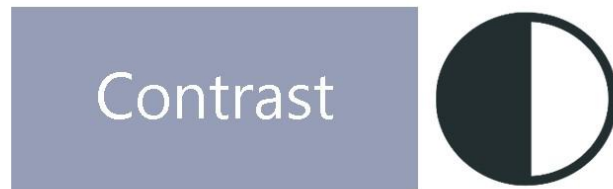
General concept

- 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

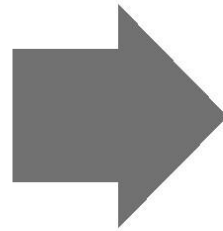
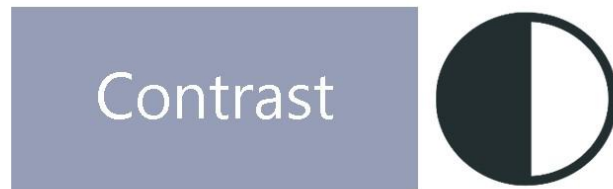


No Repetition



Design Principles

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



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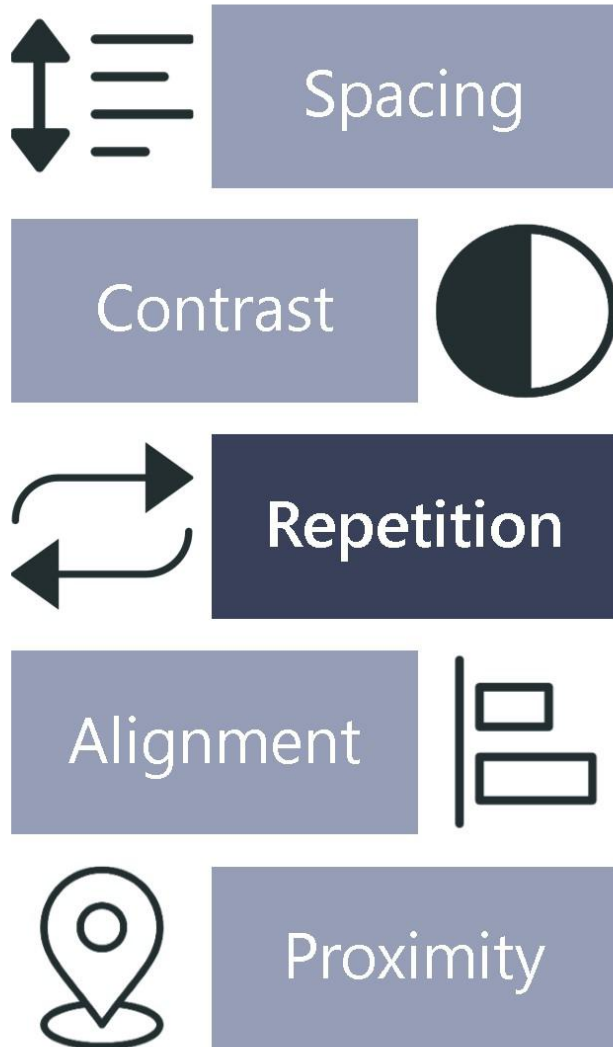
No Repetition



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
Total	13,405	11,320	2,708.0	5,240	7,029

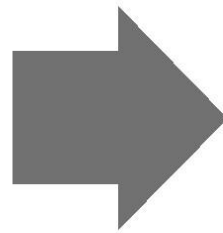
Design Principles

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

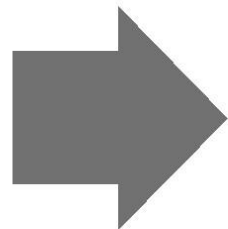
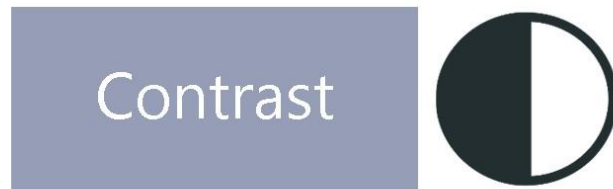
Year All	State All
Quarter All	City All

No Repetition

Year All	State All
Quarter All	City All

Design Principles

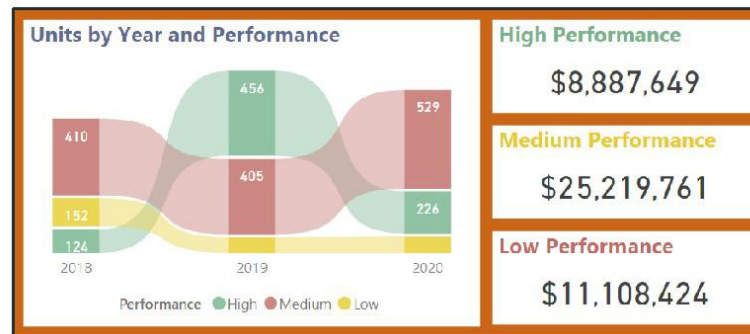
The S.C.R.A.P Methodology ▶ Alignment



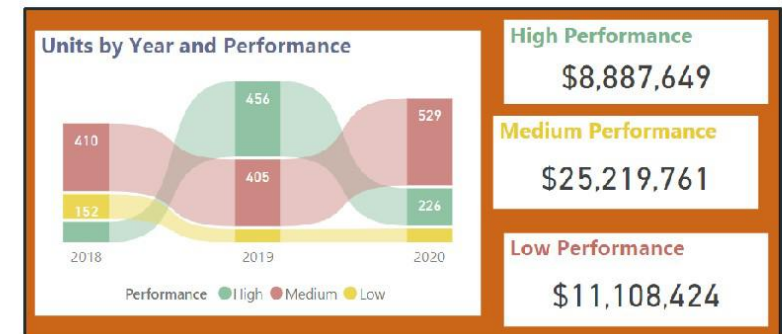
General concept

- **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

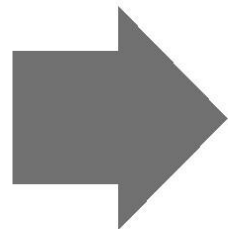
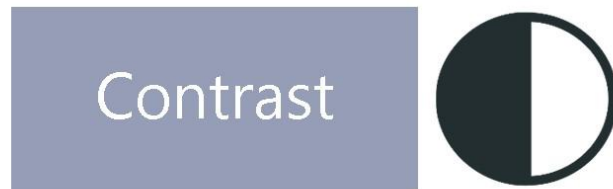


