Microsoft® MVP Most Valuable Professional

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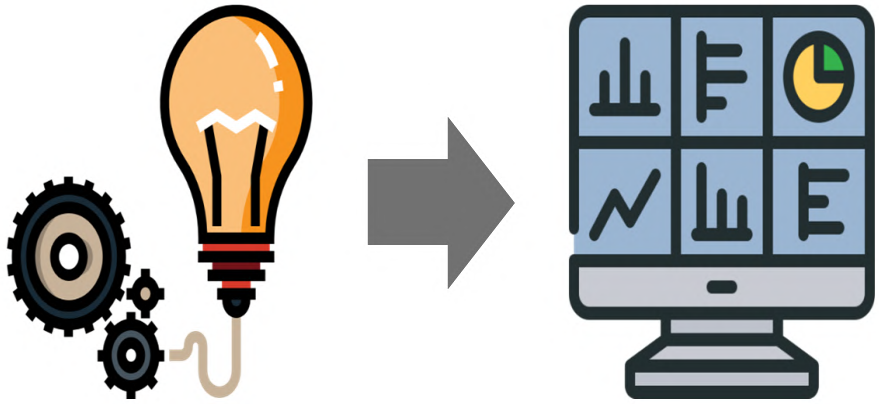

Demystifying **Chart Types** and **Design Principles** in Power BI

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

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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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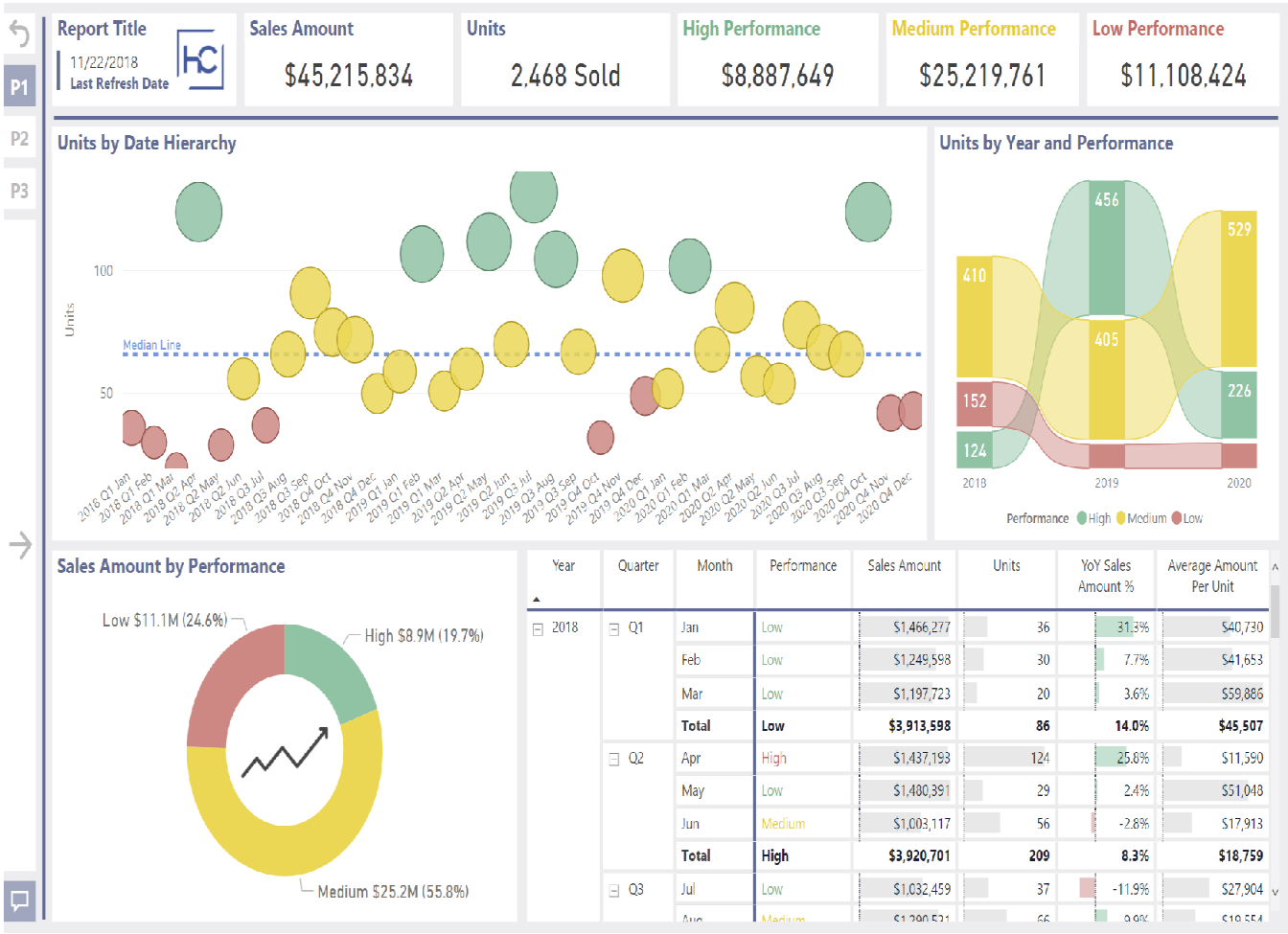
Power BI Real-Time Demo Survey

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

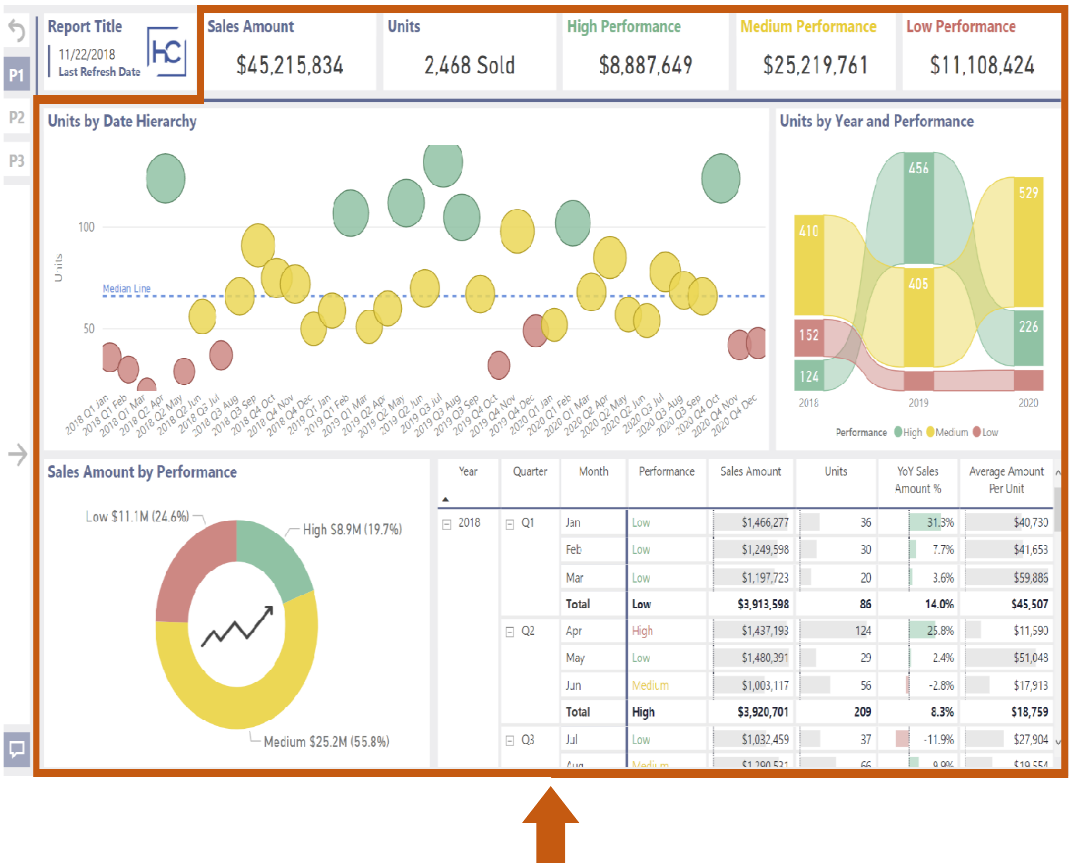


Defining a Report

Essential Report Components

Three primary components of a report

- Visualizations
  - Displays patterns, trends, or outliers in the data



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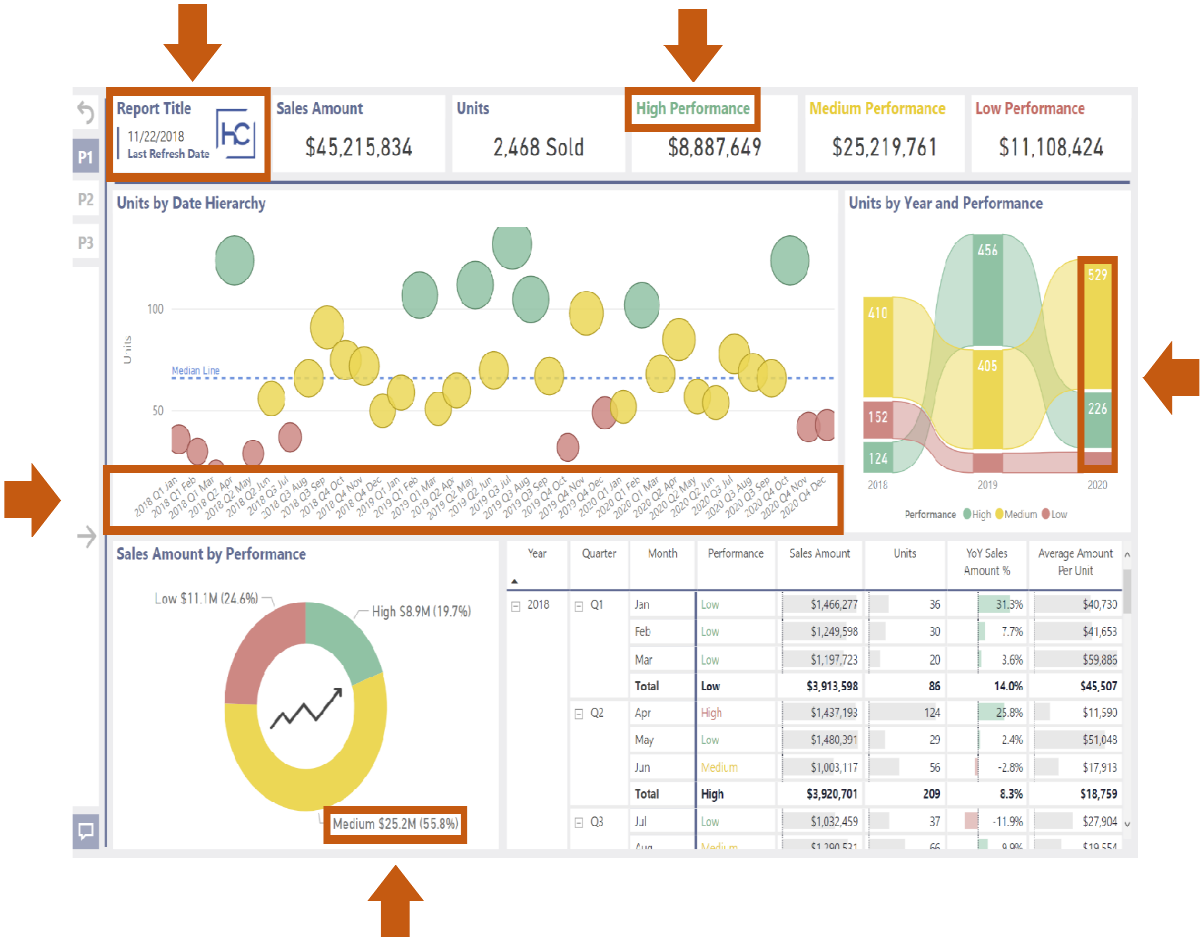
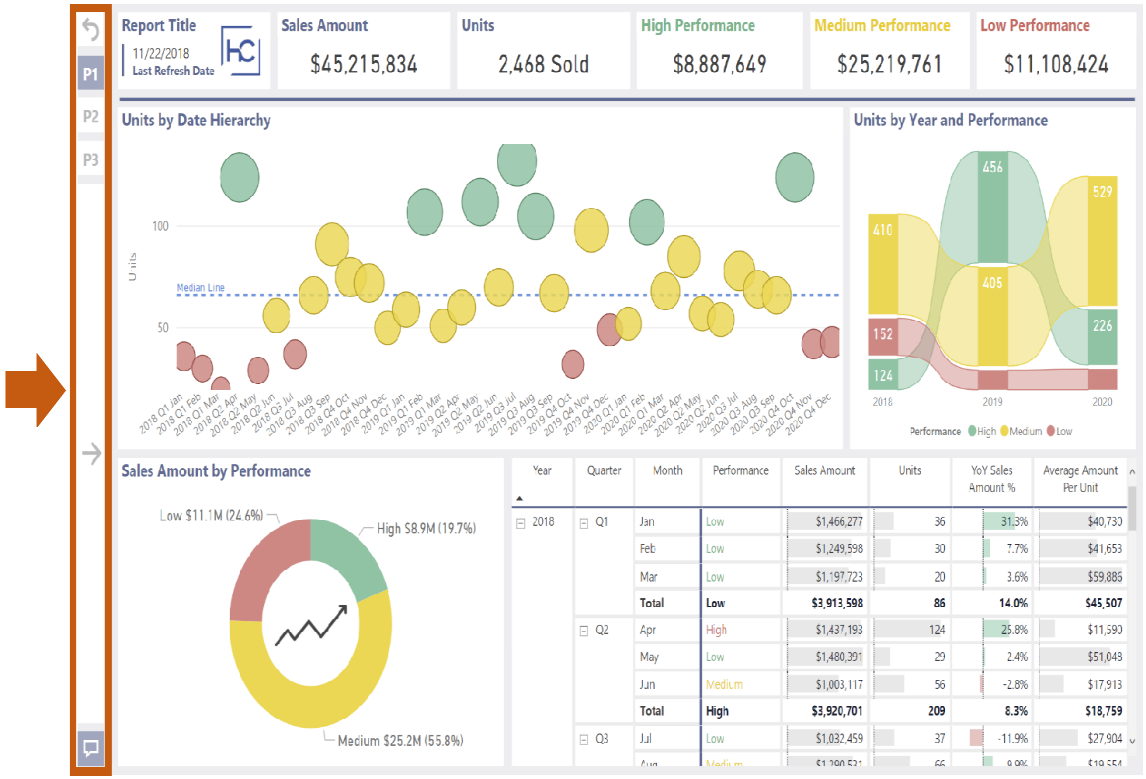


Defining a Report

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

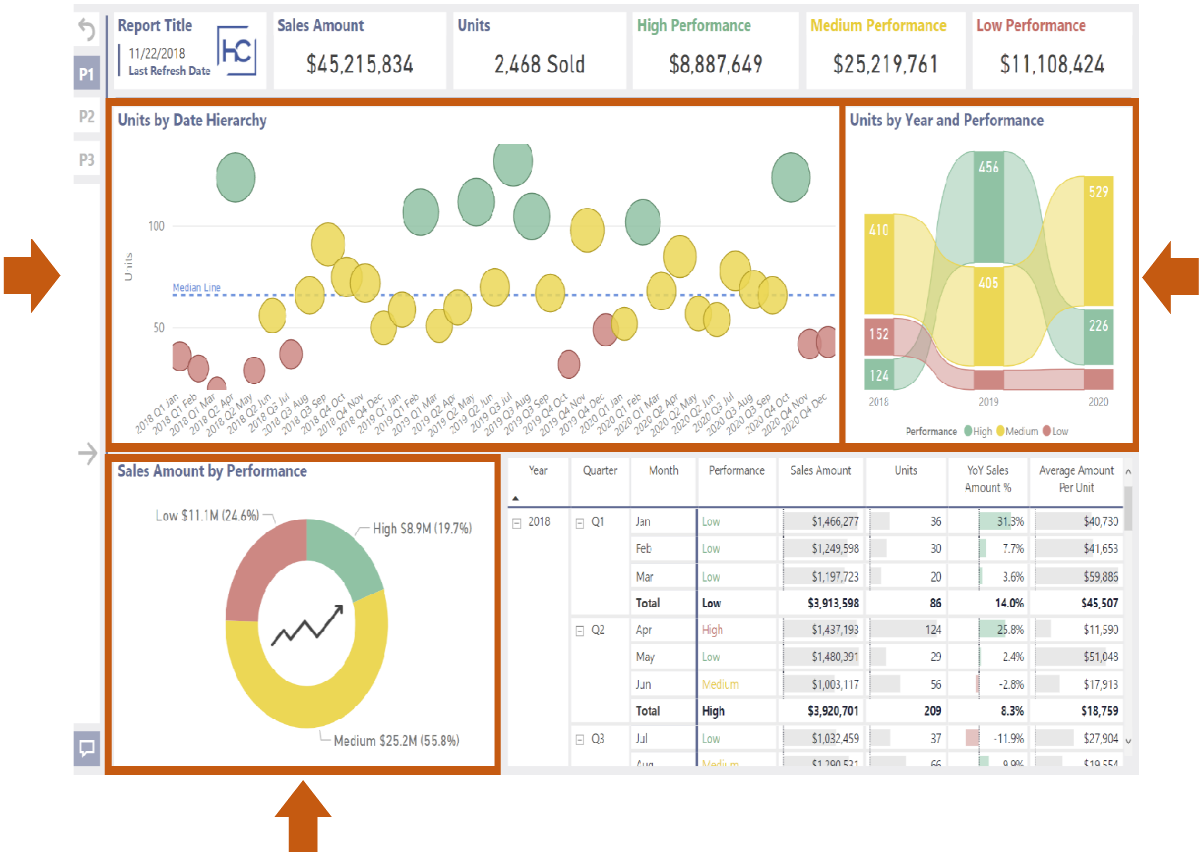
Essential Report Components ► Visualizations

