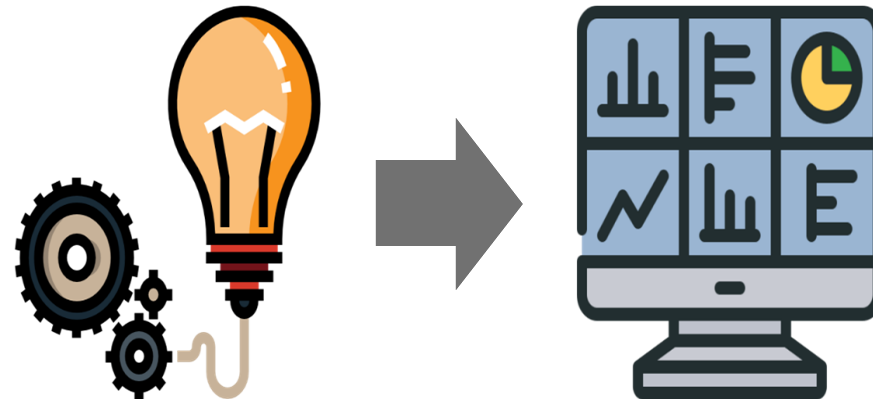


# HAVENS

CONSULTING



## 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

<https://www.havensconsulting.net>

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

**HAVENS**  
CONSULTING



# 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

**HAVENS**  
CONSULTING



# Power BI Real-Time Demo Survey





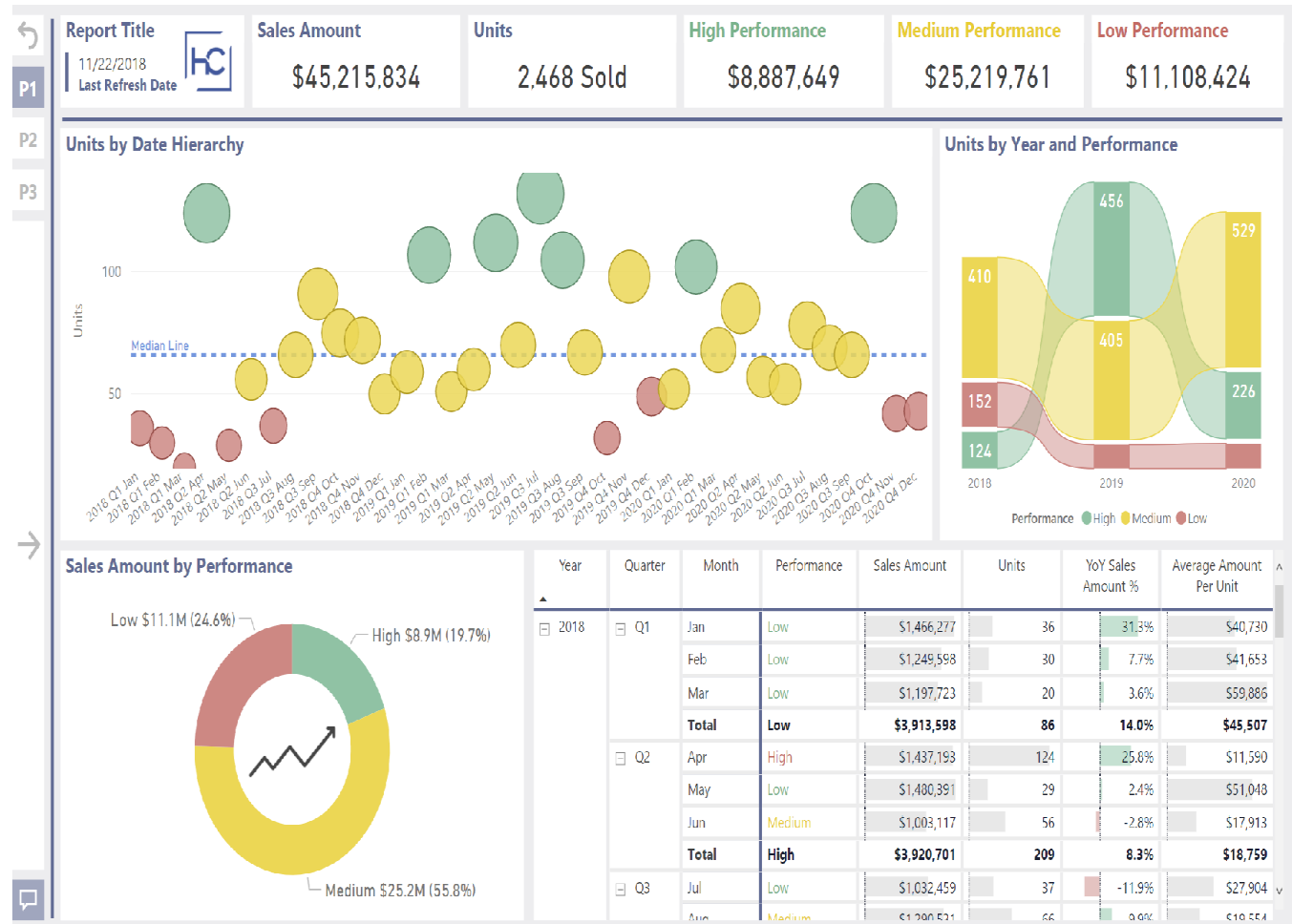