No Alignment



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 	Total Visitors 12,585 	Organic Searches 2,712 
----------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------



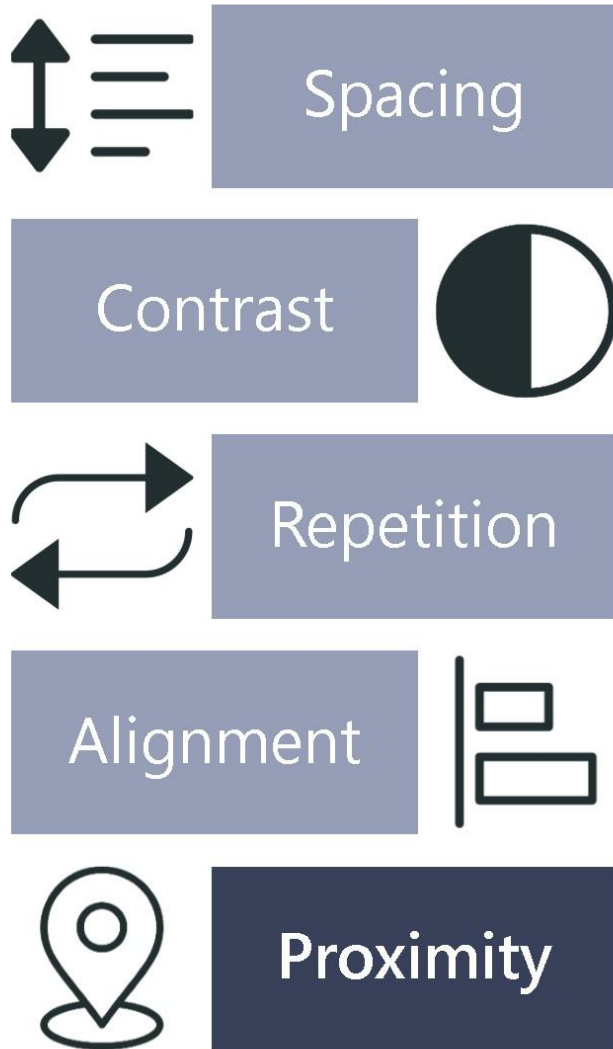
No Proximity

New Site Visitors 5,268 	Returning Visitors 7,317 	Organic Searches 2,712 	Total Visitors 12,585 
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Design Principles