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

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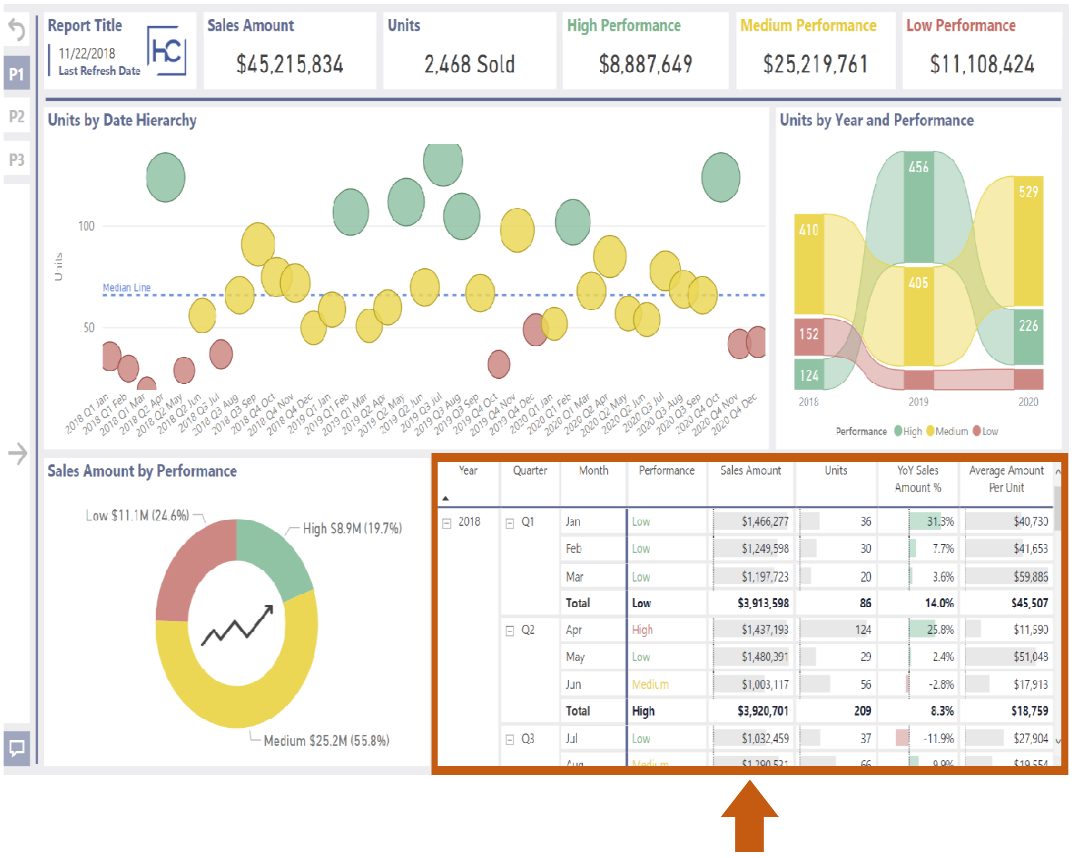
Tables

- Data displayed on columns and rows



Defining a Report

Essential Report Components ► Visualizations

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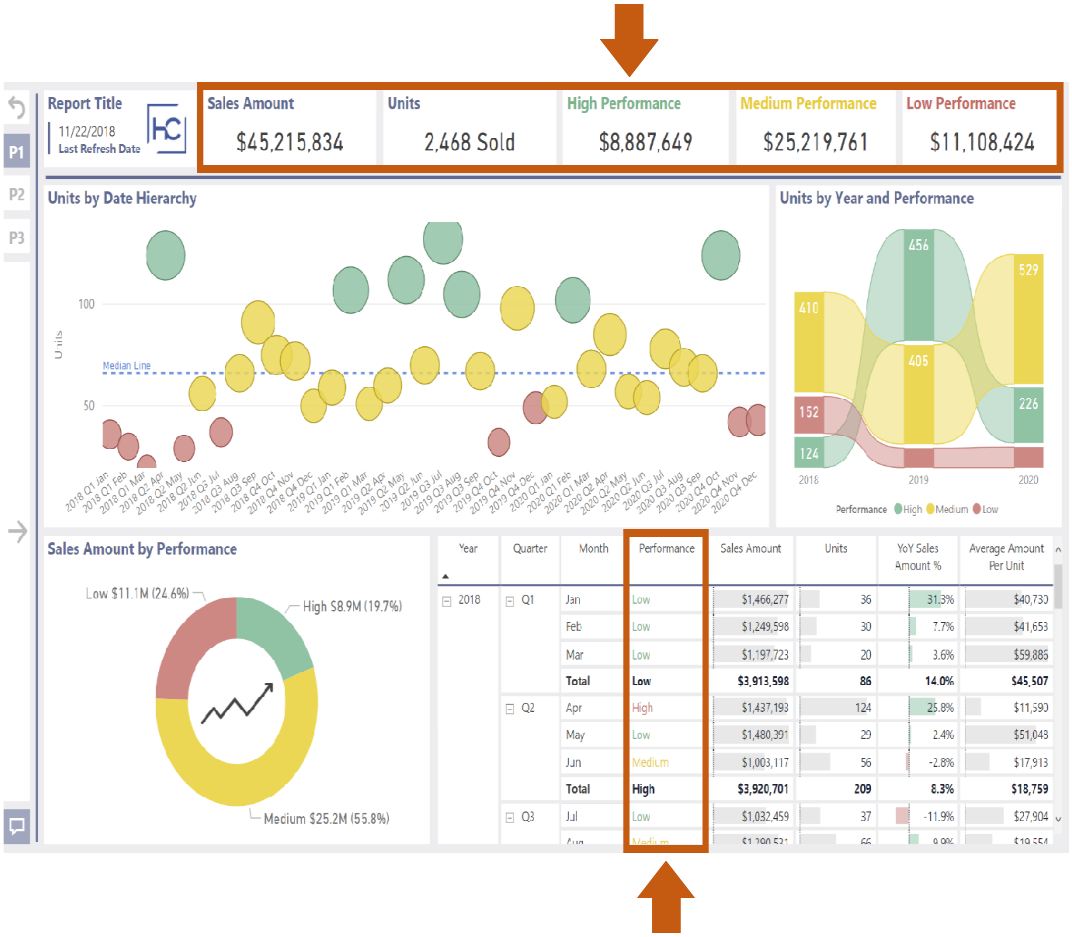
Key performance indicators (KPI's)

- Quantifiable values used to measure performance



Defining a Report

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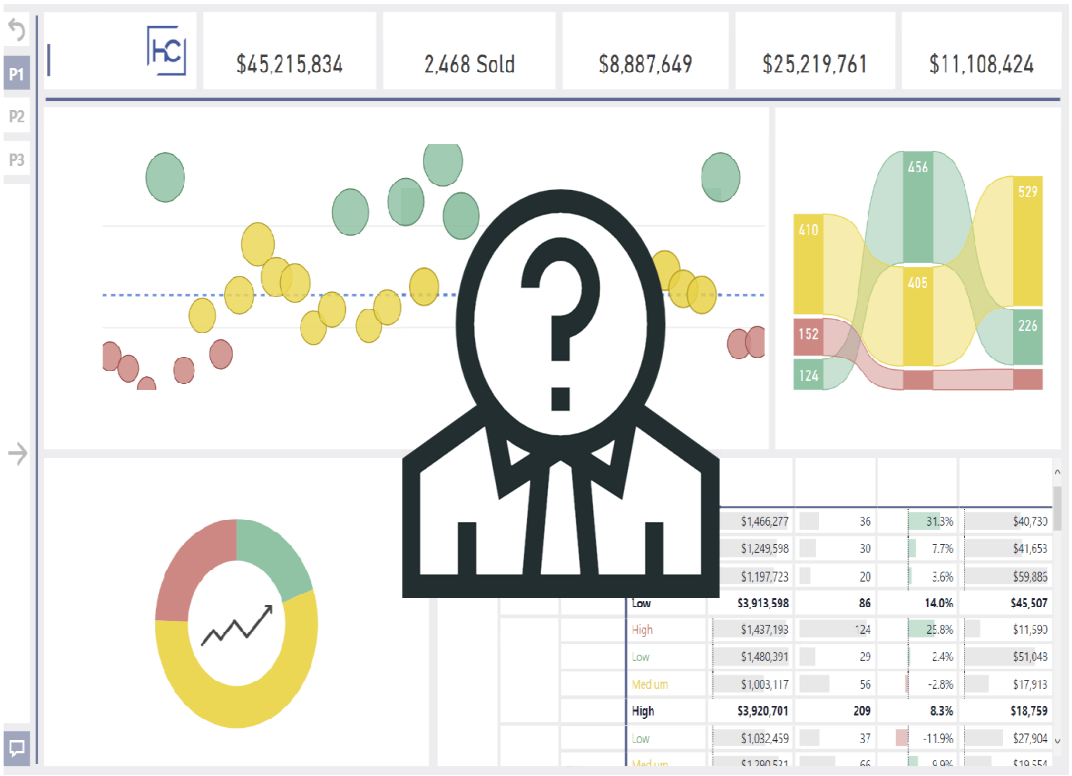


REPORTS NEED INFORMATION TO INTERPRET DATA

Defining a Report

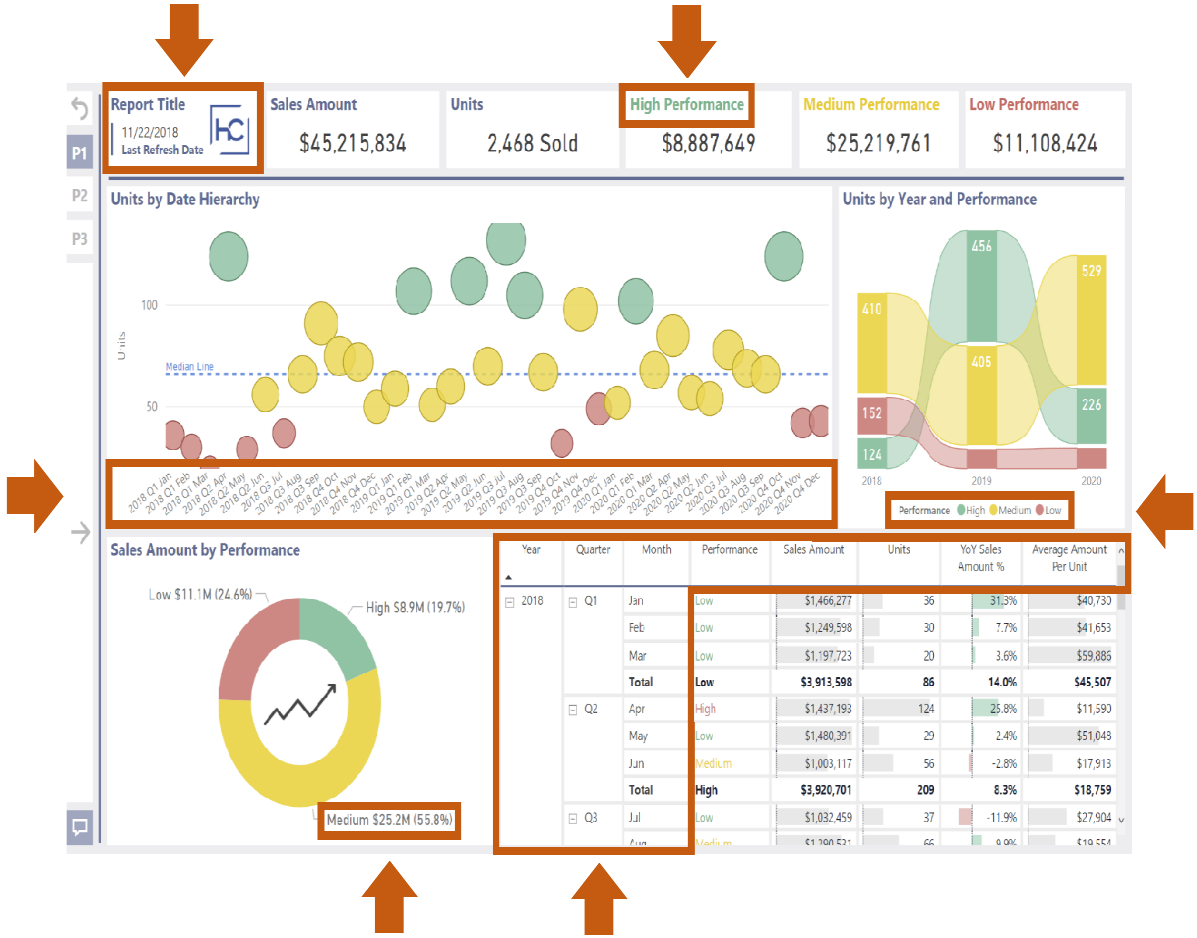
Essential Report Components ► Information

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

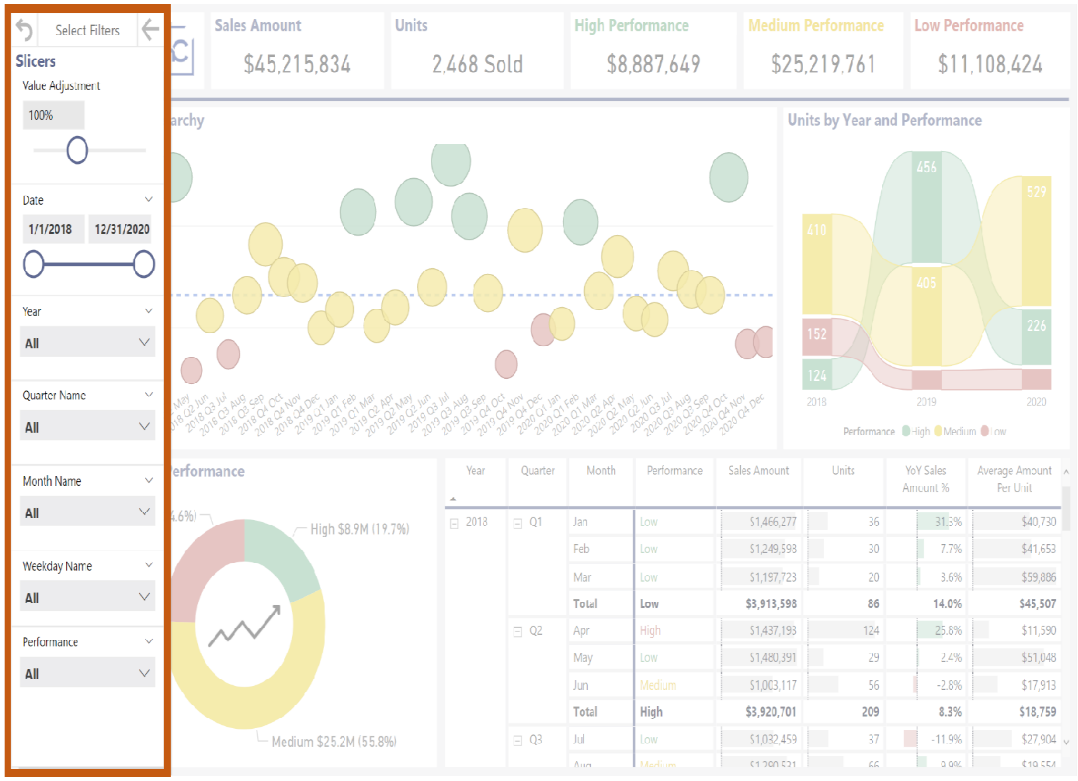
Defining filters

- 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

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Types of filters

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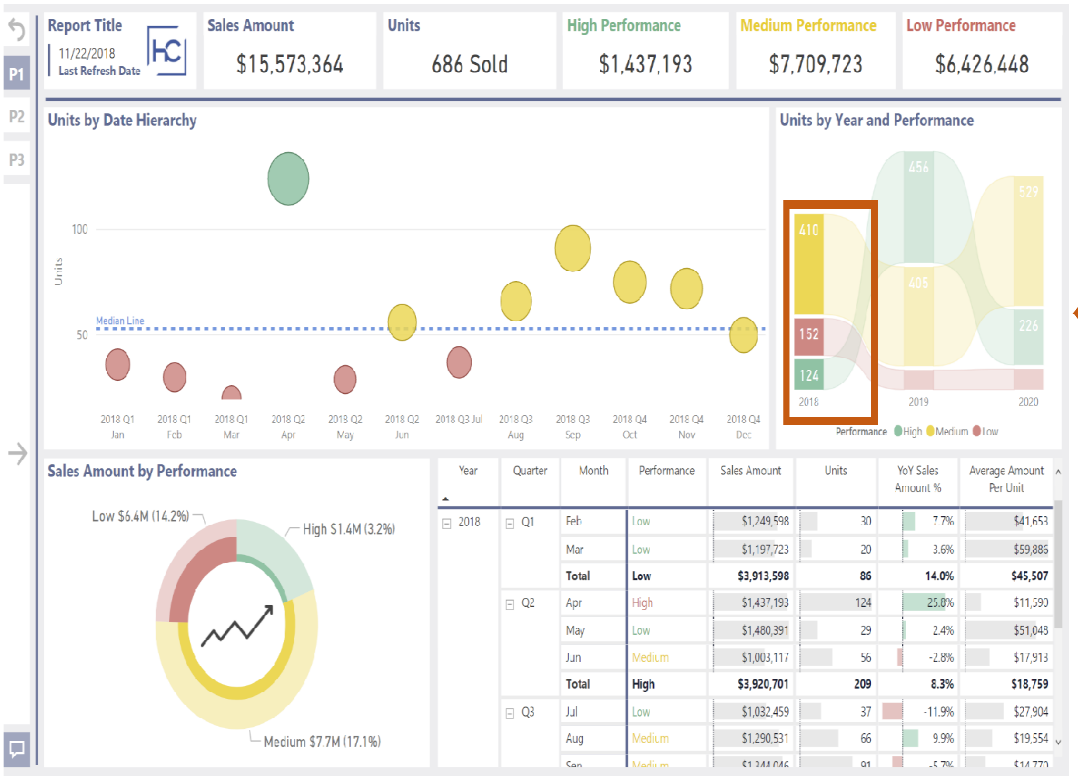
Visual cross-filters

- 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

Knowledge Check

Three Primary Components of a Report

?

?

?

Questions?