## Defining a Report

- 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

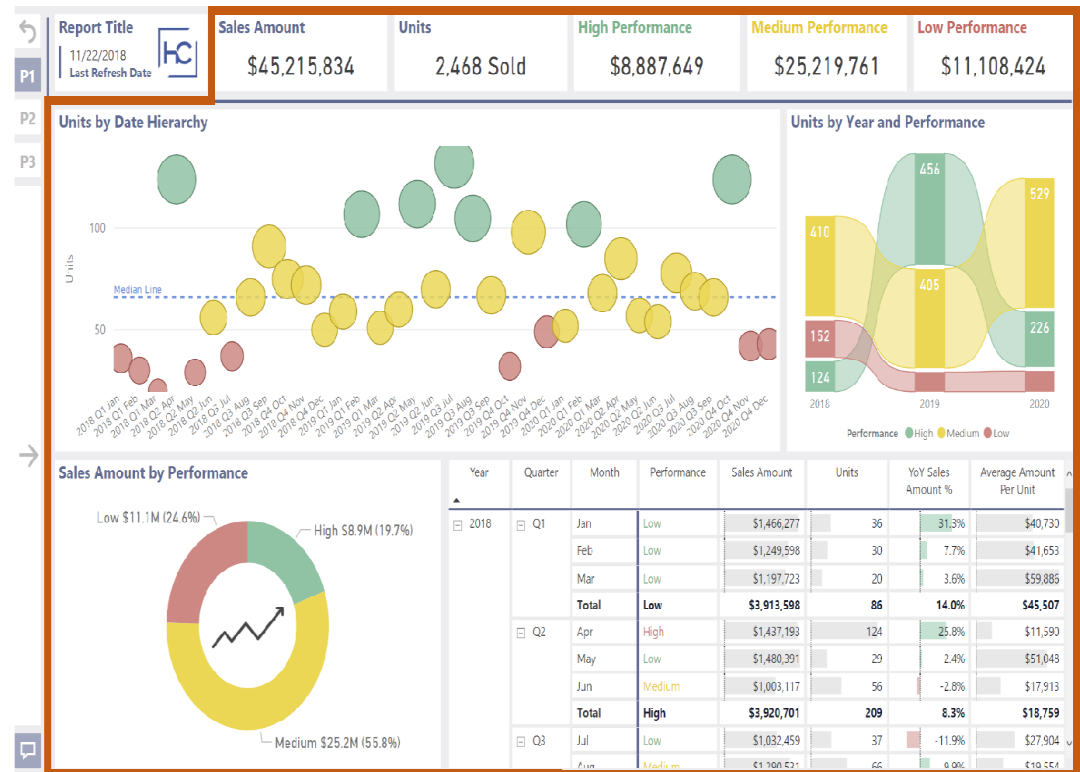
## Essential Report Components

### Three primary components of a report



#### Visualizations

- Displays patterns, trends, or outliers in the data



# Defining a Report

## Essential Report Components

### Three primary components of a report



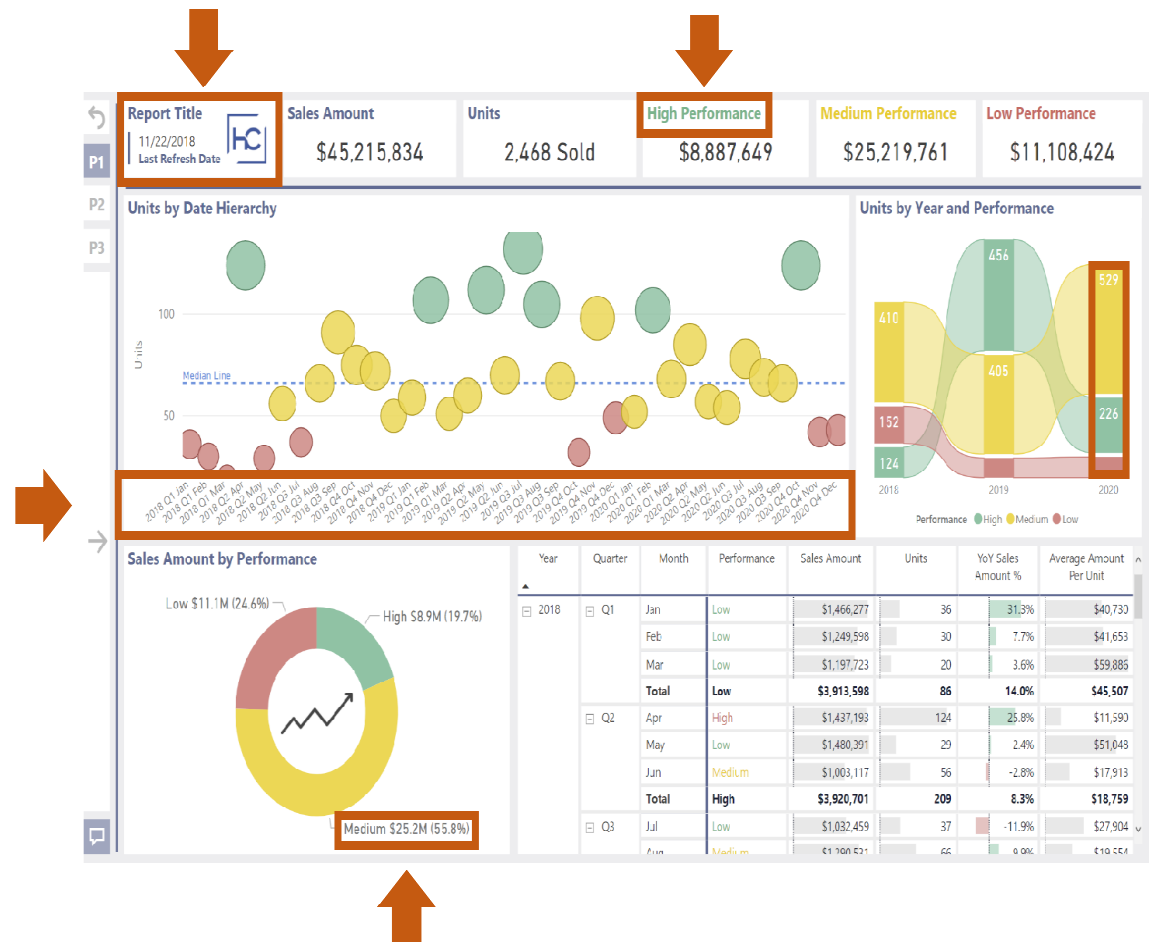