The S.C.R.A.P Methodology ▶ Proximity



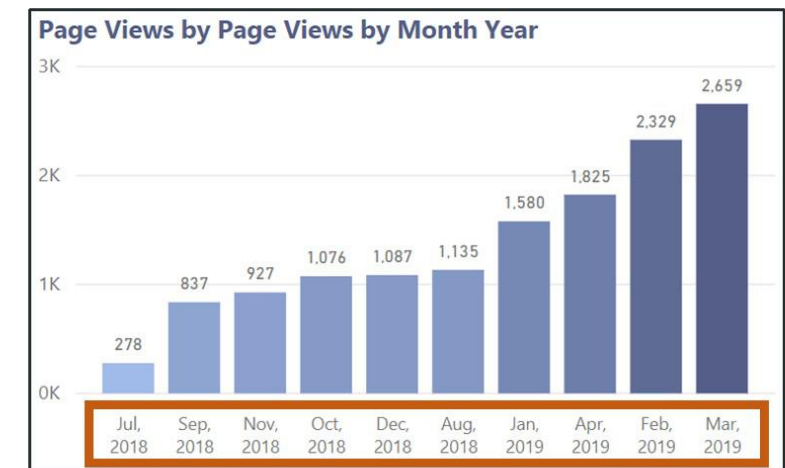
General concept

- **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

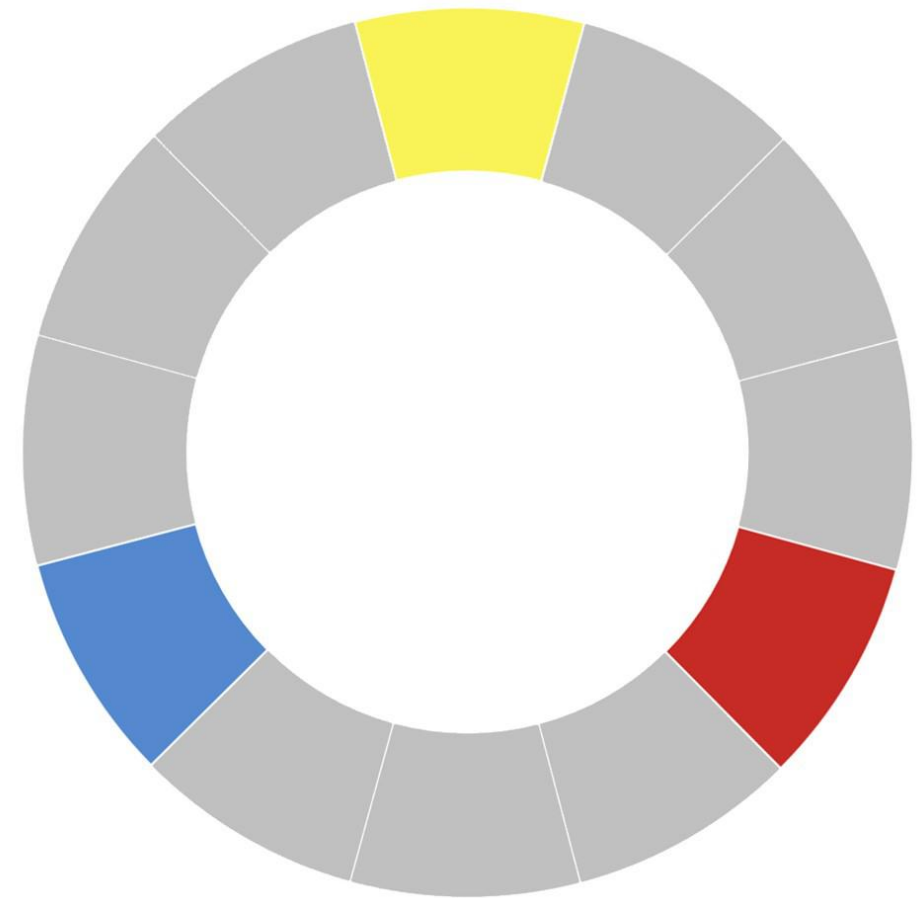
Color wheel definition

- 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

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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