Design Principles

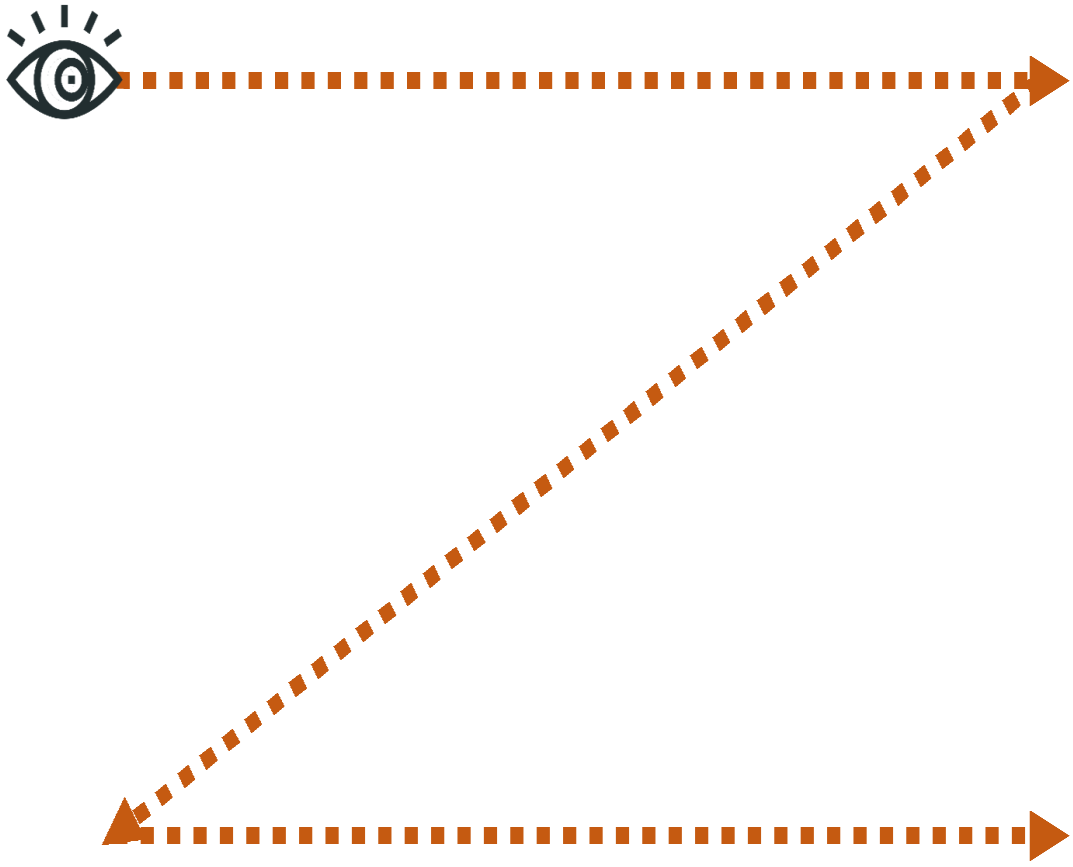
- Practices for designing more effective reports

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**.

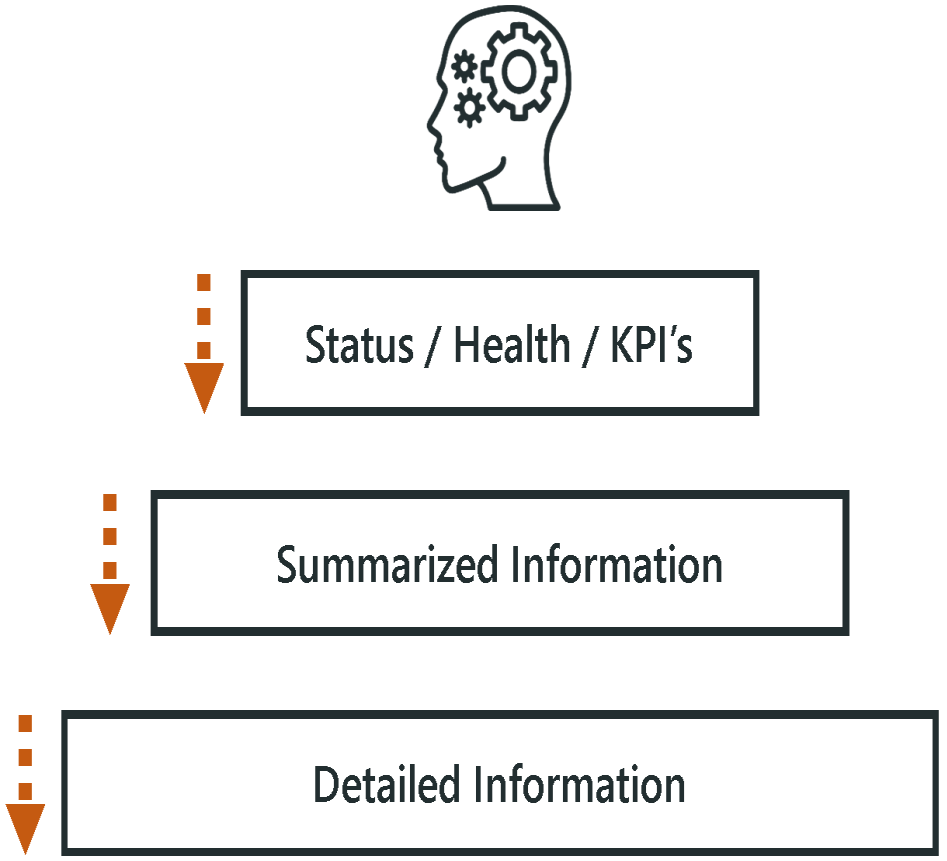


Design Principles

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**

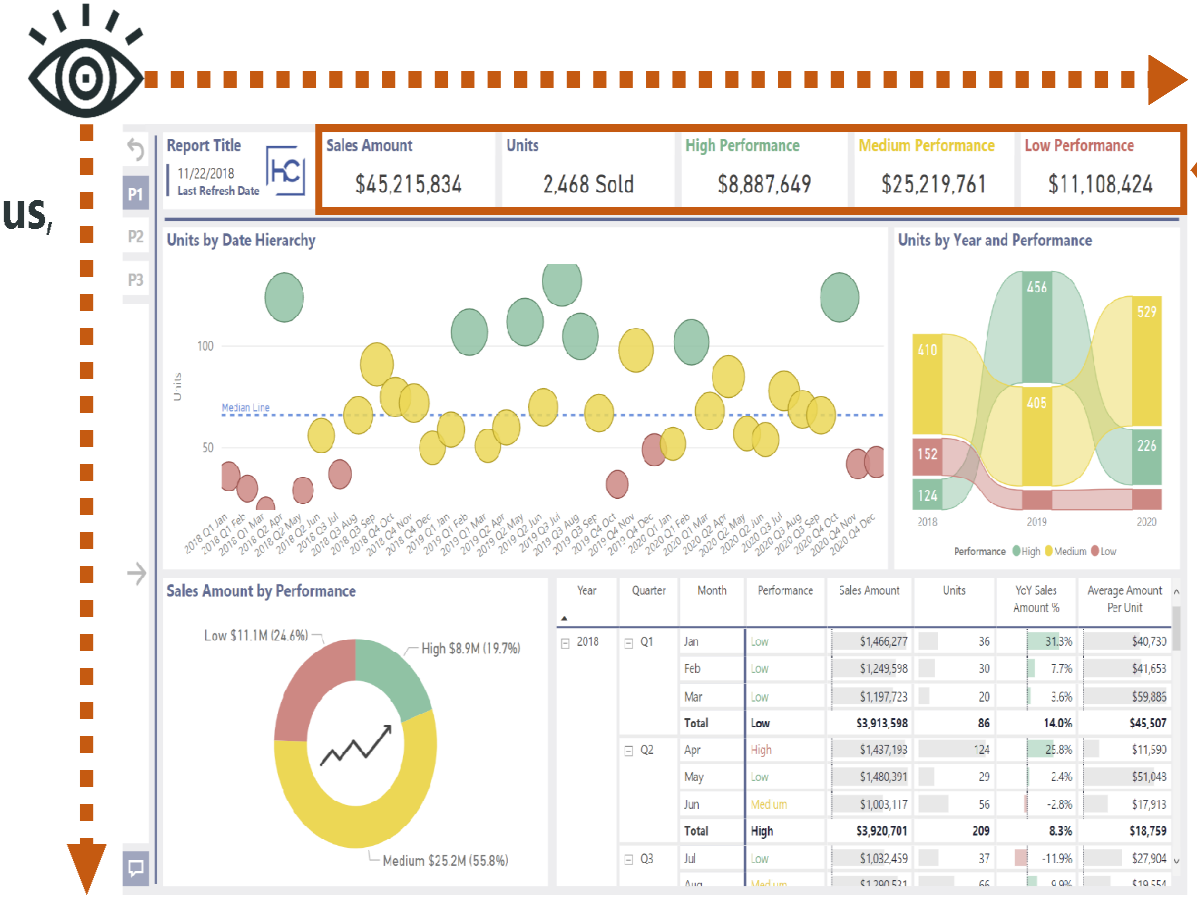


Design Principles

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

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1. Key Performance Indicators (KPI's)
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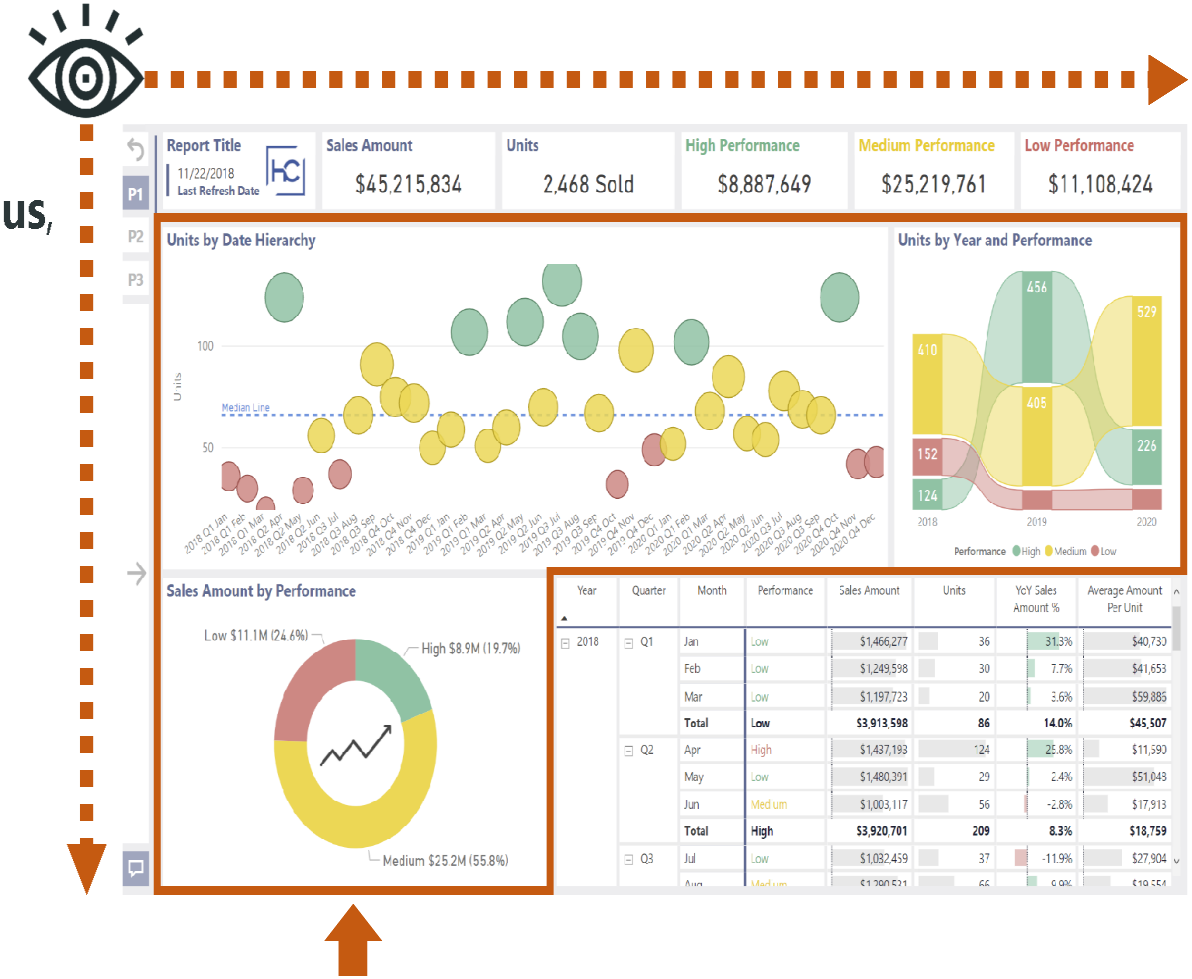
2. Summarized Information
   - Visuals displaying **patterns** or **trends** in the data. Allowing additional insights to the KPI's



Design Principles

Information Processing ► Effective Report Organization

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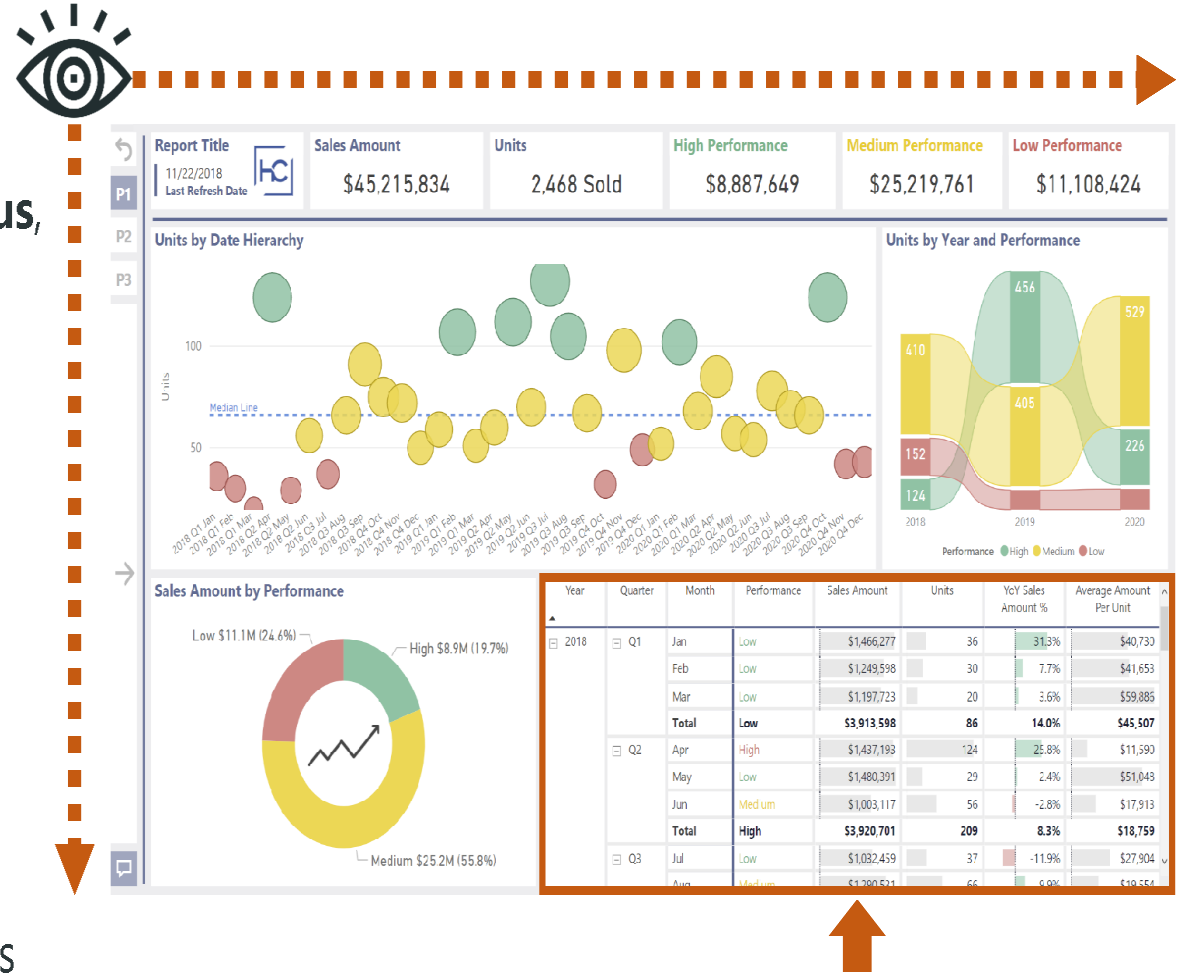
1. Key Performance Indicators (KPI's)
   - Information pertaining to the **status**, **performance**, or **health** of the organization
2. Summarized Information
   - Visuals displaying **patterns** or **trends** in the data. Allowing additional insights to the KPI's
3. Detailed Information
   - Tables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