#### Visualizations

- 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



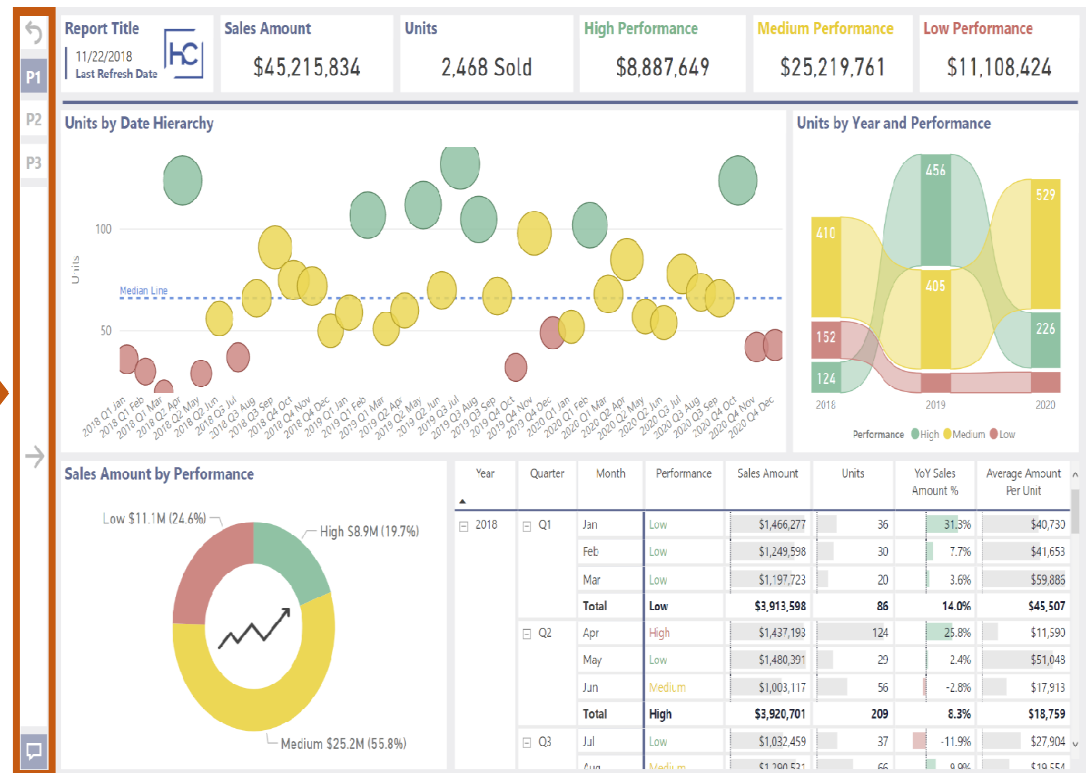
#### Information

- 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

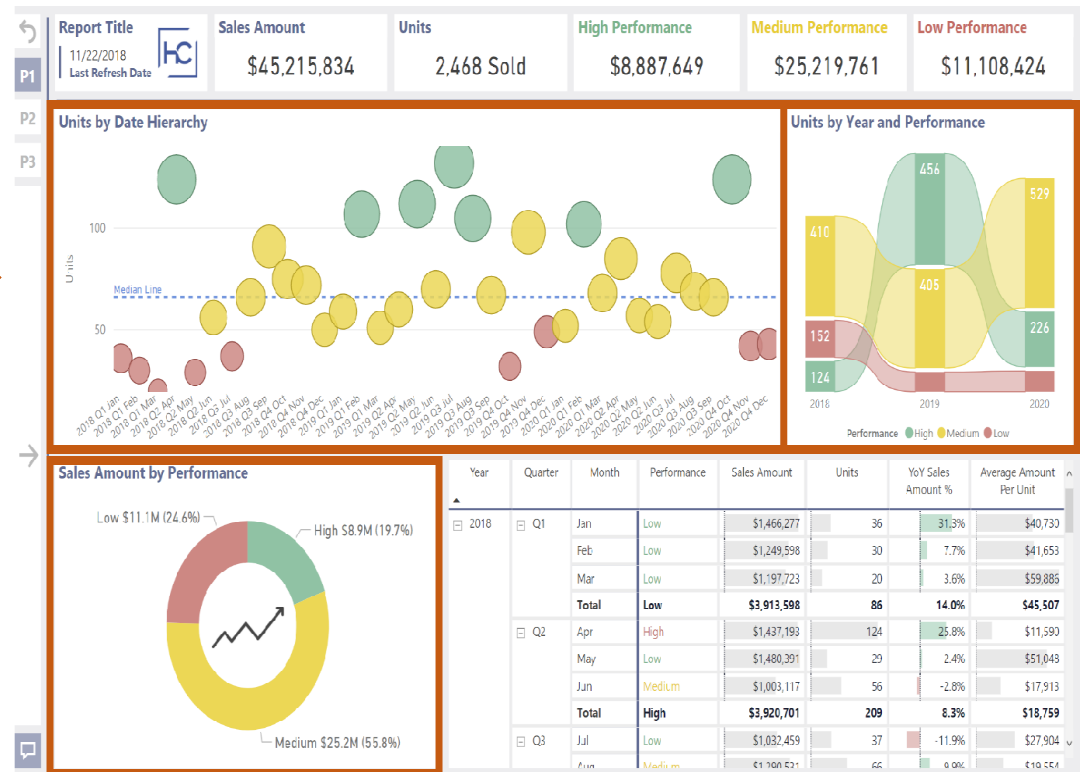
- Displays summarized data that has been categorized and sorted
- Tells a story about the data