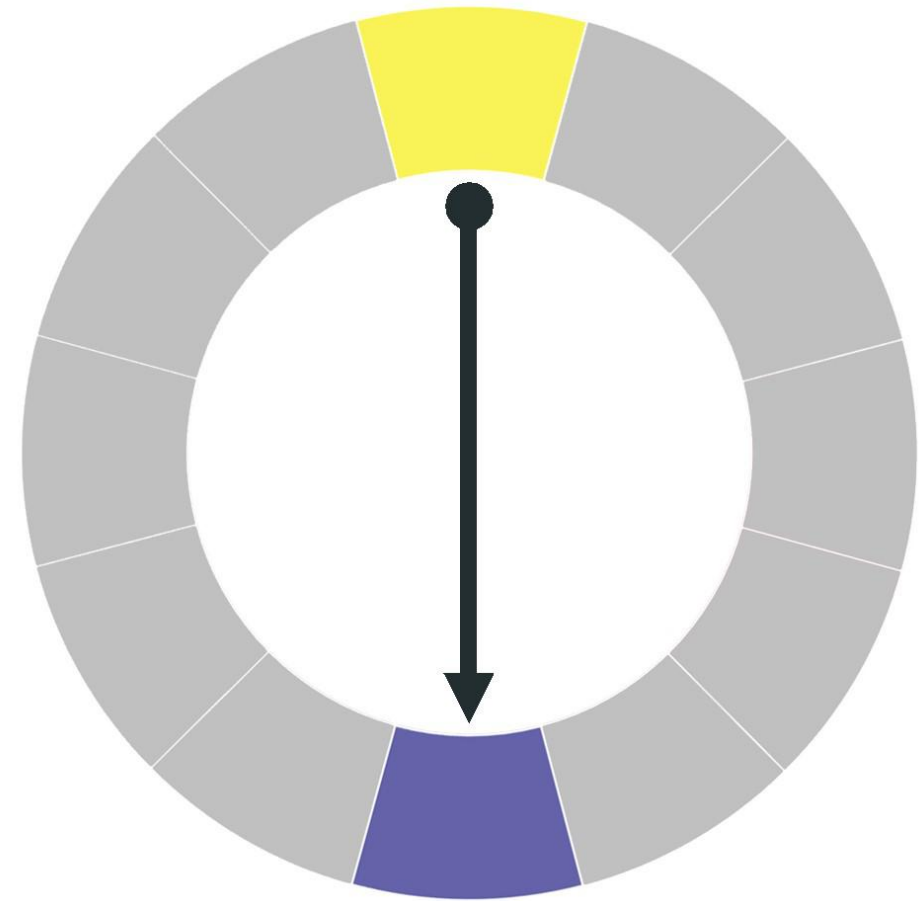
Color harmony definition

- 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

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Design Principles

Color Theory ► Color Harmony

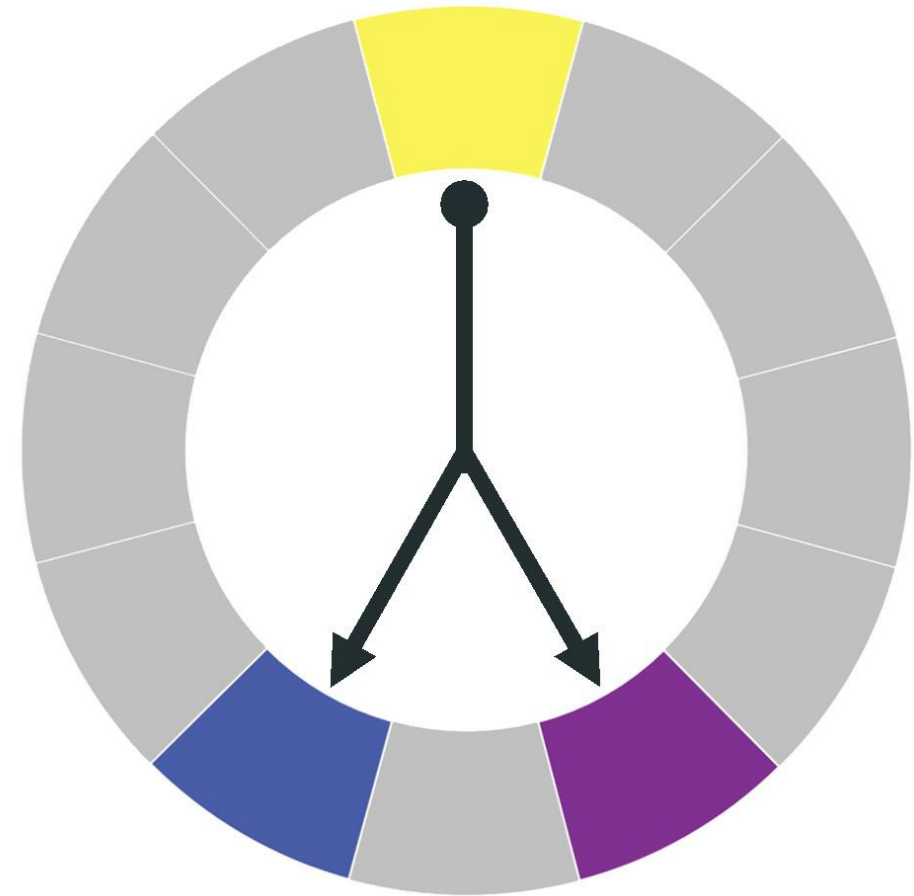
Color harmony definition

- 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

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The color wheel



Design Principles

Color Theory ► Color Harmony

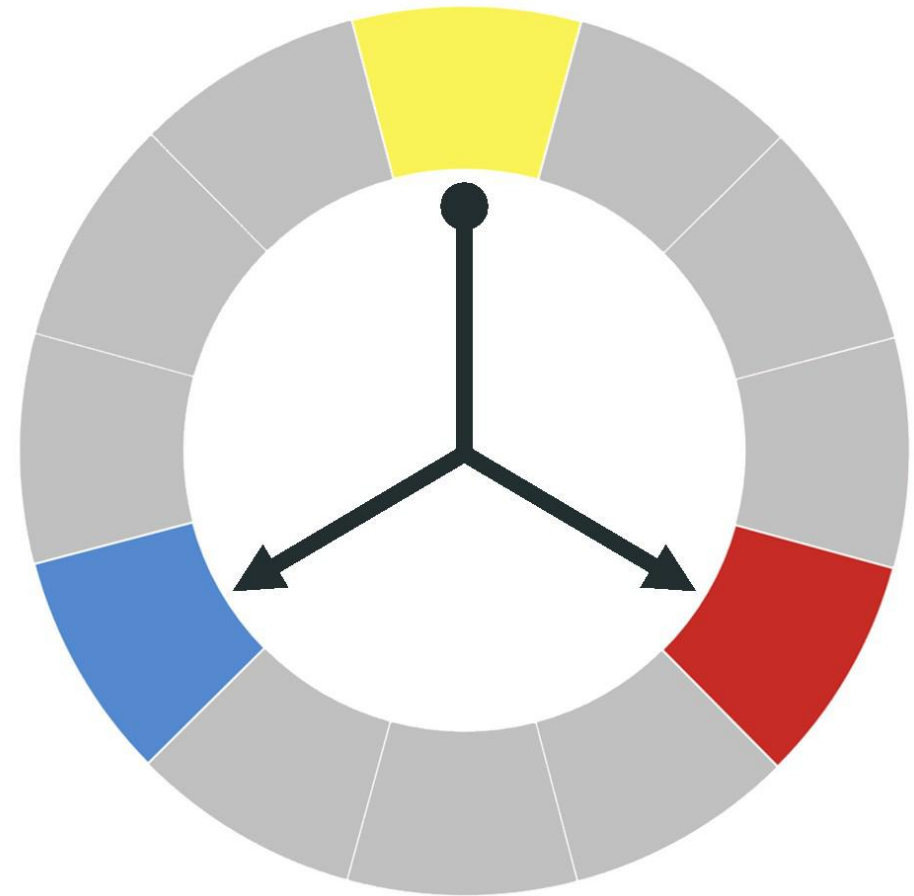
Color harmony definition

- 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

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Design Principles

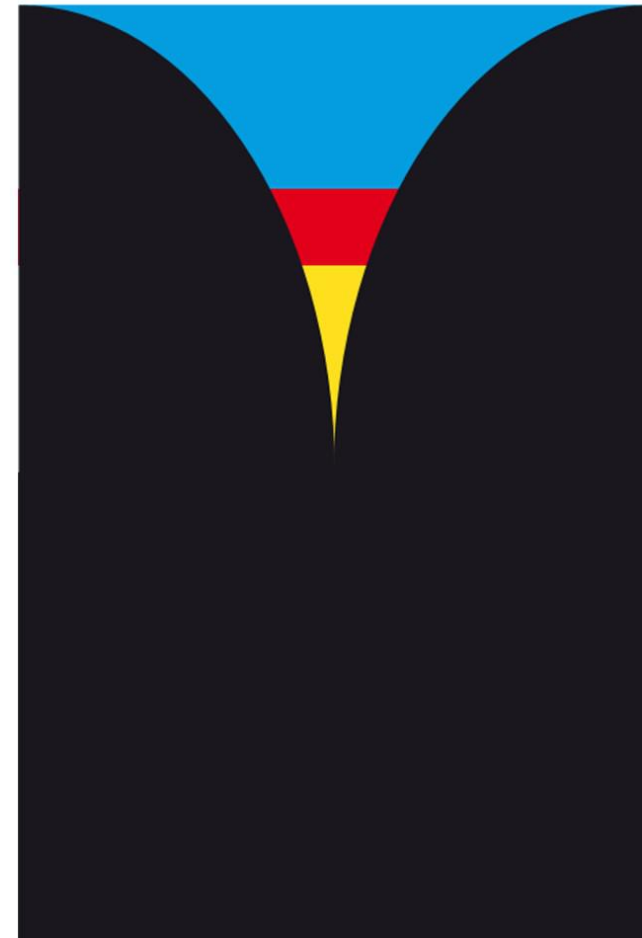
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Design Principles