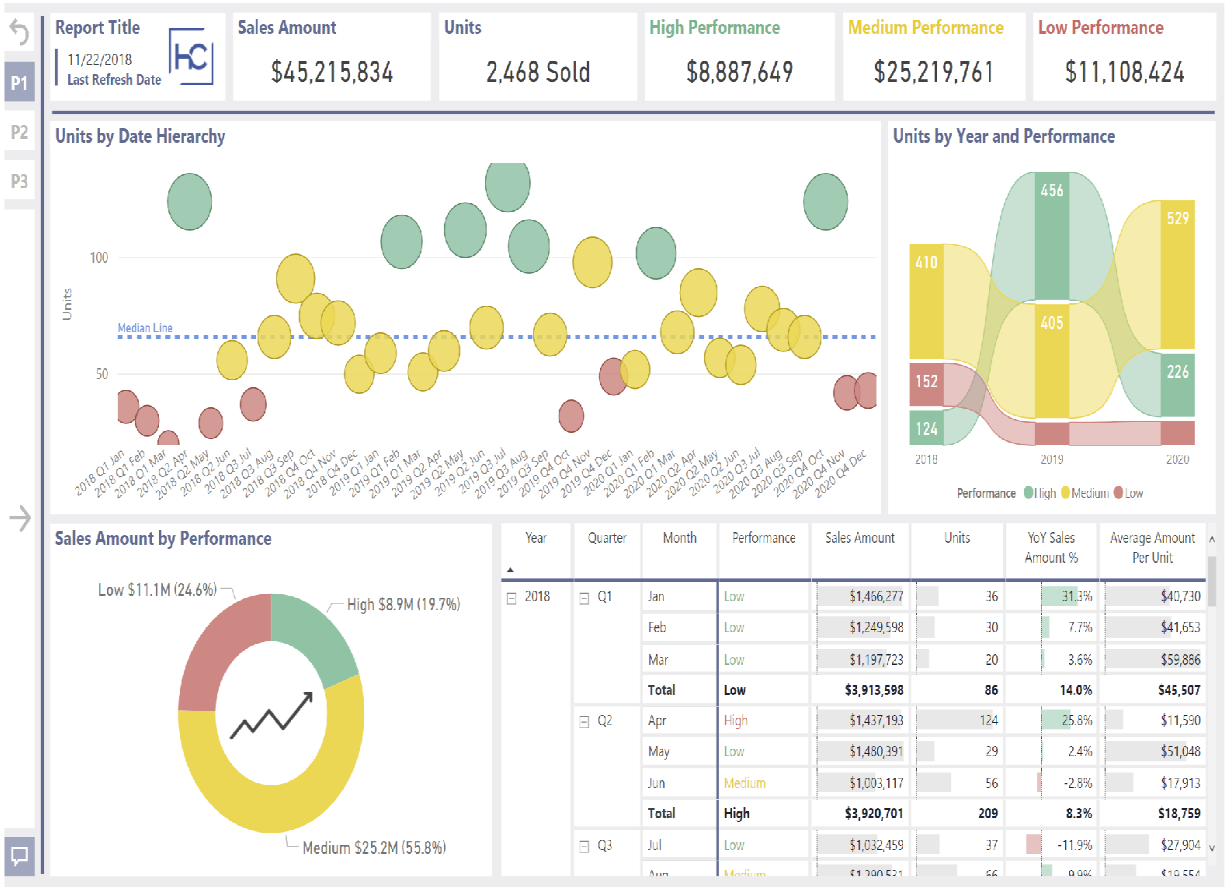


Design Principles

The S.C.R.A.P Methodology

- Spacing
- Contrast
- Repetition
- Alignment
- Proximity

Report with applied methodologies



Design Principles

The S.C.R.A.P Methodology ► Spacing

Spacing

Contrast

Repetition

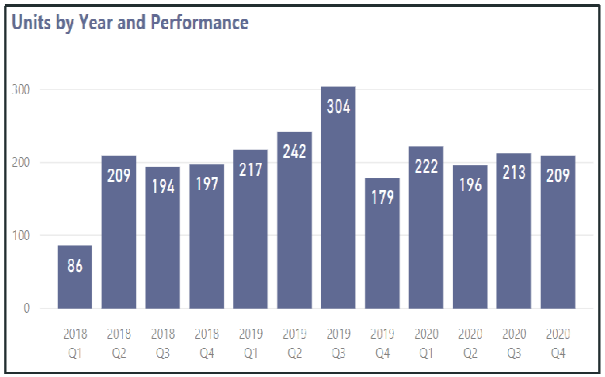
Alignment

Proximity

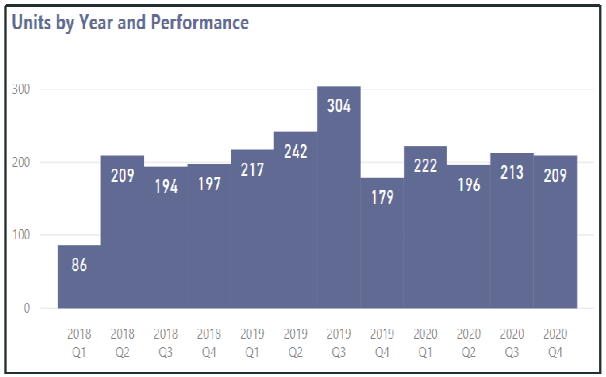
General concept

- **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

- Spacing
- Contrast
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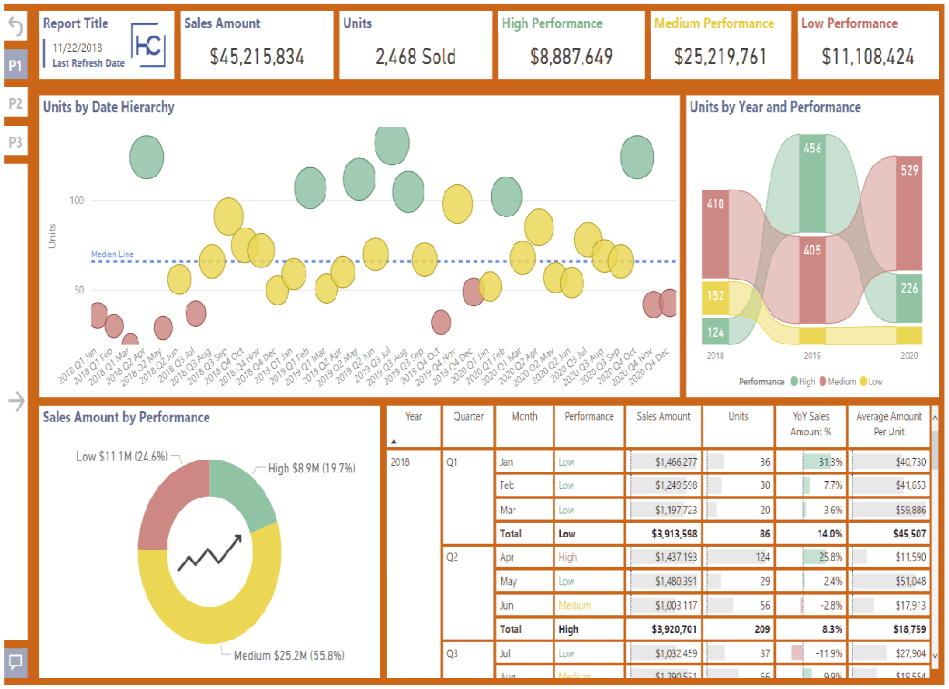
General concept

- **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

- Spacing
- **Contrast**
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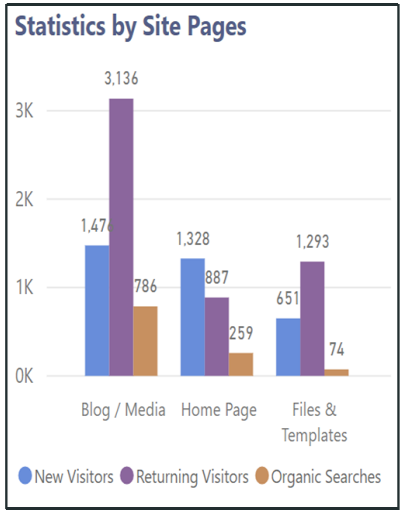
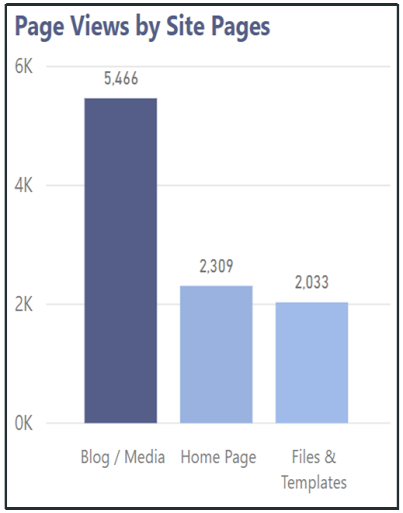
General concept

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

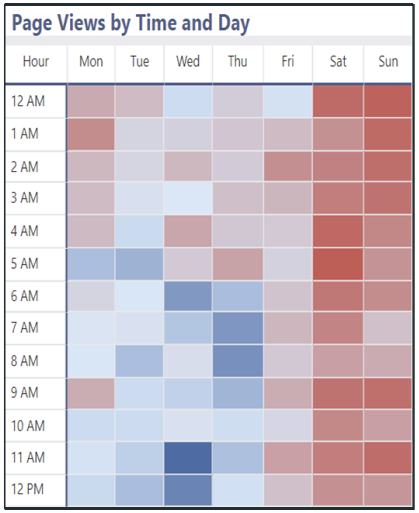
Categorical Colors



Sequential Colors



Diverging Colors



Design Principles

The S.C.R.A.P Methodology ► Contrast

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- **Contrast**
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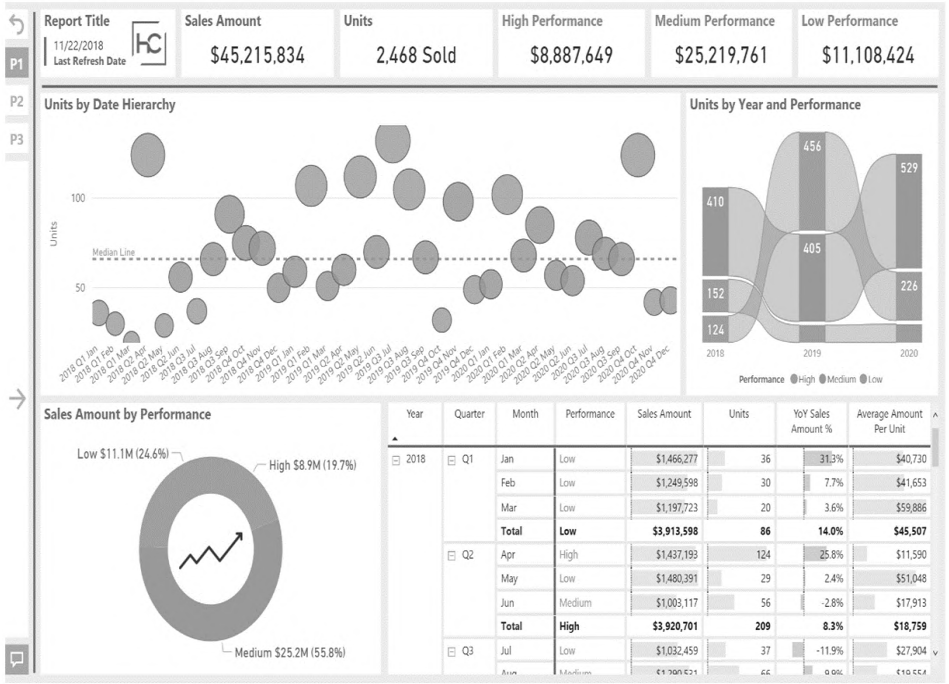
General concept

- 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

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
- Contributes to the **squint test** requirements

Design Principles

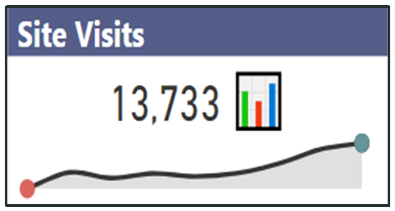
The S.C.R.A.P Methodology ► Repetition

- Spacing
- Contrast
- **Repetition**
- Alignment
- Proximity

General concept

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

Repetition

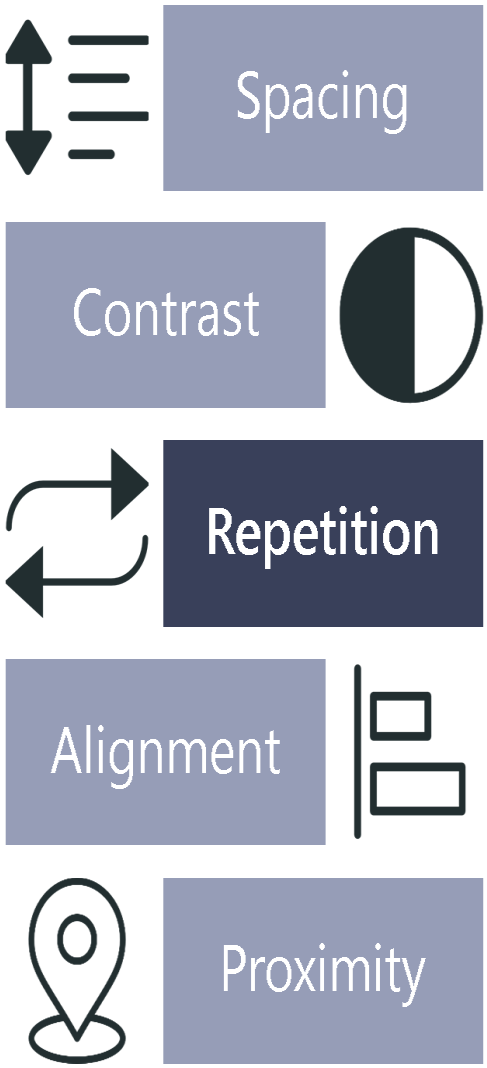


Repetition

No Repetition

Design Principles

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



General concept

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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

Spacing

Contrast

Repetition

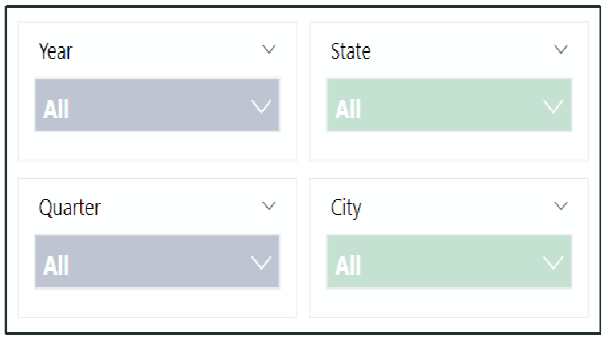
Alignment

Proximity

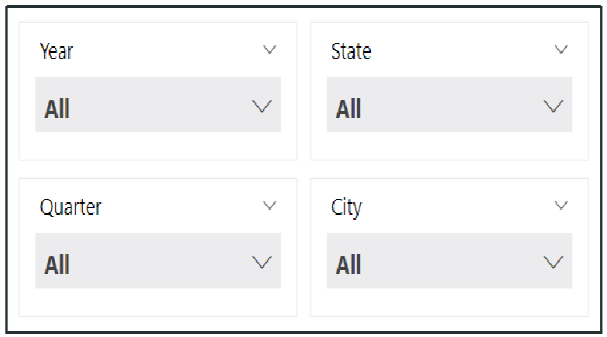
General concept

- 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



No Repetition



Design Principles

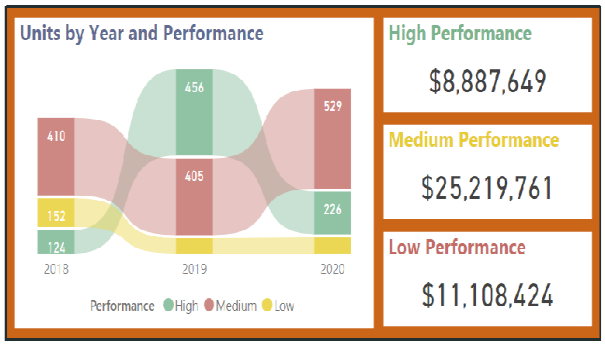
The S.C.R.A.P Methodology ► Alignment

- Spacing
- Contrast
- Repetition
- **Alignment**
- Proximity

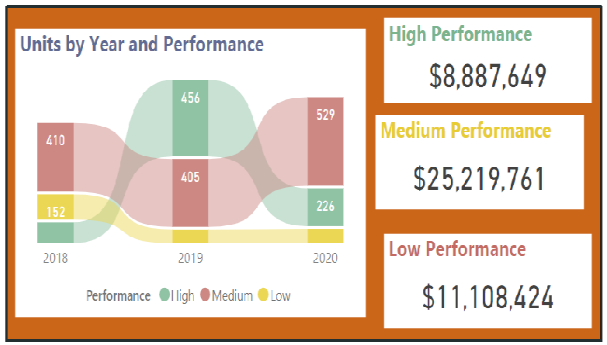
General concept

- **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



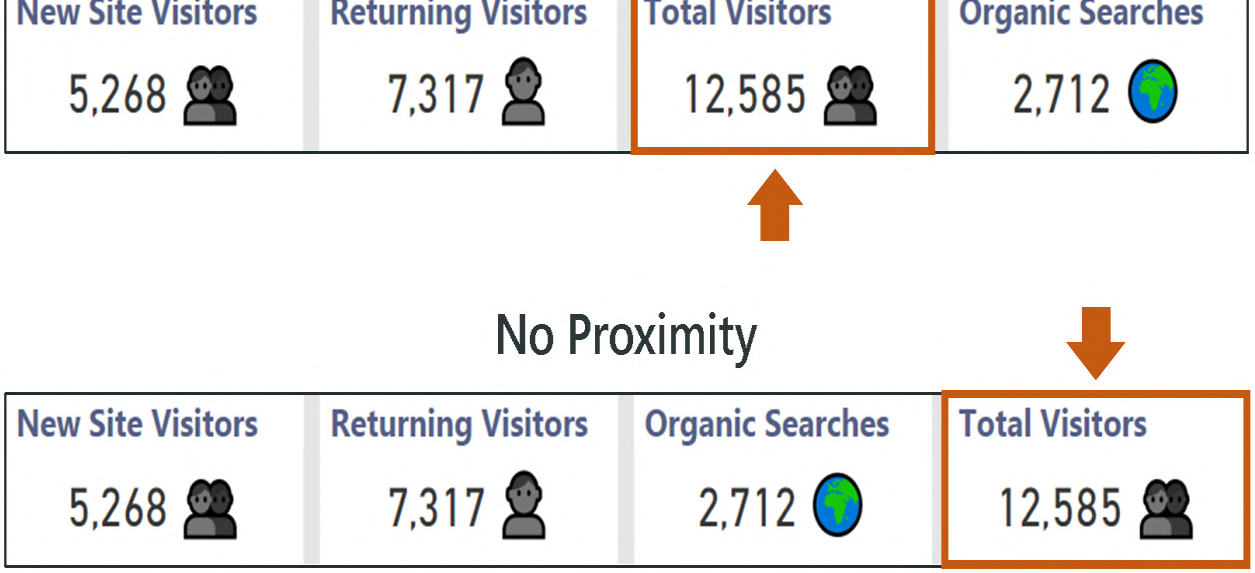
Design Principles

The S.C.R.A.P Methodology ► Proximity

- Spacing
- Contrast
- Repetition
- Alignment
- **Proximity**

General concept

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



Design Principles

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- Contrast
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General concept