### 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



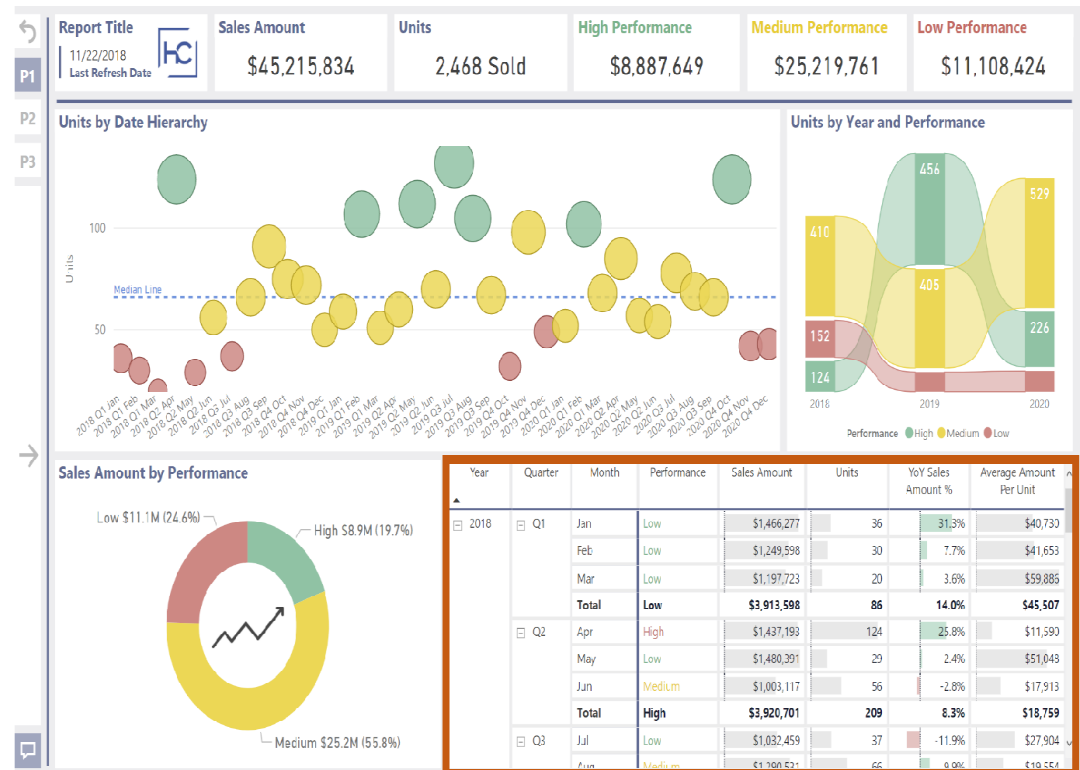
#### Charts / graphs

- 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



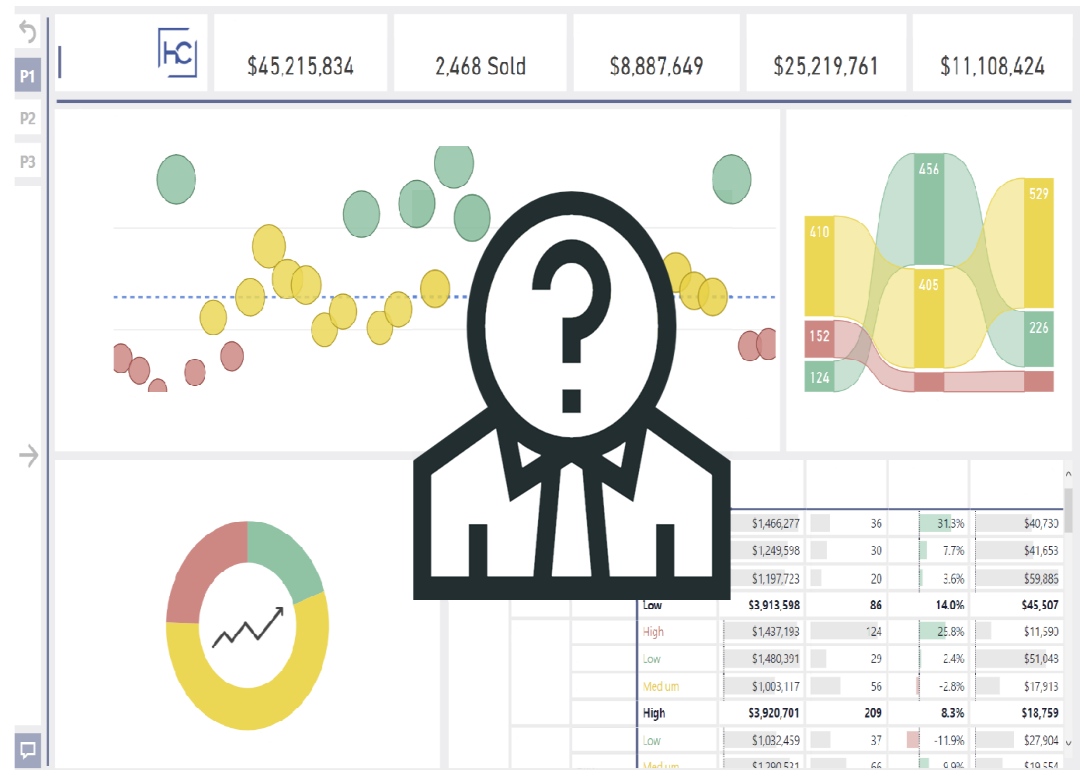
#### Tables

- 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