Color Theory ► Color Harmony

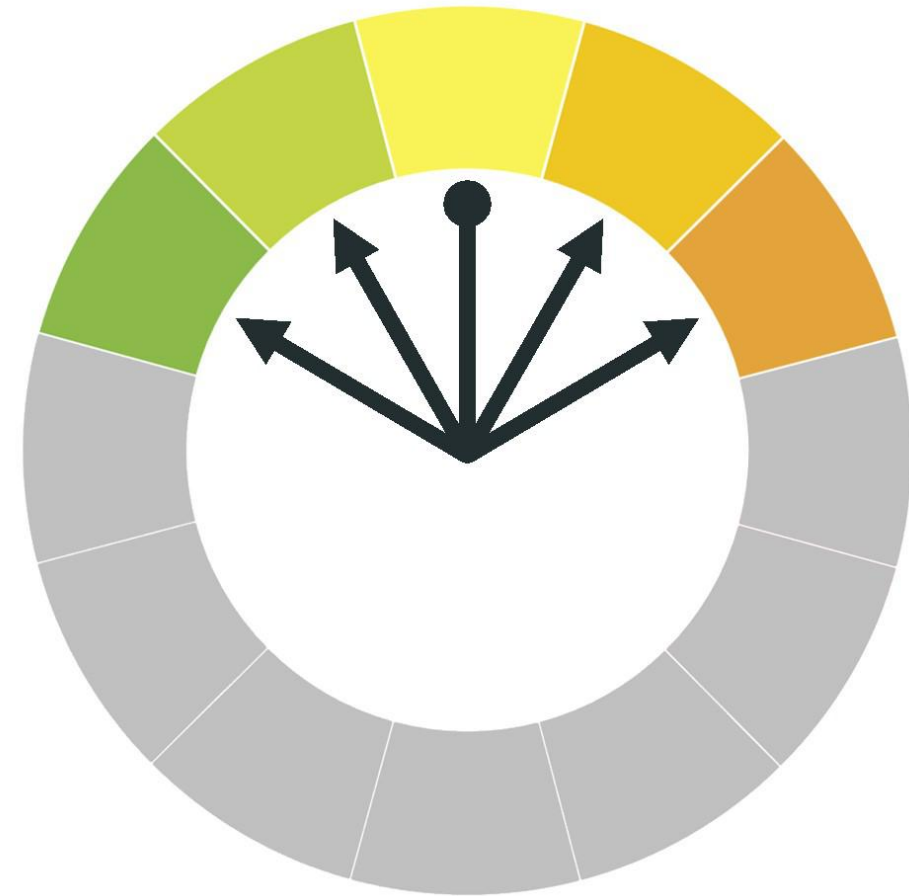
Color harmony definition

- 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

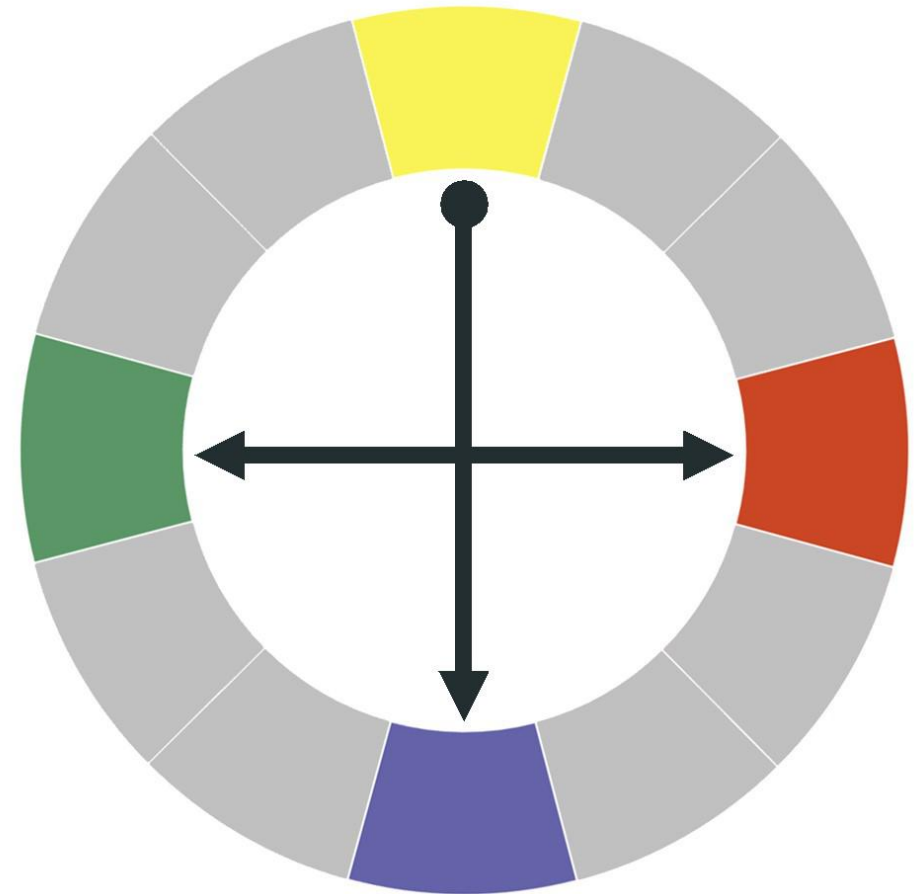
Color harmony definition

- 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

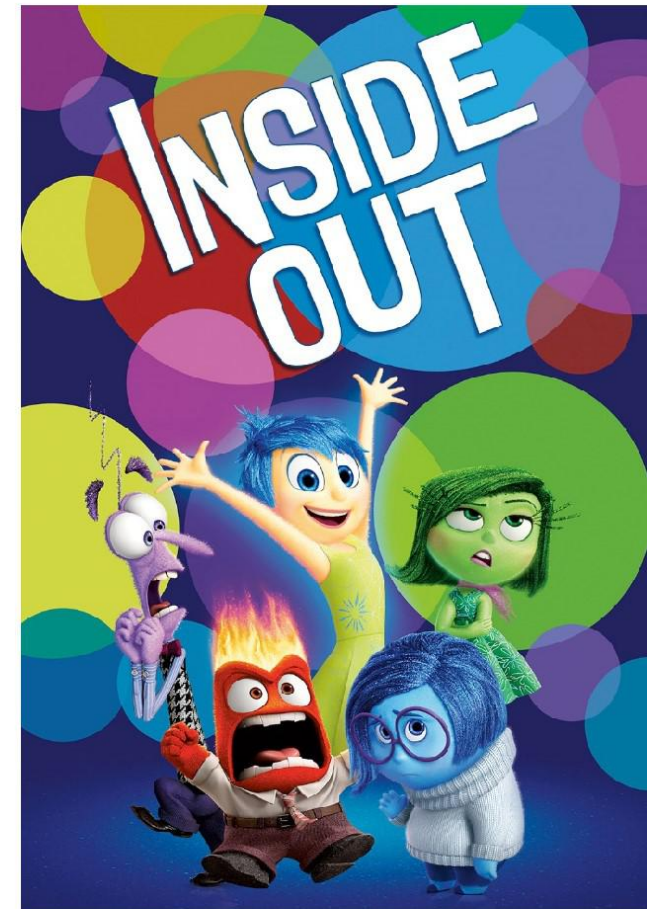
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The color wheel



Design Principles

How do we **process** information?

Left to Right

Top to Bottom



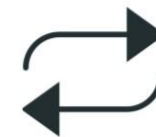
Knowledge Check