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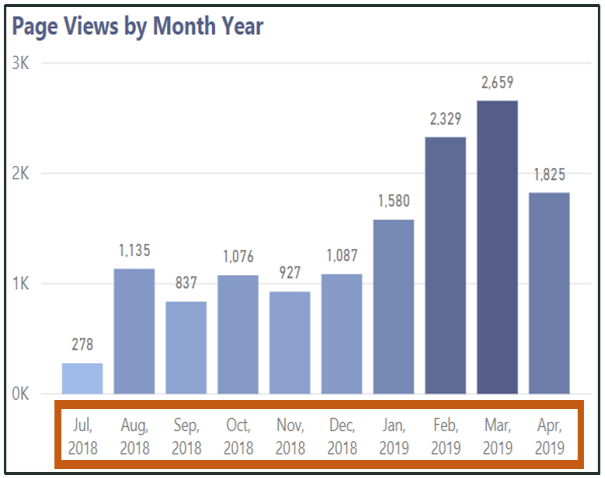
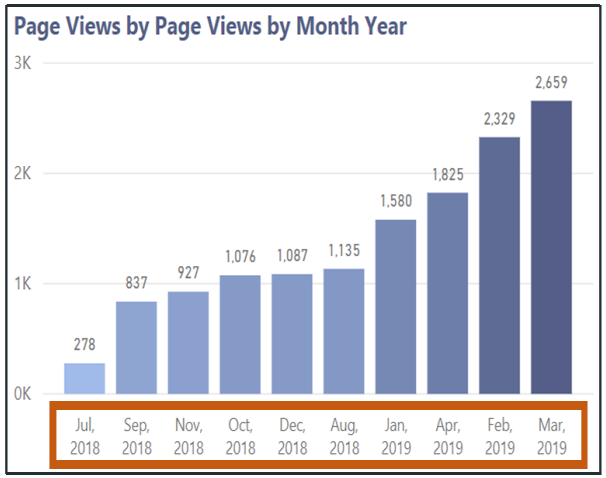
- Applicable to **objects within a report**
- Applicable to **elements within an object**

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

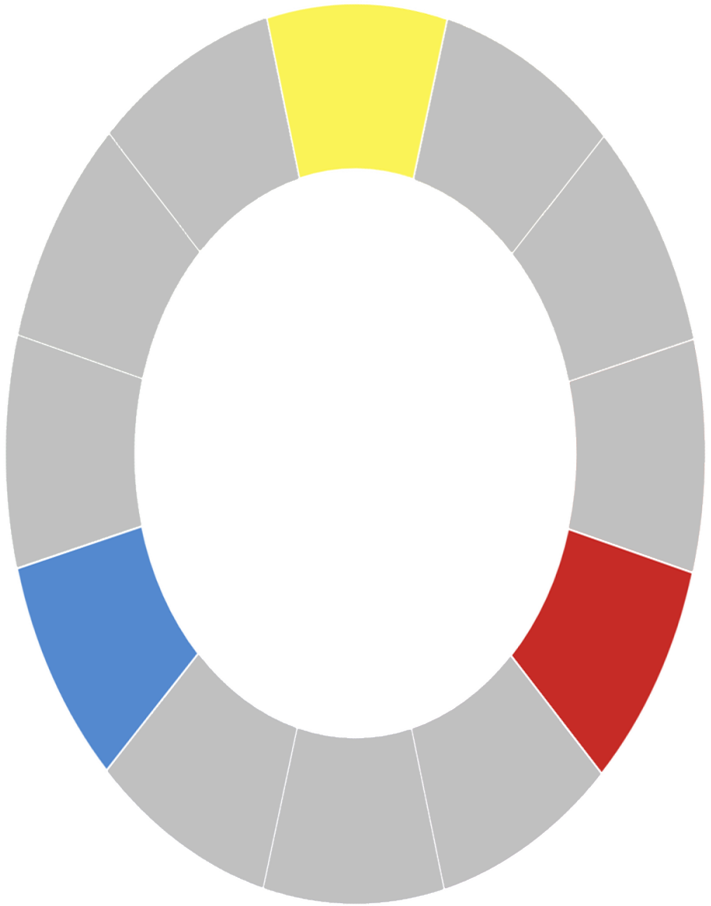
Color wheel definition

- 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



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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

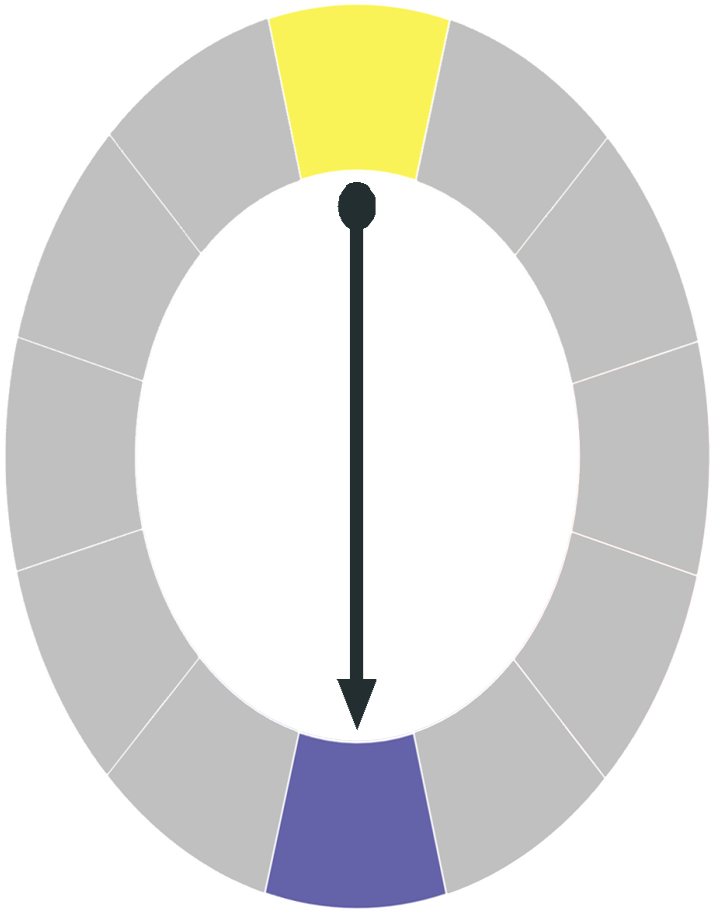
Color harmony definition

- 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



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Design Principles

Color Theory ► Color Harmony

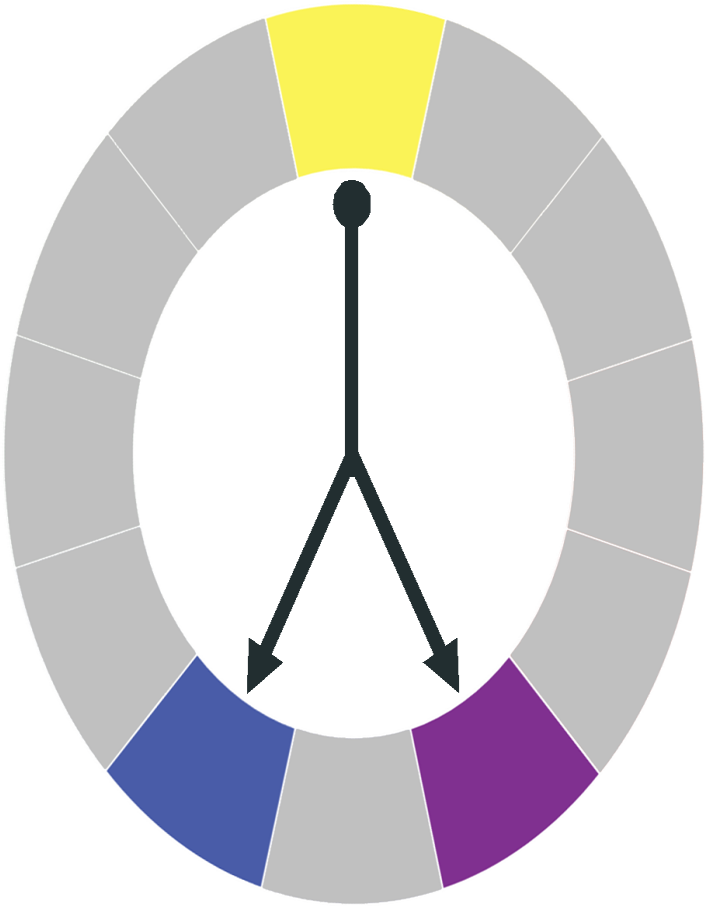
Color harmony definition

- 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



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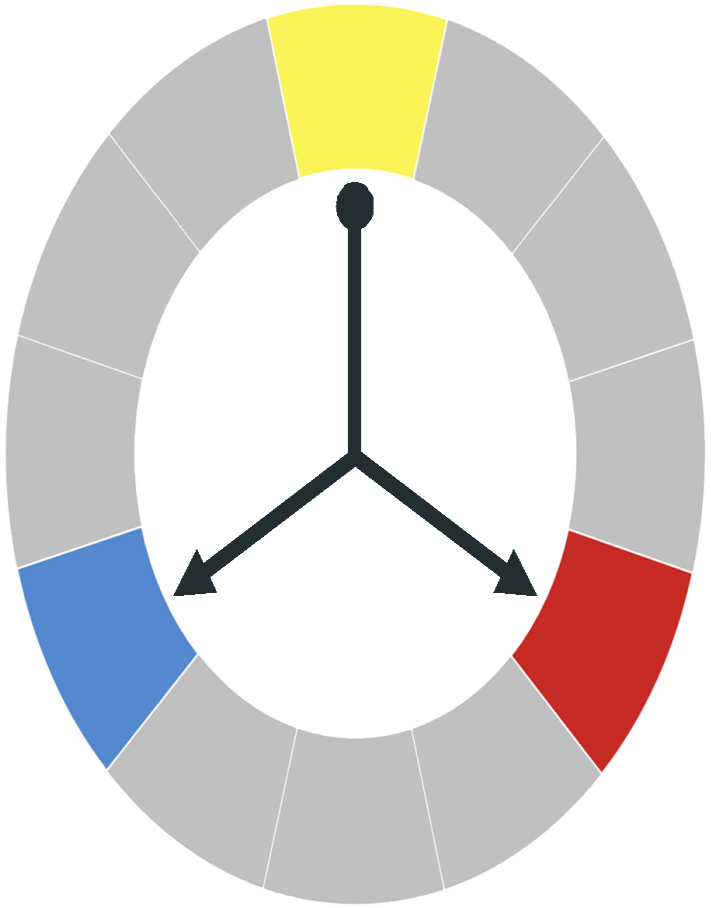
- Using a **combination of colors** that is **harmonious** to the human eye

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



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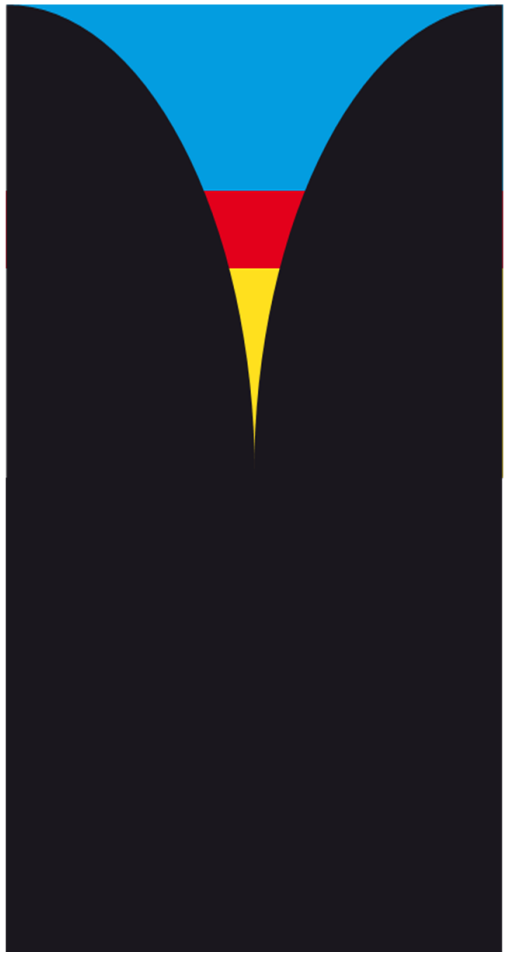


Design Principles

Color Theory ► Color Harmony

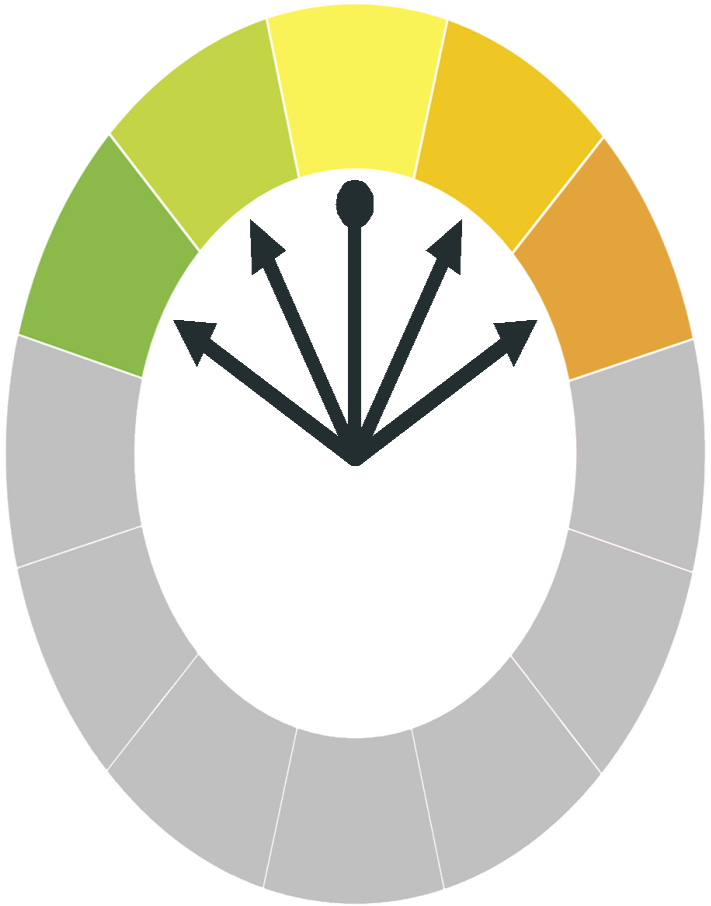
Color harmony definition

- 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



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The color wheel

Design Principles

Color Theory ► Color Harmony

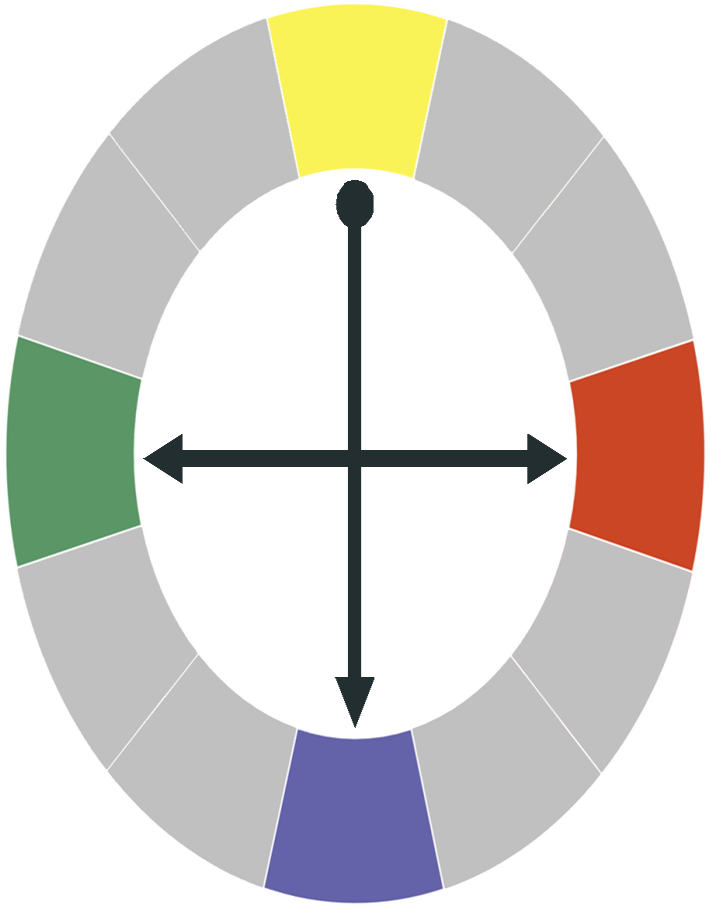
Color harmony definition

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

Types of color harmony

- 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

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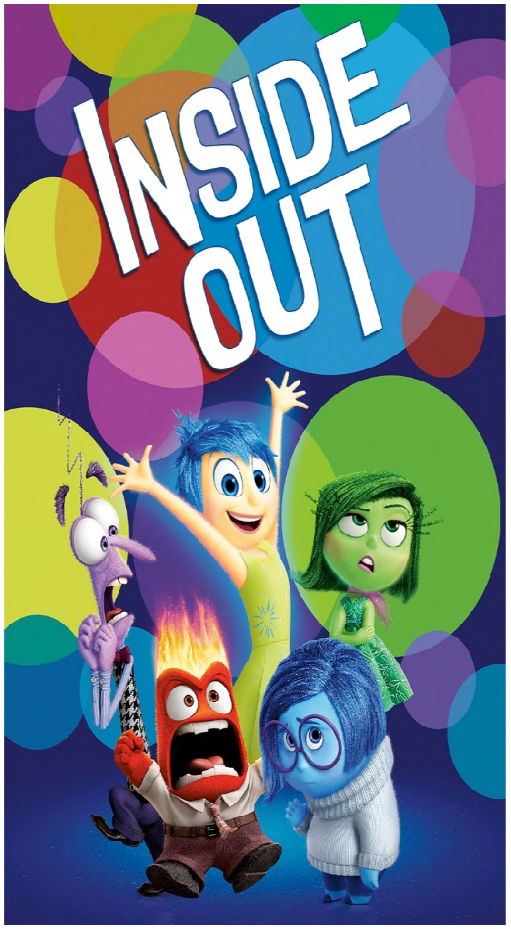
The color wheel