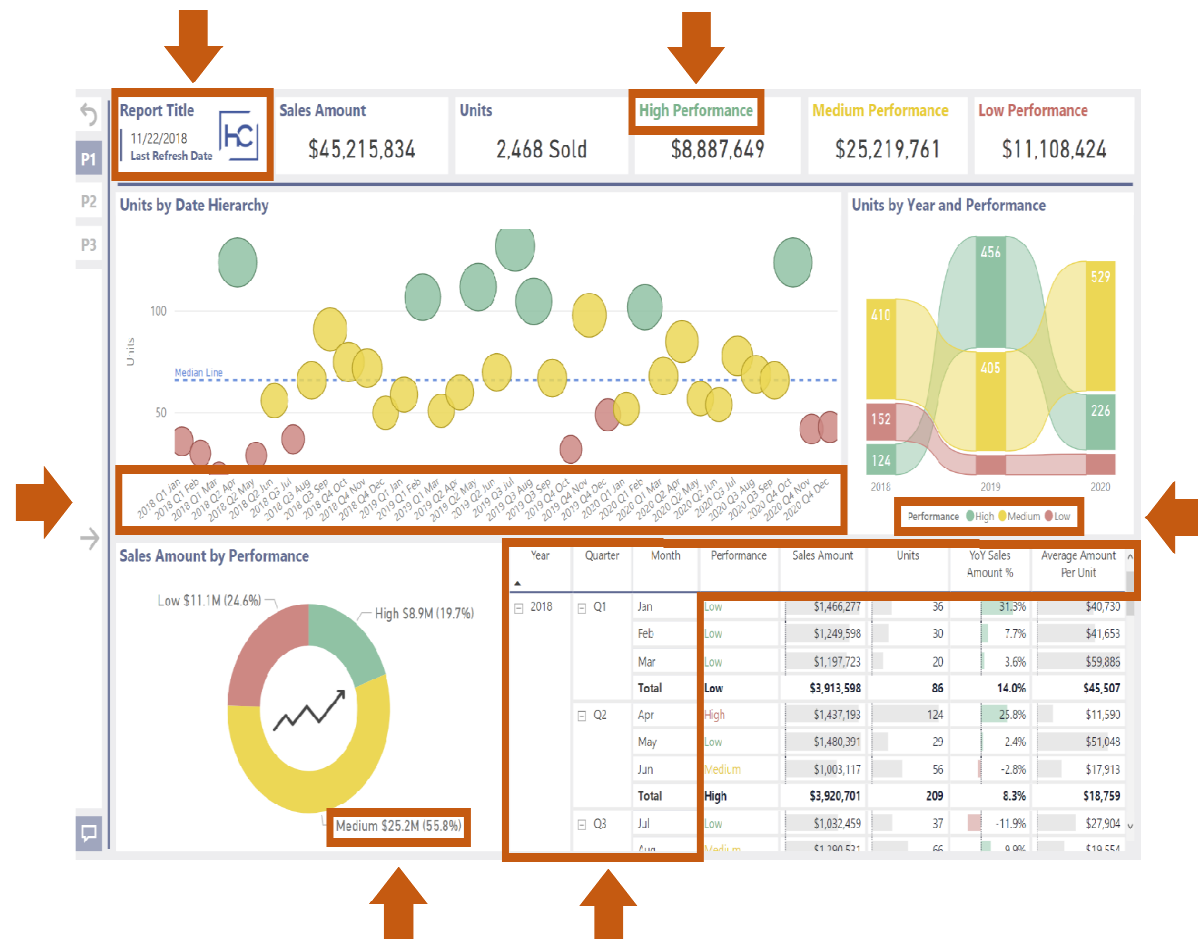
## Essential Report Components ► Information

### 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

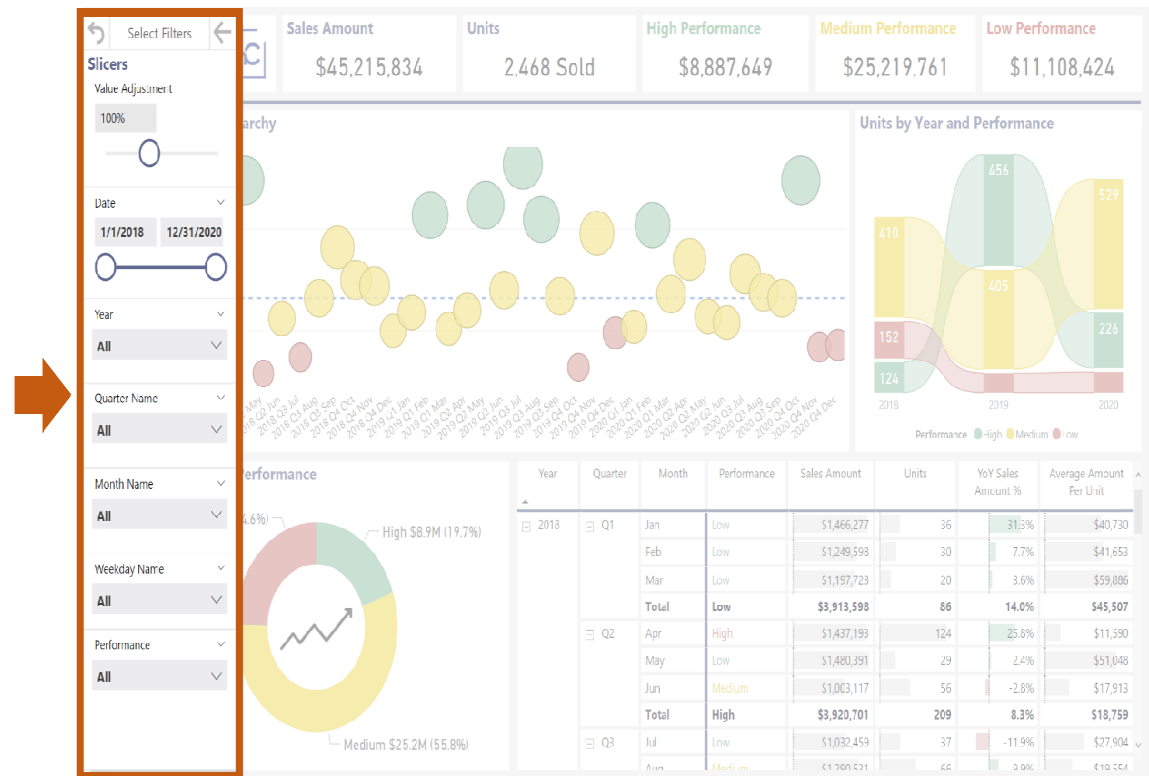
- Allows users to filter on different data segments
- Provides report interactions to derive insights from data