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



Spacing

Contrast



Repetition

Alignment



Proximity

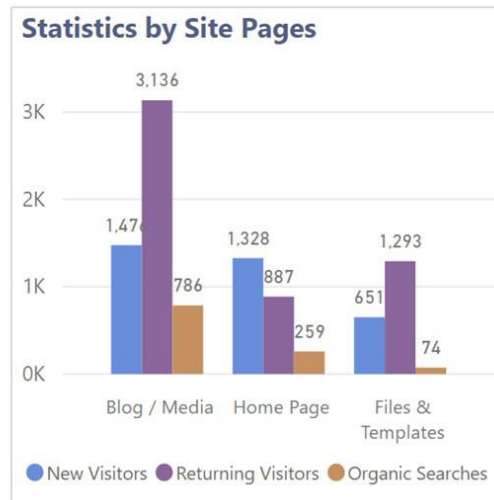
S.C.R.A.P Methodology

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

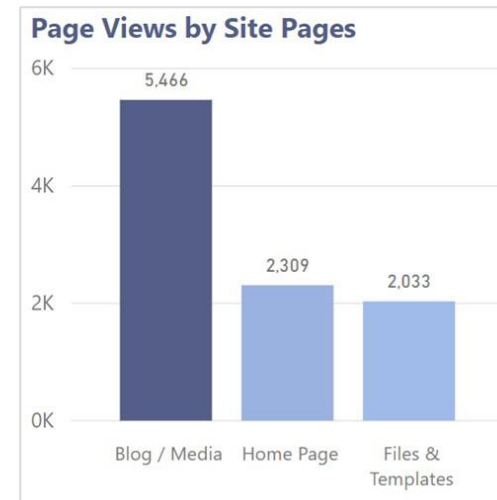


Knowledge Check

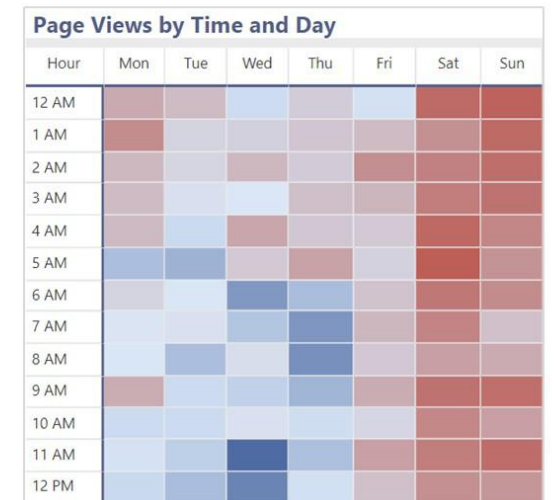
Categorical



Sequential



Diverging



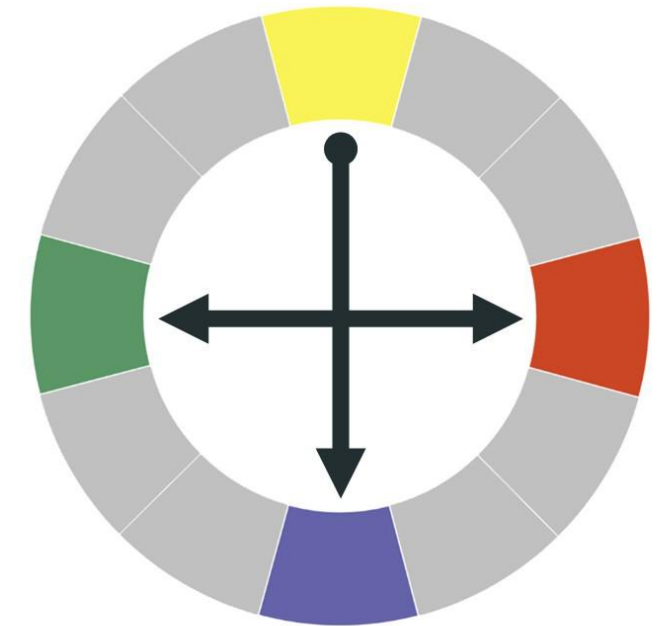
Design Principles

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



Knowledge Check

Tetratic





Questions?