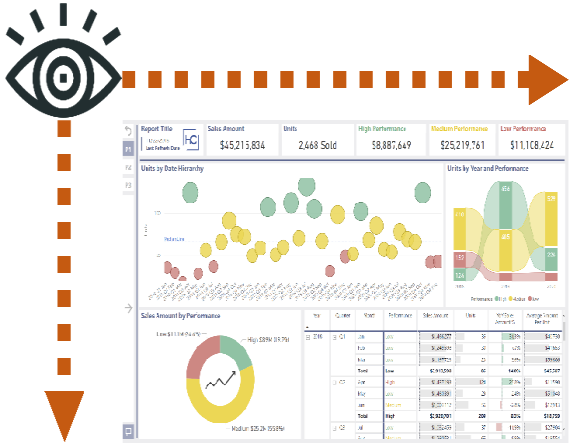
Knowledge Check

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

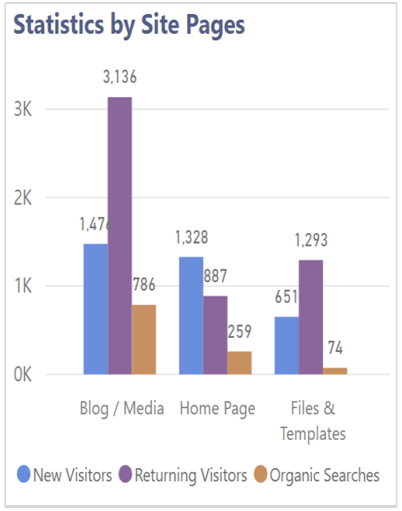
Proximity

Knowledge Check

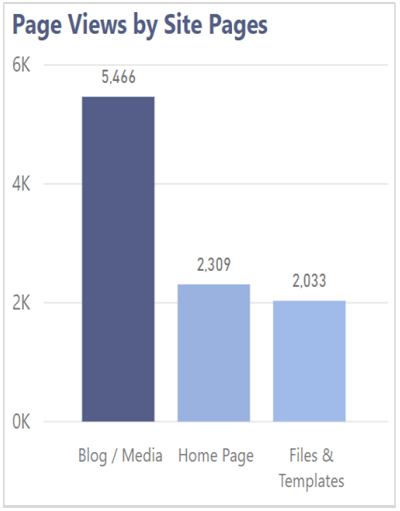
S.C.R.A.P Methodology

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

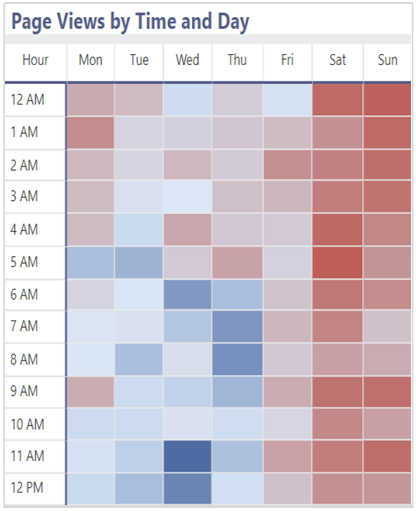
Categorical



Sequential



Diverging

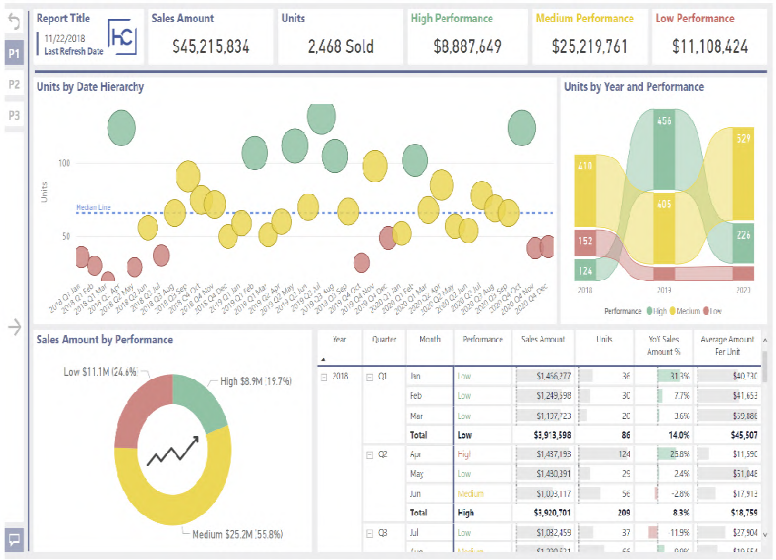


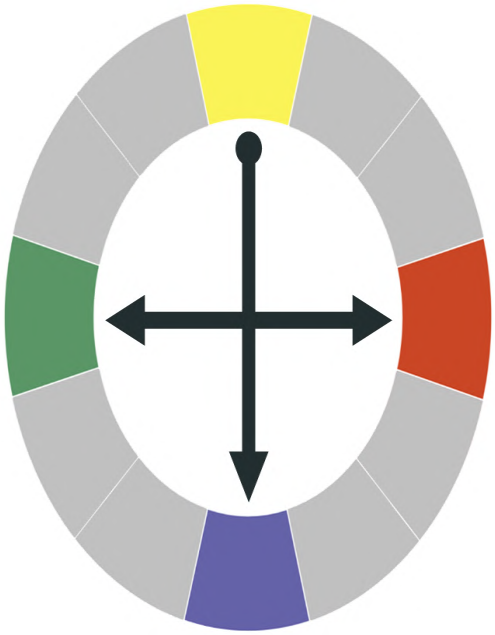
Knowledge Check

Design Principles

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

Tetratic





Questions?

Data Visualization

- Methodologies for creating impactful visualizations

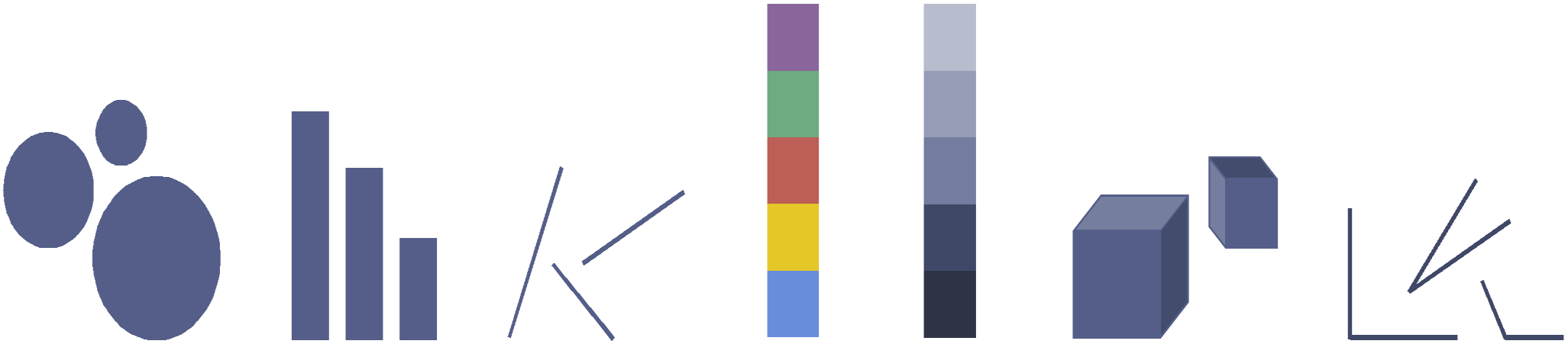
Design Principles

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



VISUAL CUES ARE NOT CREATED EQUAL

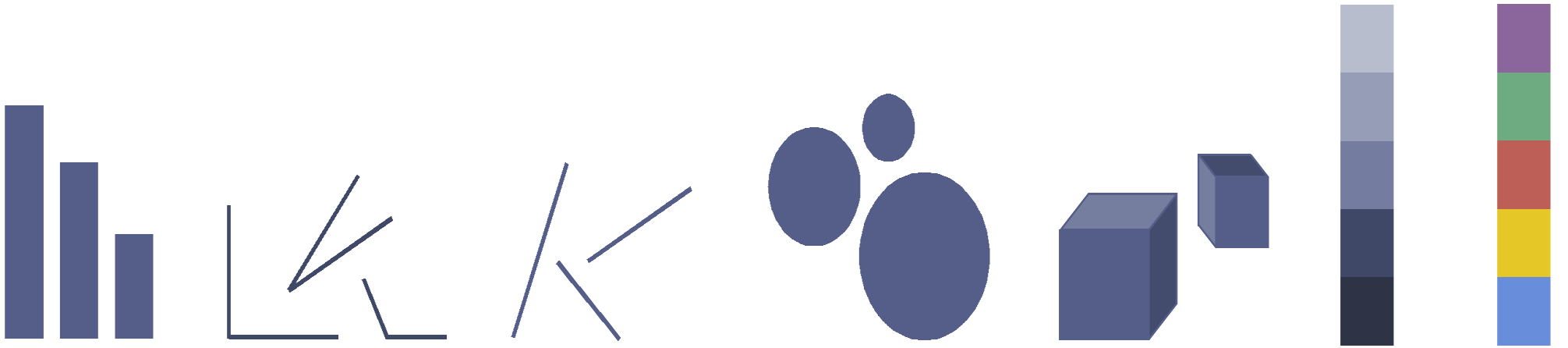
Design Principles

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



Design Principles

Visual Cues ► Accuracy Influencers

What influences accuracy?

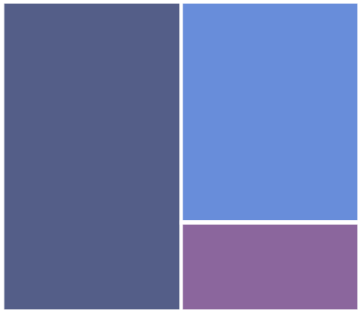
Alignment

- 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

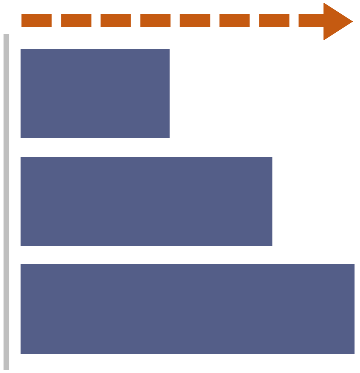
Direction

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

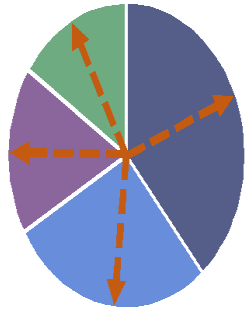
Length (Aligned)



Tree Map



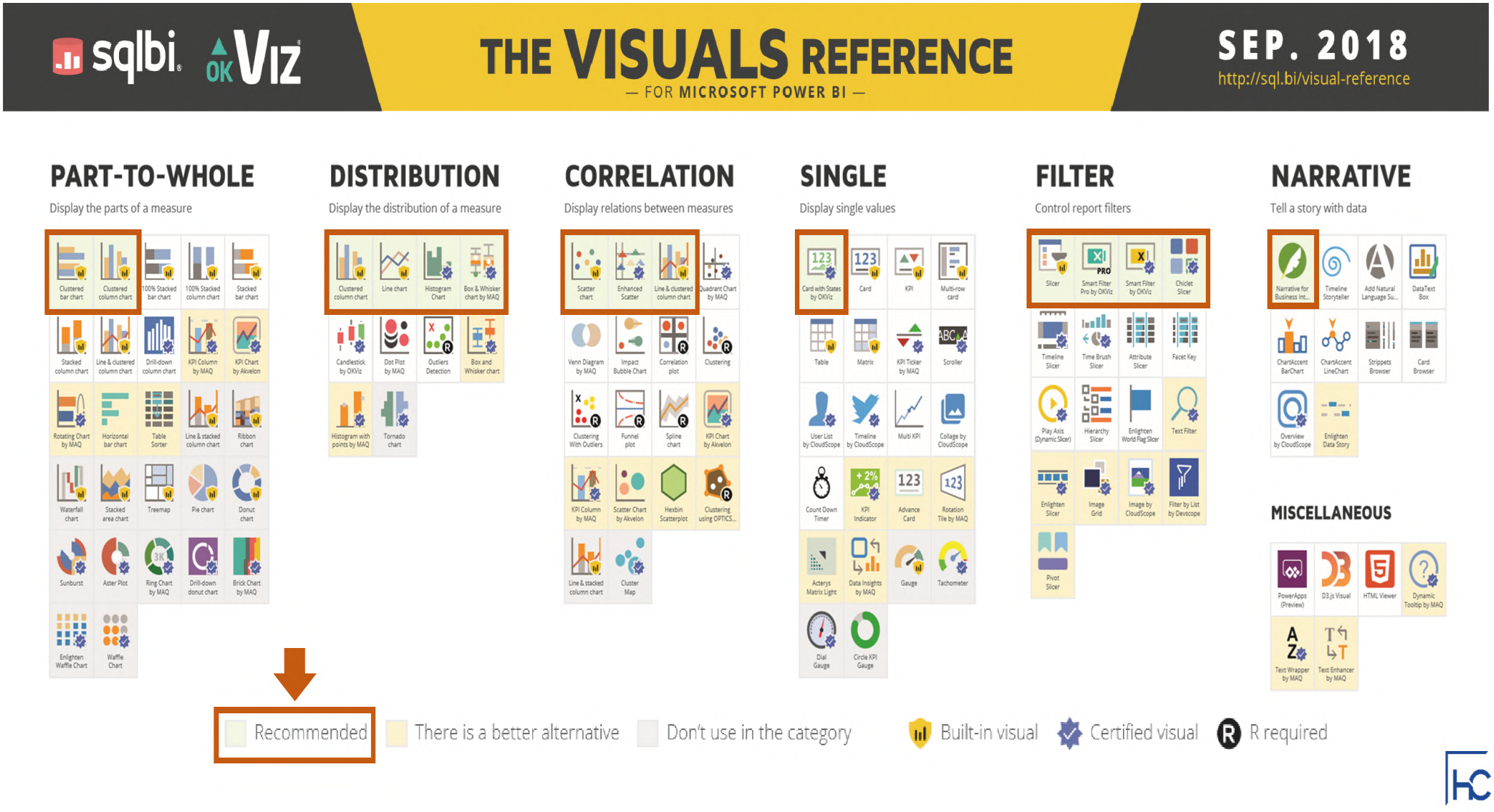
Bar Chart



Pie Chart

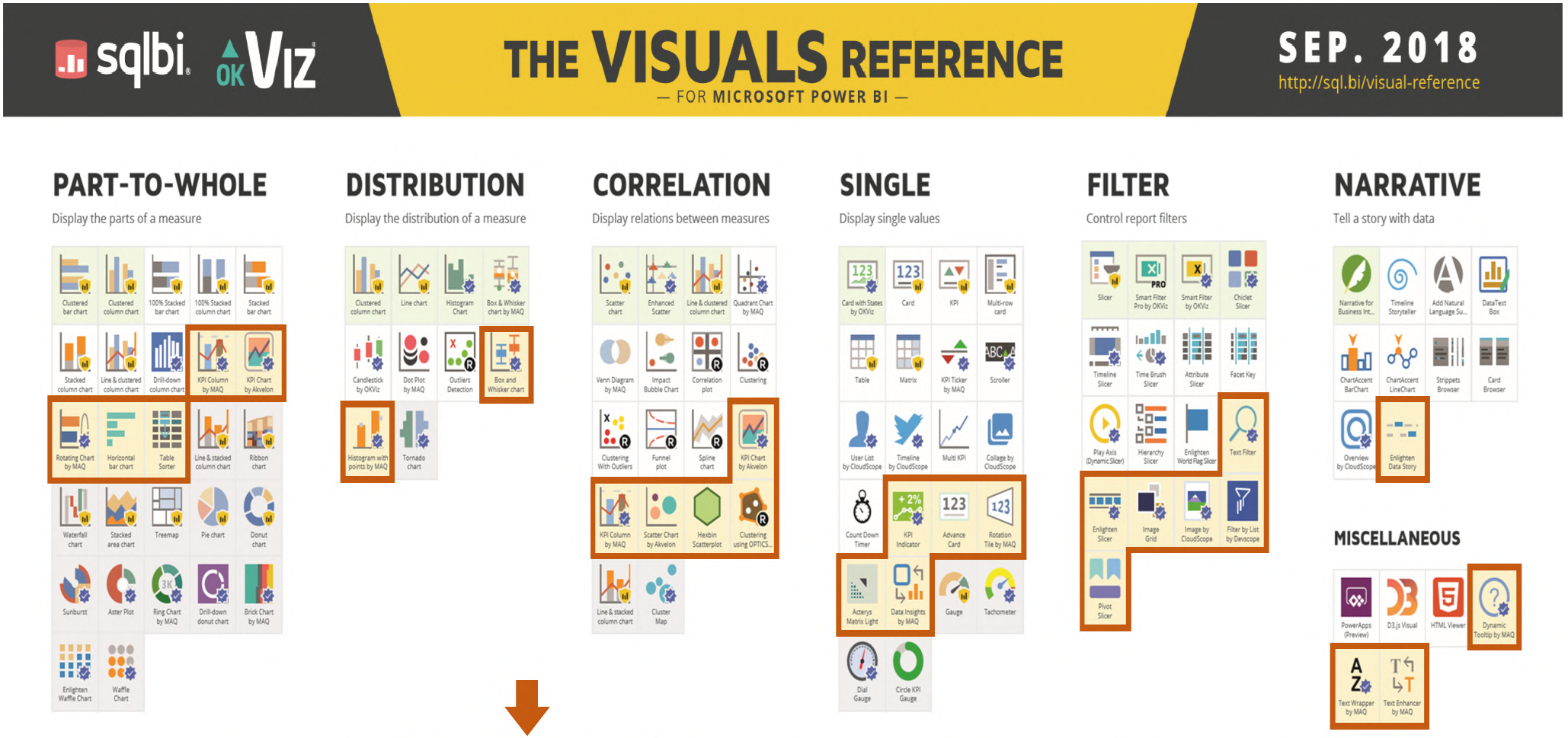
Design Principles

Visual Categories



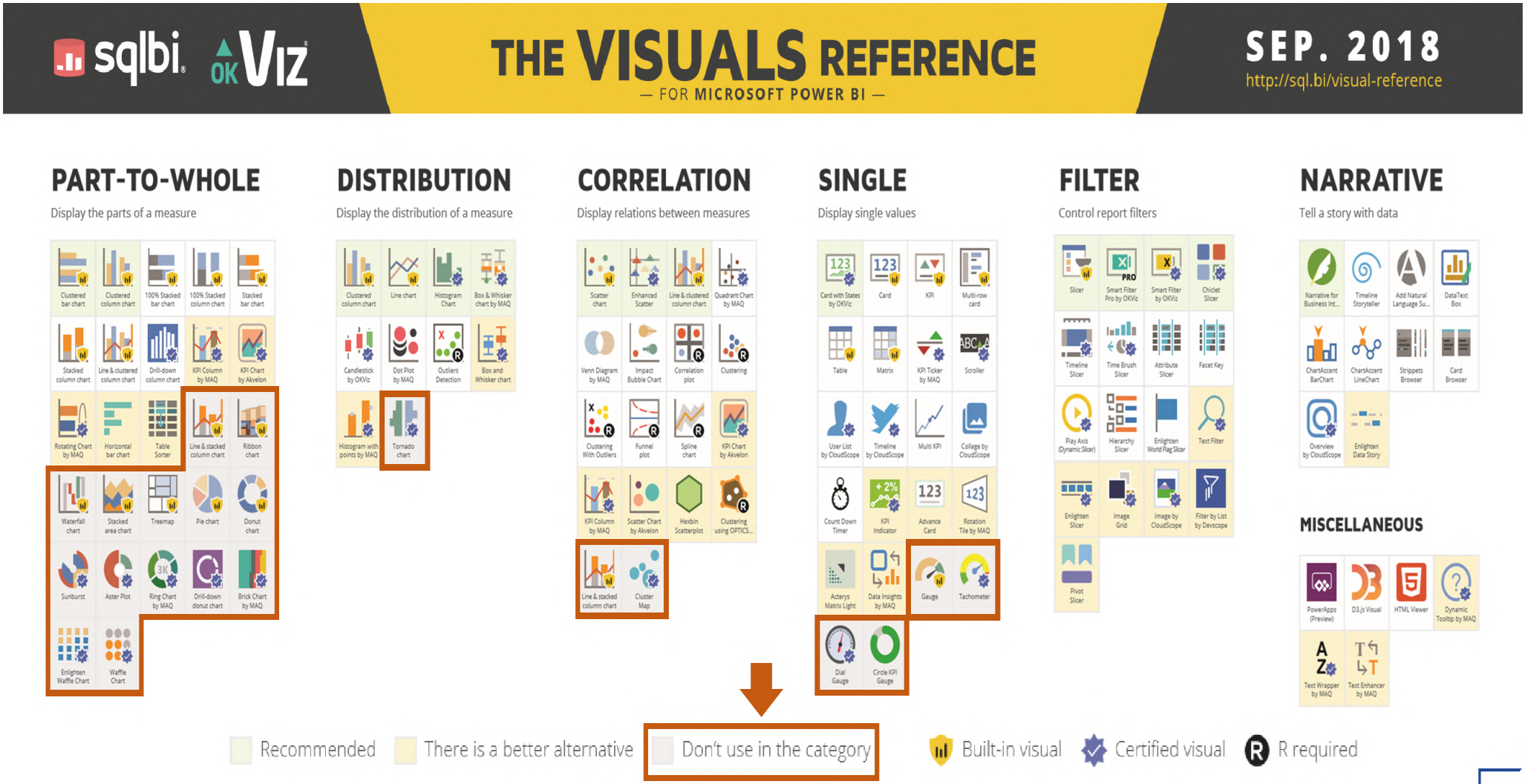
Design Principles

Visual Categories



Design Principles

Visual Categories



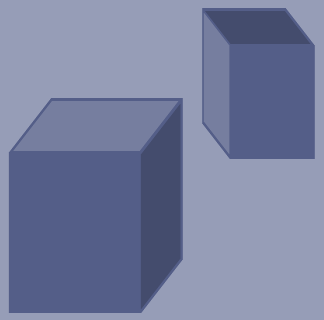
Knowledge Check

Visual Cues

Easiest visual cue to process?