### 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
- Provides report interactions to derive insights from data

### Types of filters



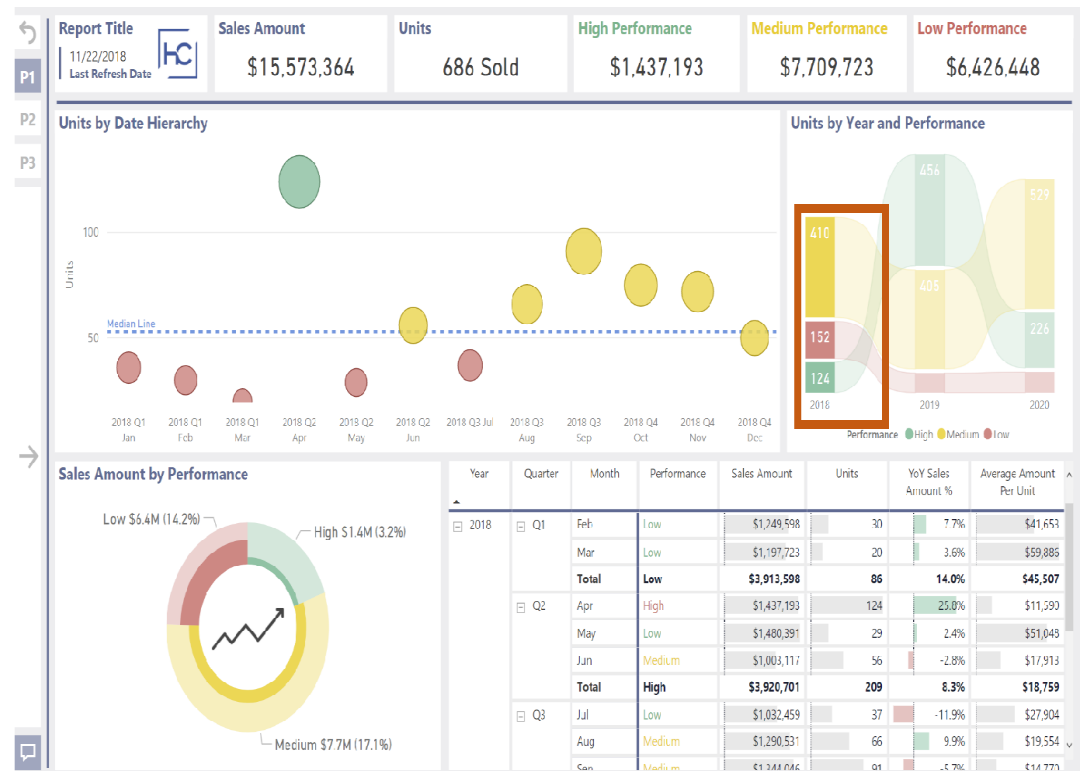
#### Report slicers

- 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

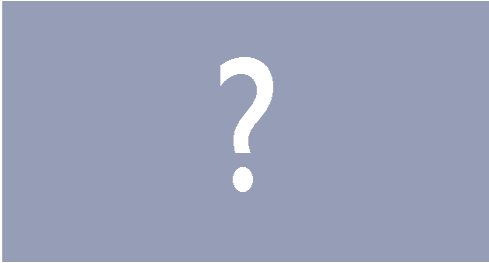
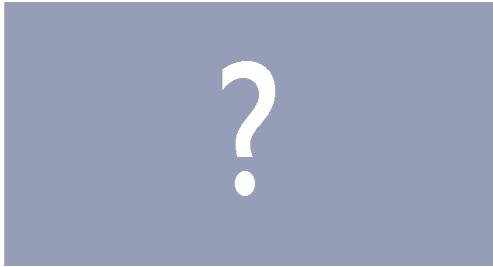
More Detailed



# Three Primary Components of a Report



**Knowledge  
Check**





Questions?