Data Visualization

- Methodologies for creating impactful visualizations

Design Principles

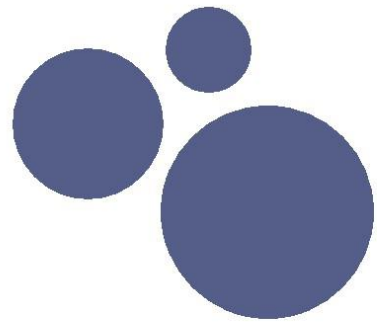
Visual Cues

General methodology

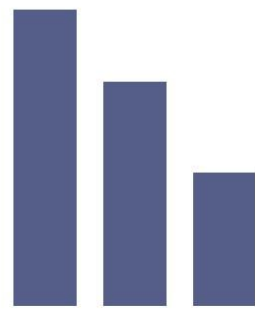
- Visualizations **translate** variances in data by utilizing different visual cues
- Each visual cue is **interpreted** differently by the human brain



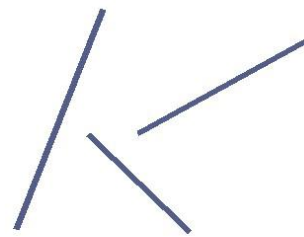
Types of visual cues



Area



Length



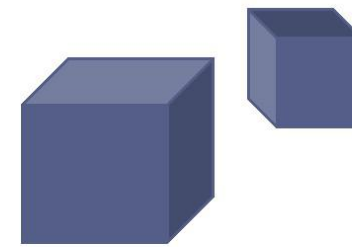
Slope



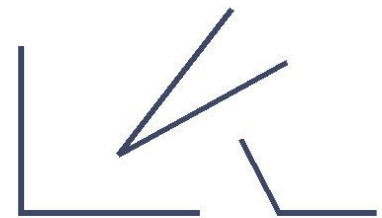
Color
Hue



Color
Intensity



Volume



Angle

VISUAL CUES ARE NOT CREATED EQUAL

Design Principles

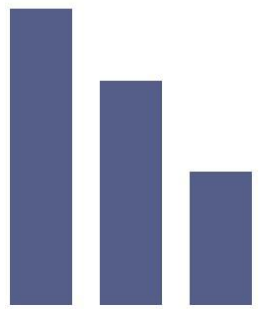
Visual Cues ▶ Ranked

General methodology

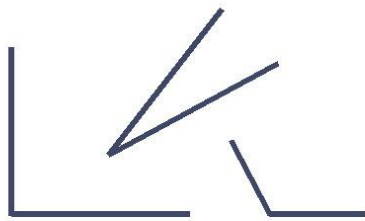
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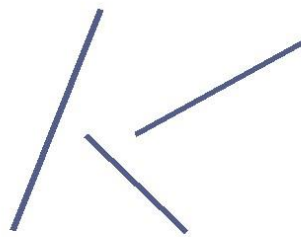
Visual cues ranked by accuracy



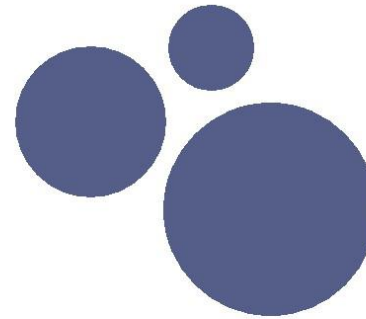
Length



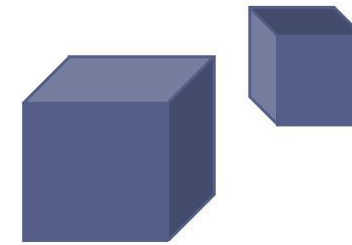
Angle



Slope



Area



Volume



Color Intensity



Color Hue

More Accurate

Less Accurate



Design Principles

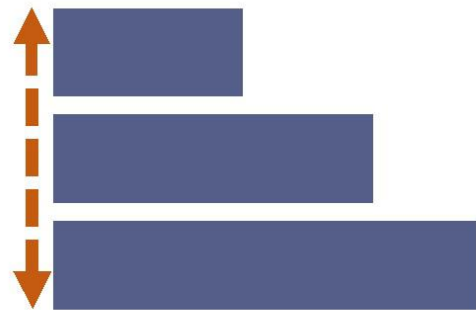
Visual Cues ► Accuracy Influencers

What influences accuracy?

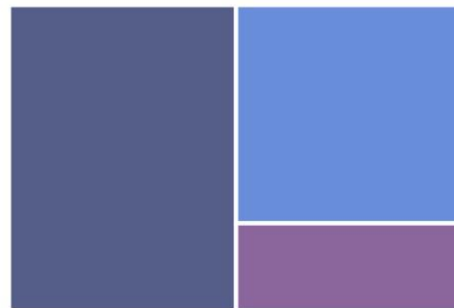


Alignment

- 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)

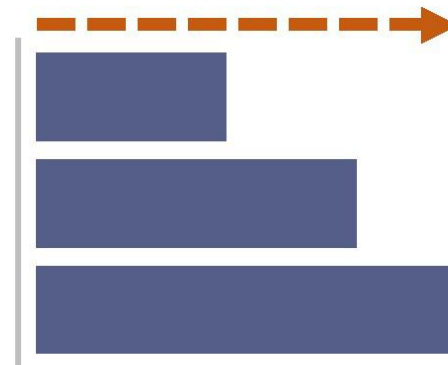


Tree Map

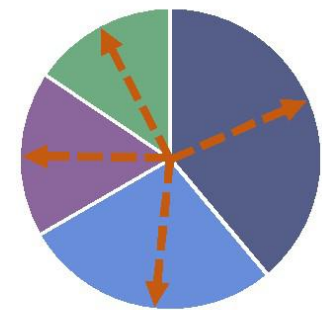


Direction

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



Bar
Chart



Pie
Chart

Design Principles

Visual Categories



THE VISUALS REFERENCE

— FOR MICROSOFT POWER BI —

SEP. 2018
<http://sql.bi/visual-reference>

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
Acerys 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 Su...	DataText Box
ChartAccent BarChart	ChartAccent LineChart	Strippets 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