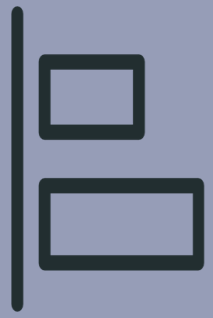
Length (Aligned)

Hardest visual cue to process?



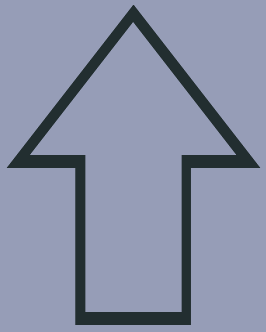
Volume

What influences **accuracy?**



Alignment

What influences **accuracy?**

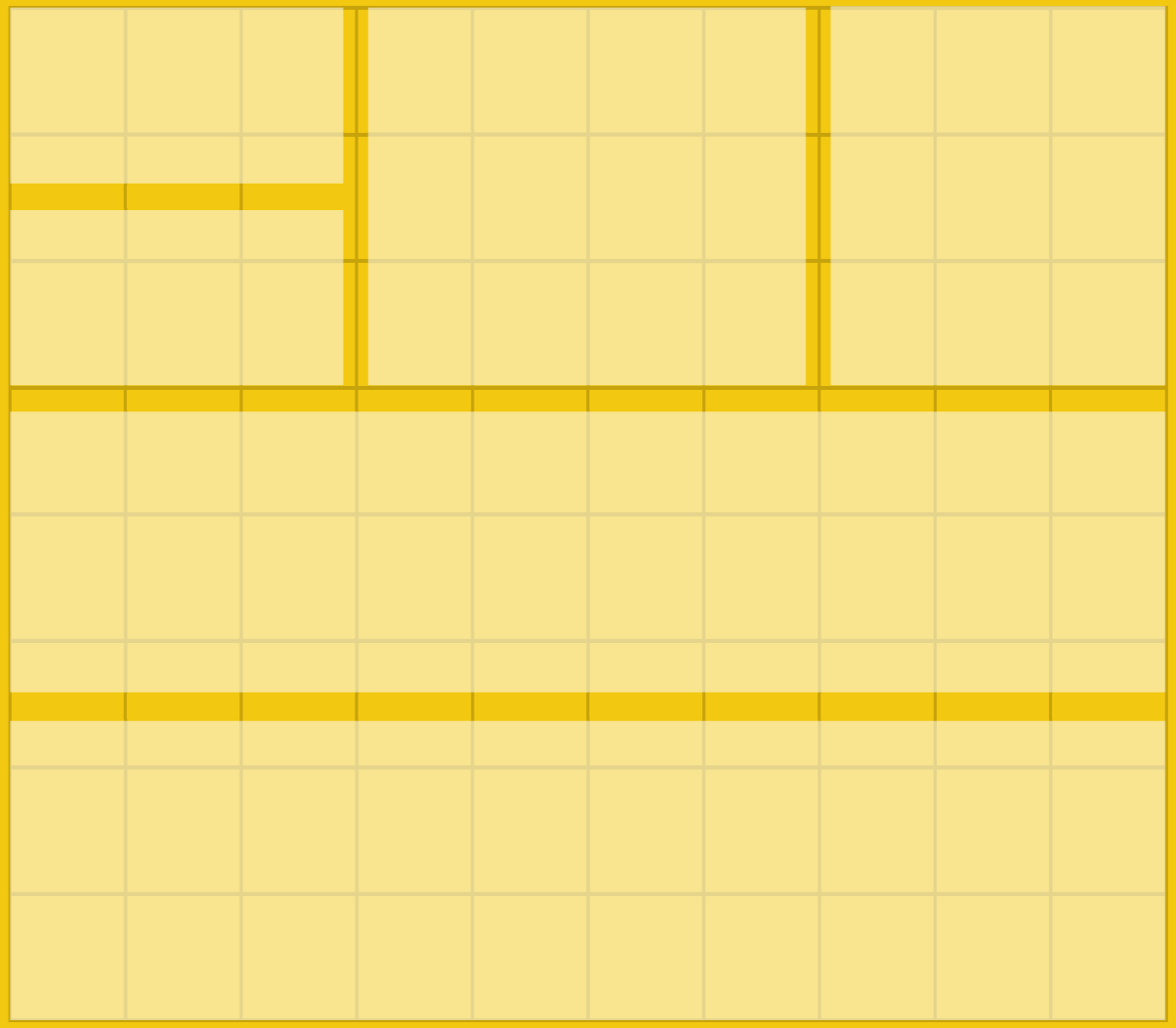


Direction

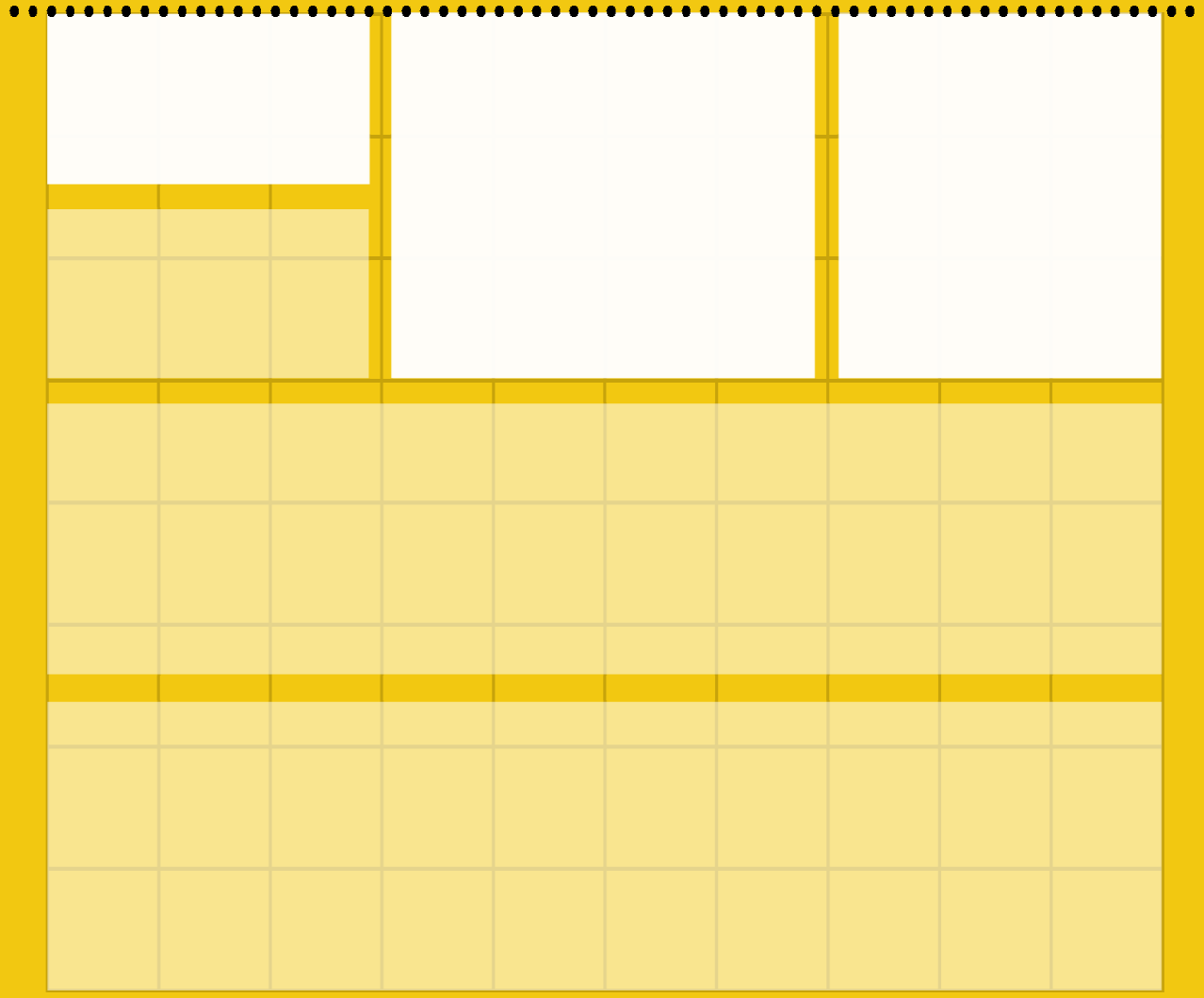
Questions?

8 RULES

Designing reports and dashboards in Power BI

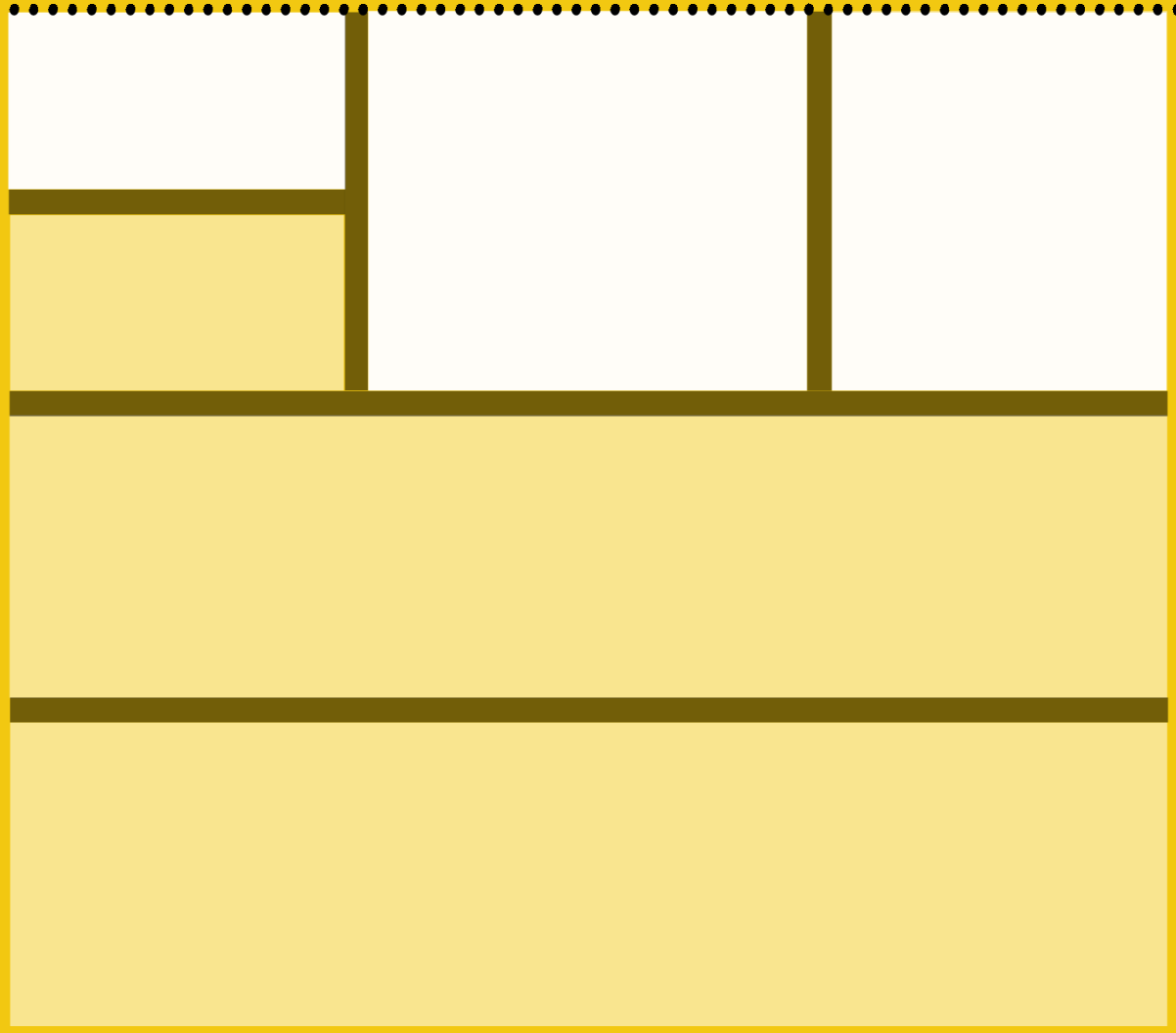


1.
Always use a Grid

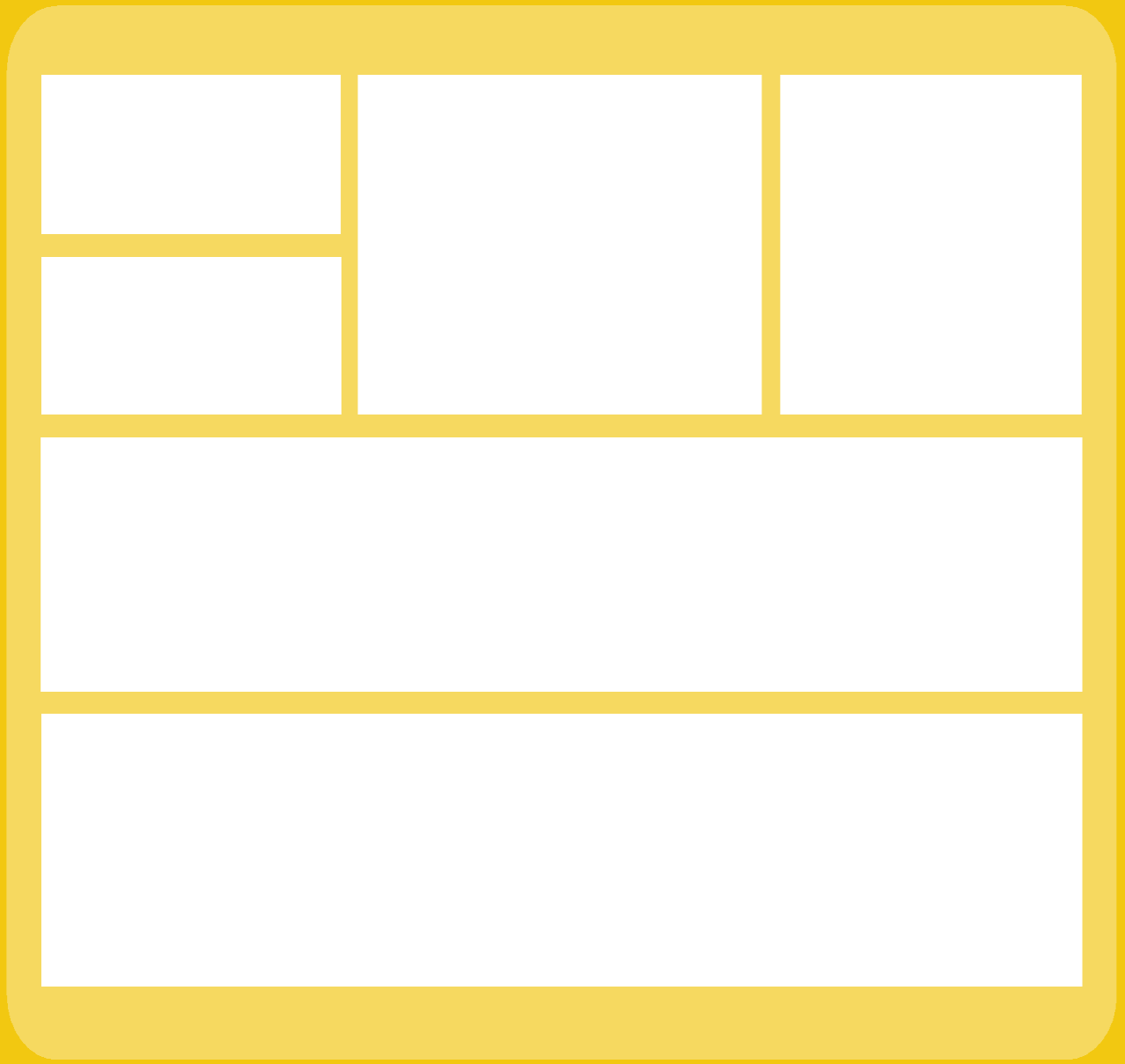


2.