# Design Principles

- Practices for designing more effective reports

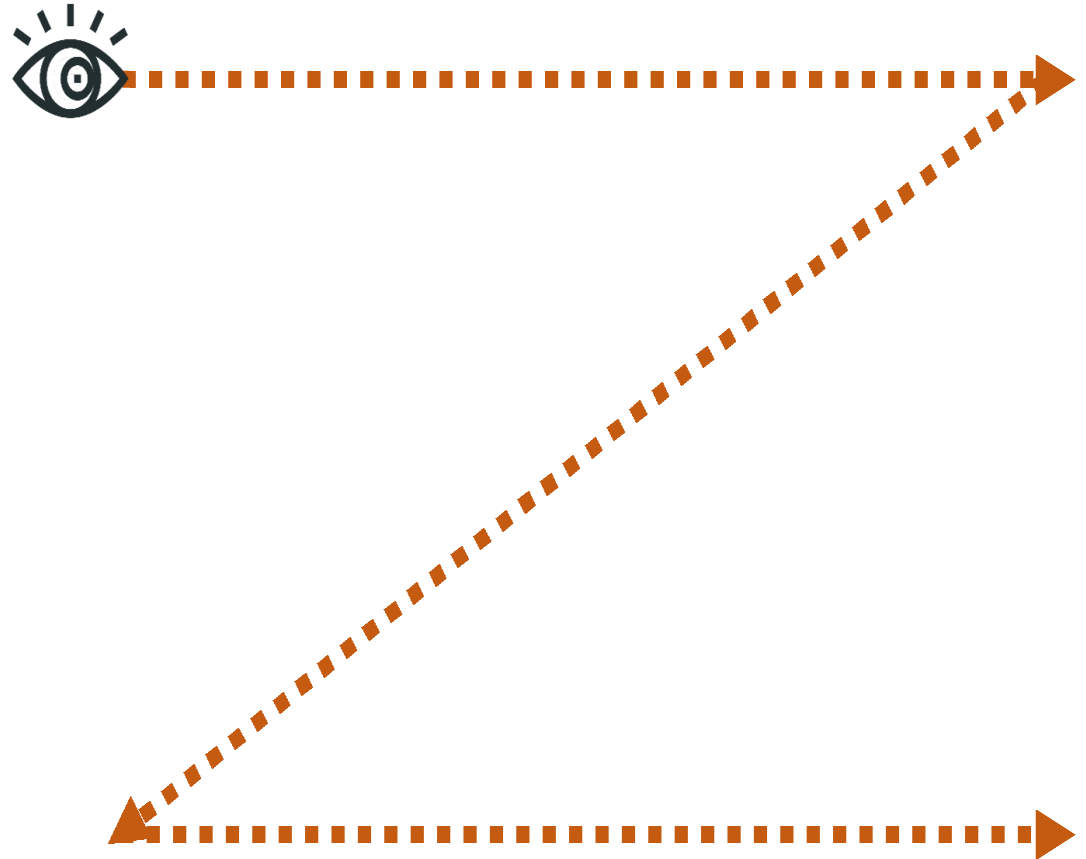


# Design Principles

## 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**.

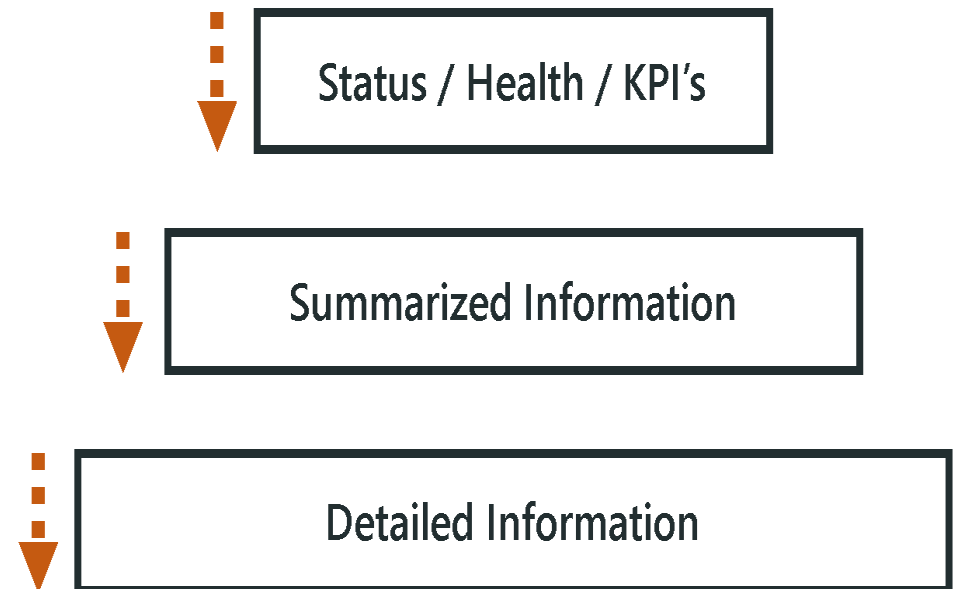


# Design Principles

## 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**

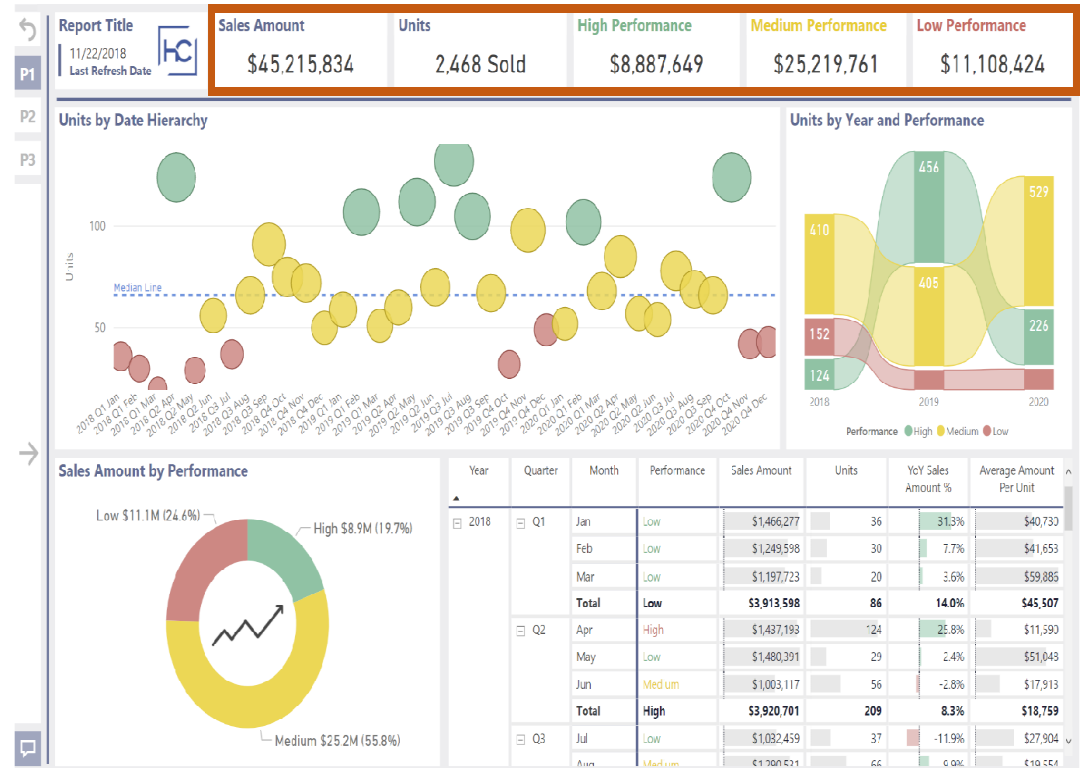


# Design Principles

## 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

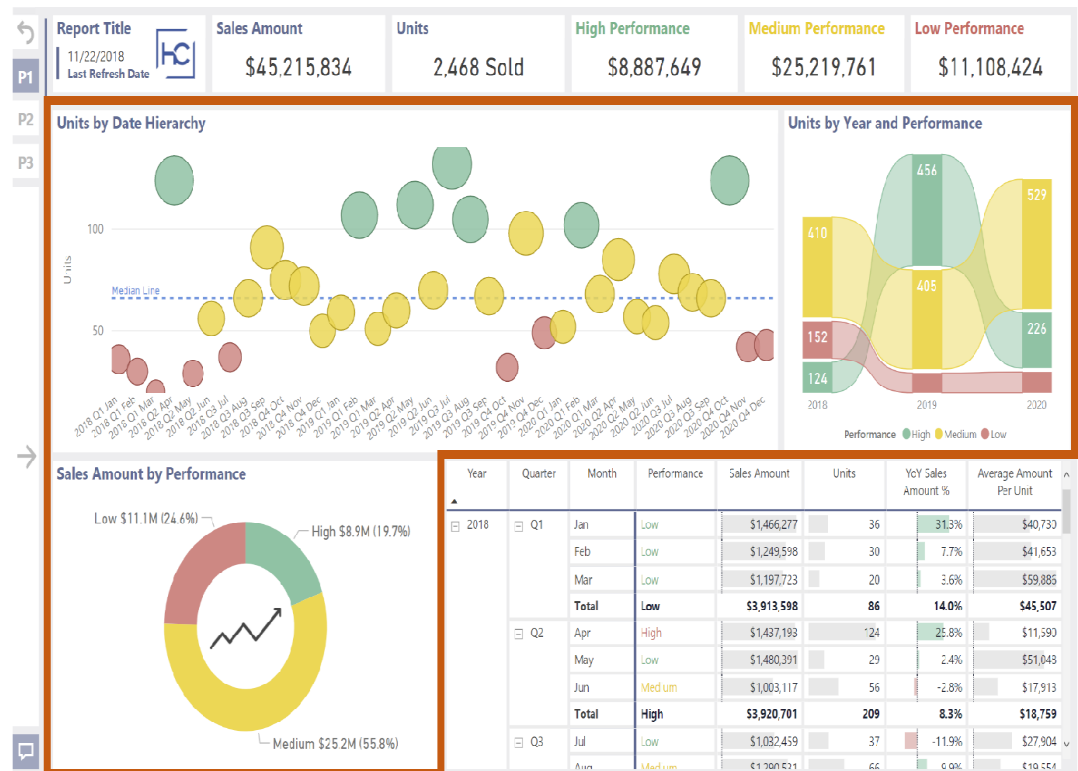