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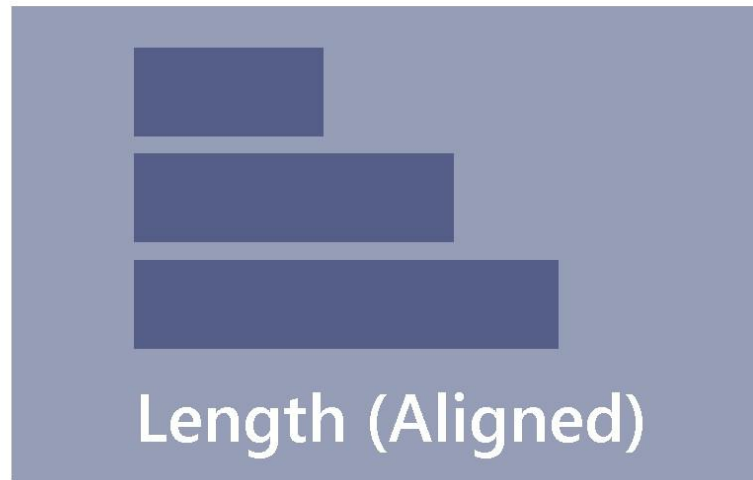
Certified visual

R required

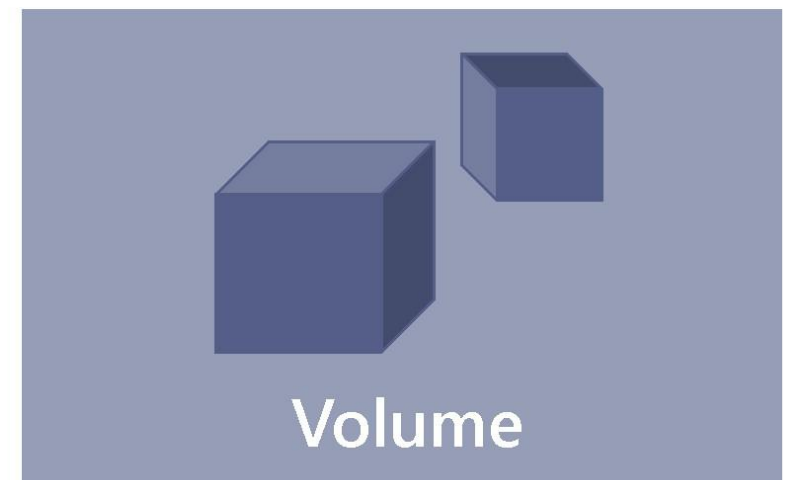


Visual Cues

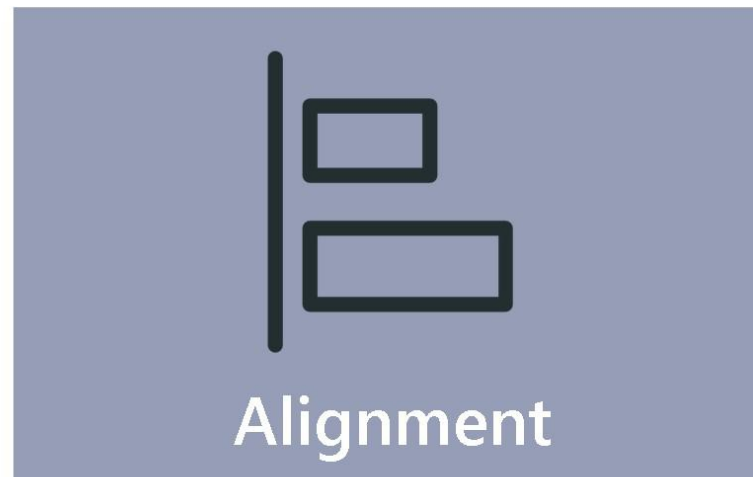
Easiest visual cue to process?



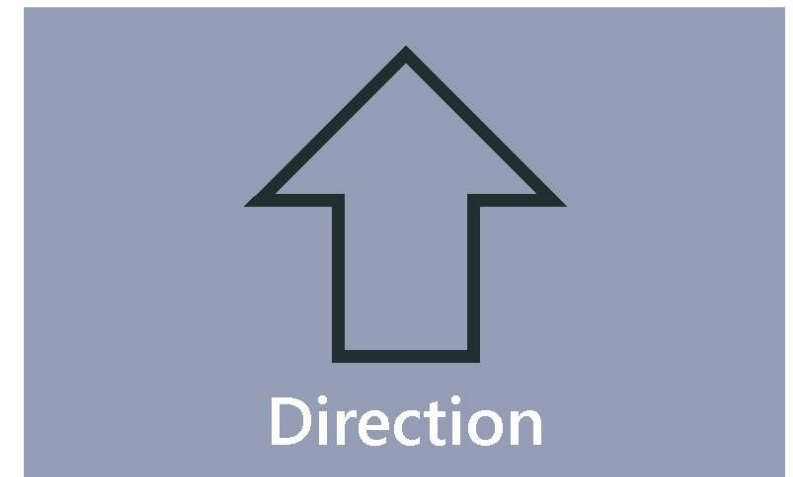
Hardest visual cue to process?



What influences **accuracy**?



What influences **accuracy**?



Knowledge Check



Questions?



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
 - *Enabling Gridlines* in Power BI Desktop will help create consistent borders between visuals
- 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>

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>



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