Use a correct Alignment



3.
Appropriate Spacing



4.

Select the right Background

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!

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

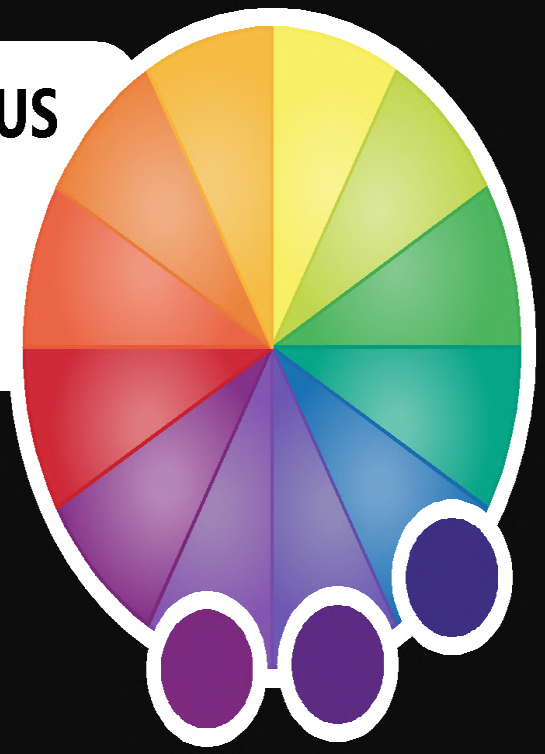
6.

Use Negative Space wisely

7. Choose your Color palette

ANALOGOUS
Colors

<4



TRIADIC
Color

<4

MONOCHROMATIC
Color

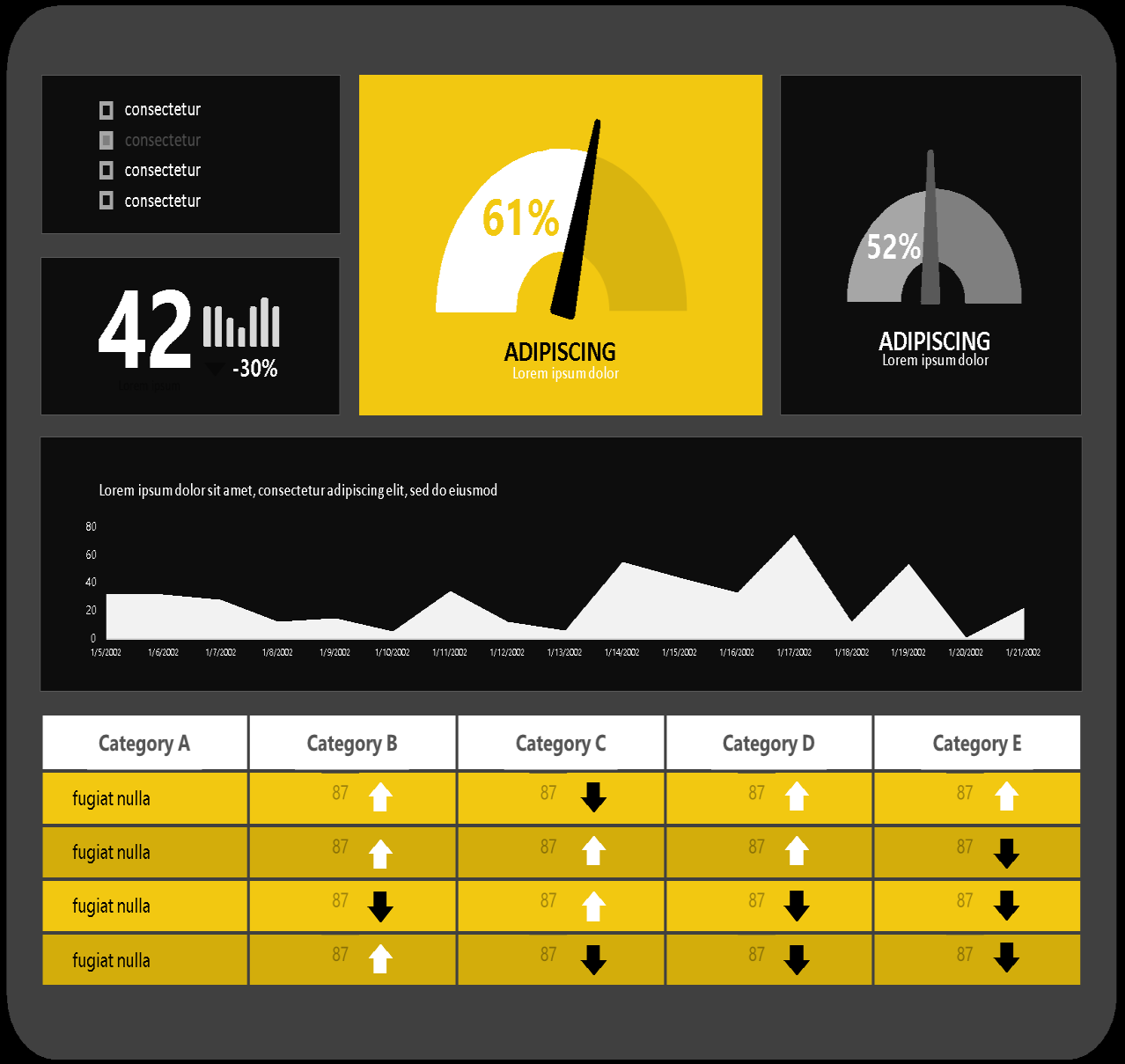
<6

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



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 ↓

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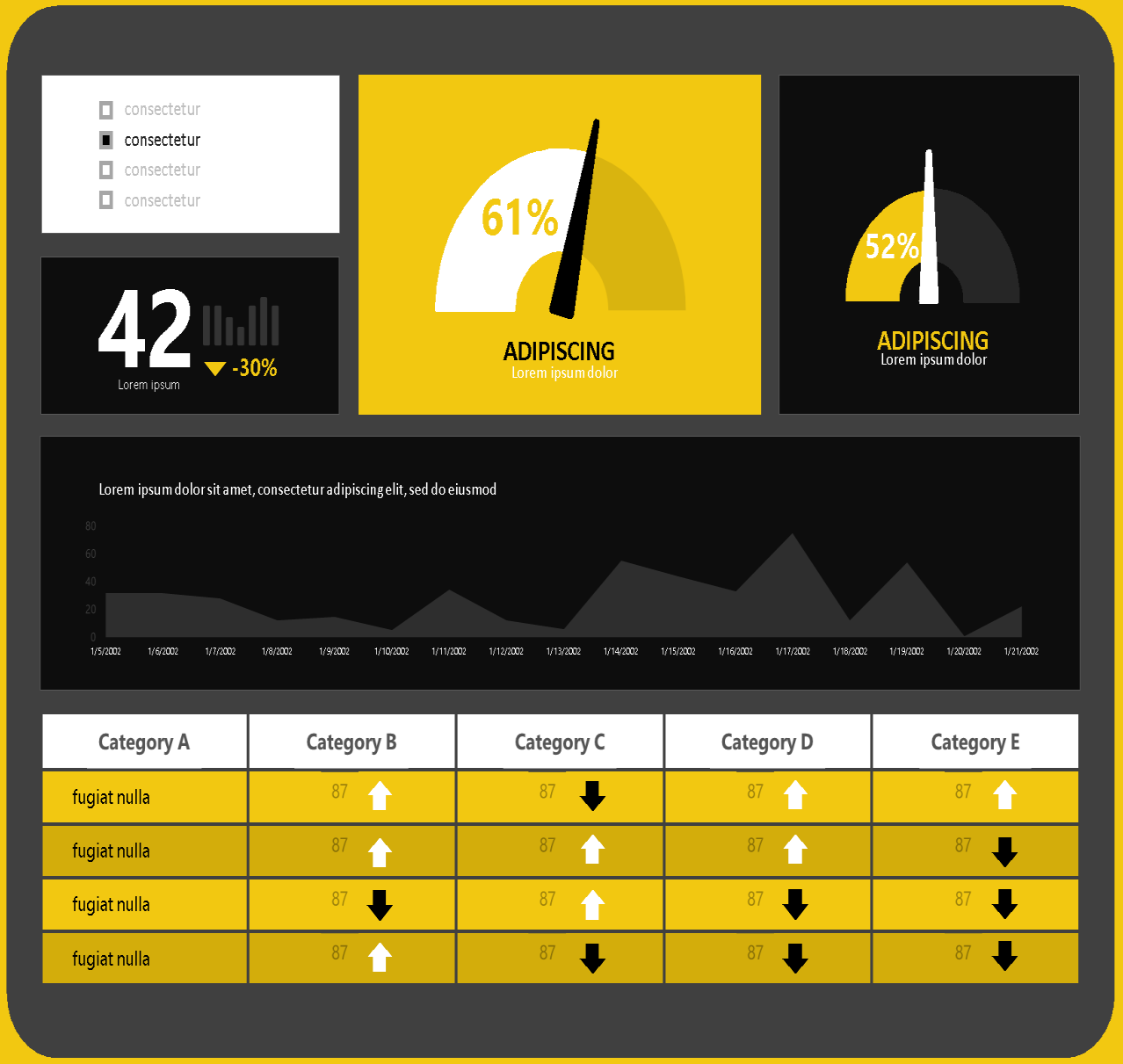


Category A	Category B	Category C	Category D	Category E
fugiat nulla	87 ↑	87 ↓	87 ↑	87 ↑
fugiat nulla	87 ↑	87 ↑	87 ↑	87 ↓
fugiat nulla	87 ↓	87 ↑	87 ↓	87 ↓
fugiat nulla	87 ↑	87 ↓	87 ↓	87 ↓

Success!!!

Thanks!

Slides

By Miguel Myers

Questions? @HavensBI

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

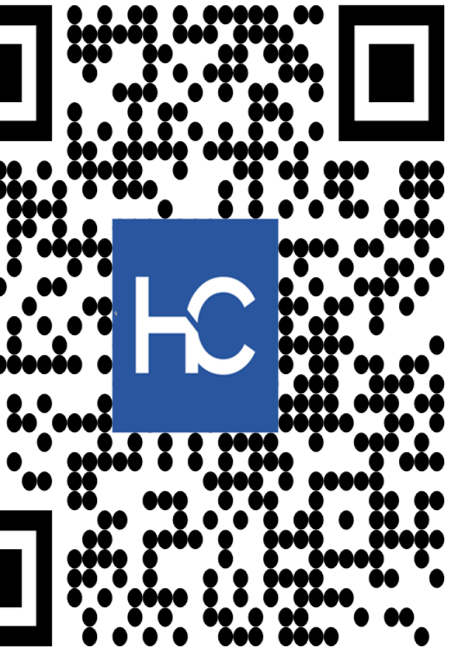
- **Design principle practices:**
  - Apply alignment to *every object* – no exceptions
    - Borders between objects should be able to follow a *natural line* throughout the report page
    - *Enabling Gridlines* in Power BI Desktop will help create consistent borders between visuals
  - Have feedback 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

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

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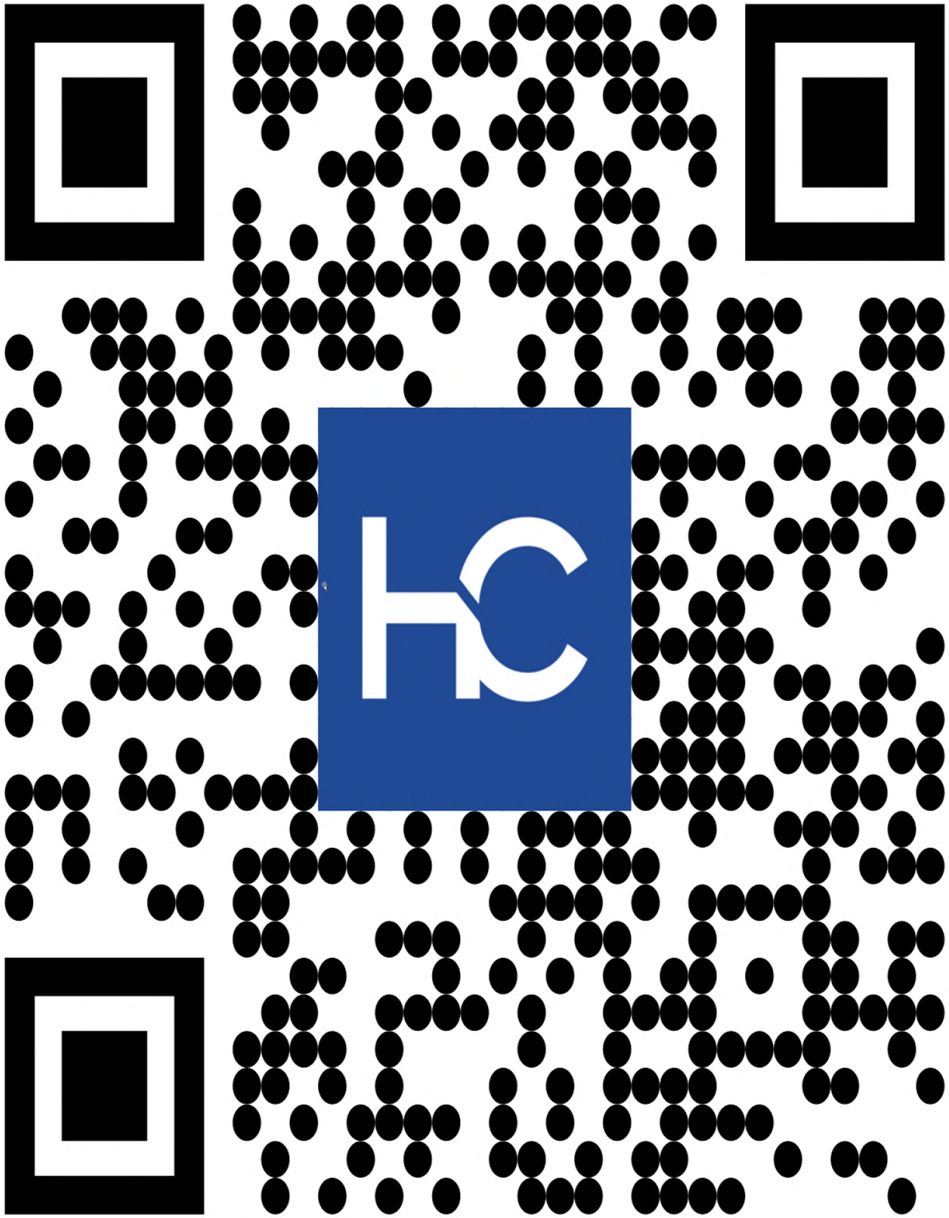
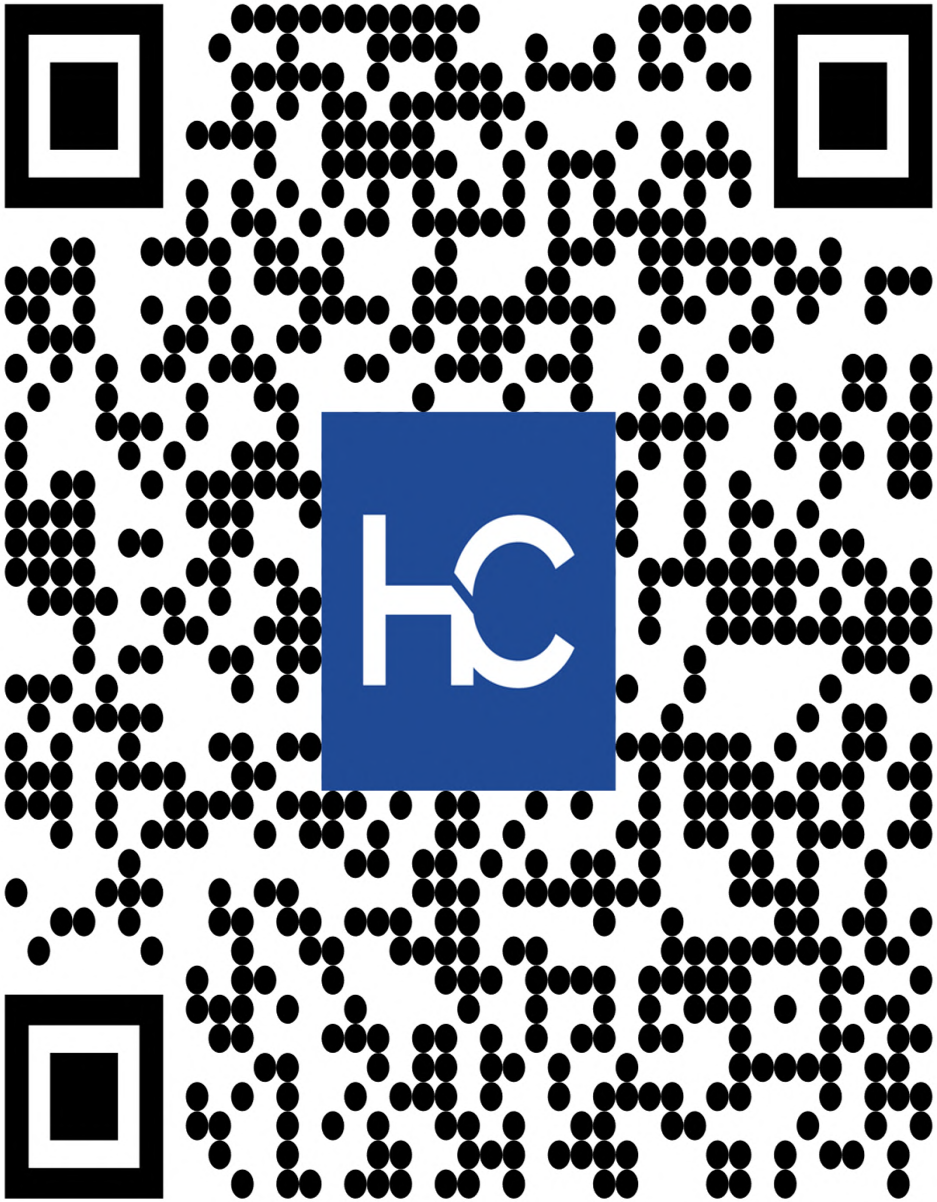
LinkedIn Page

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

Company Website



Blog Signup Raffle