# Design Principles

## Information Processing ► Effective Report Organization

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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

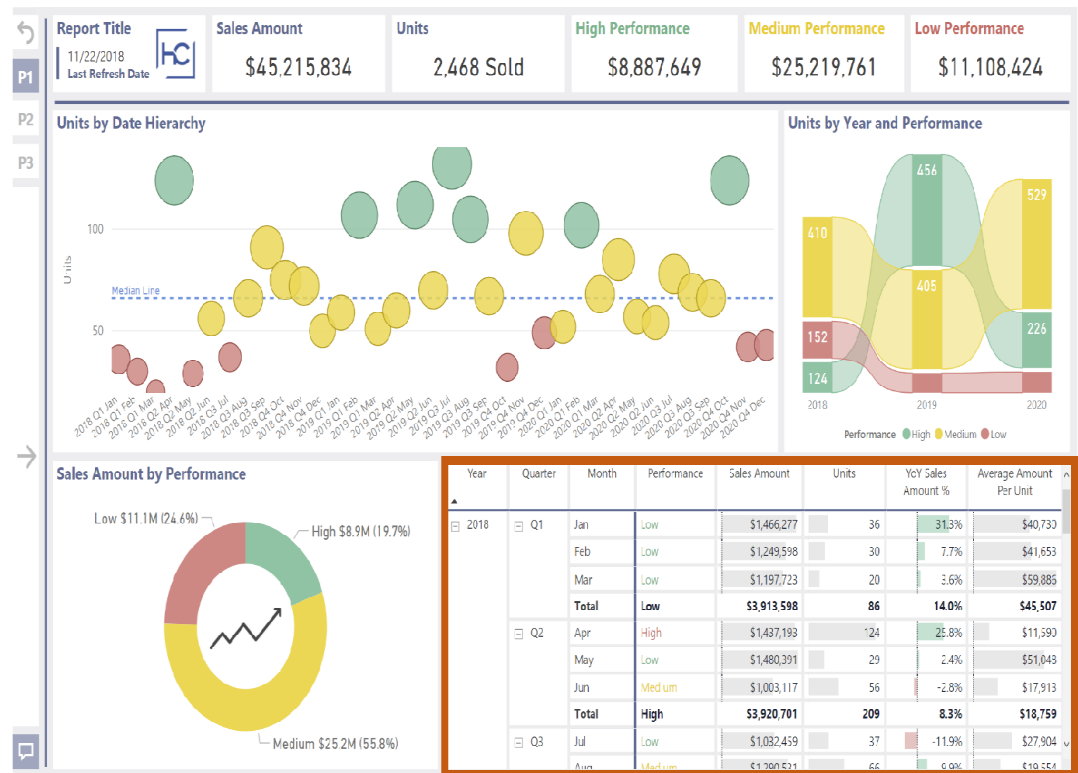


# Design Principles

## Information Processing ► Effective Report Organization

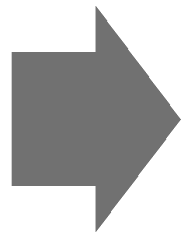
### The data processing flow

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

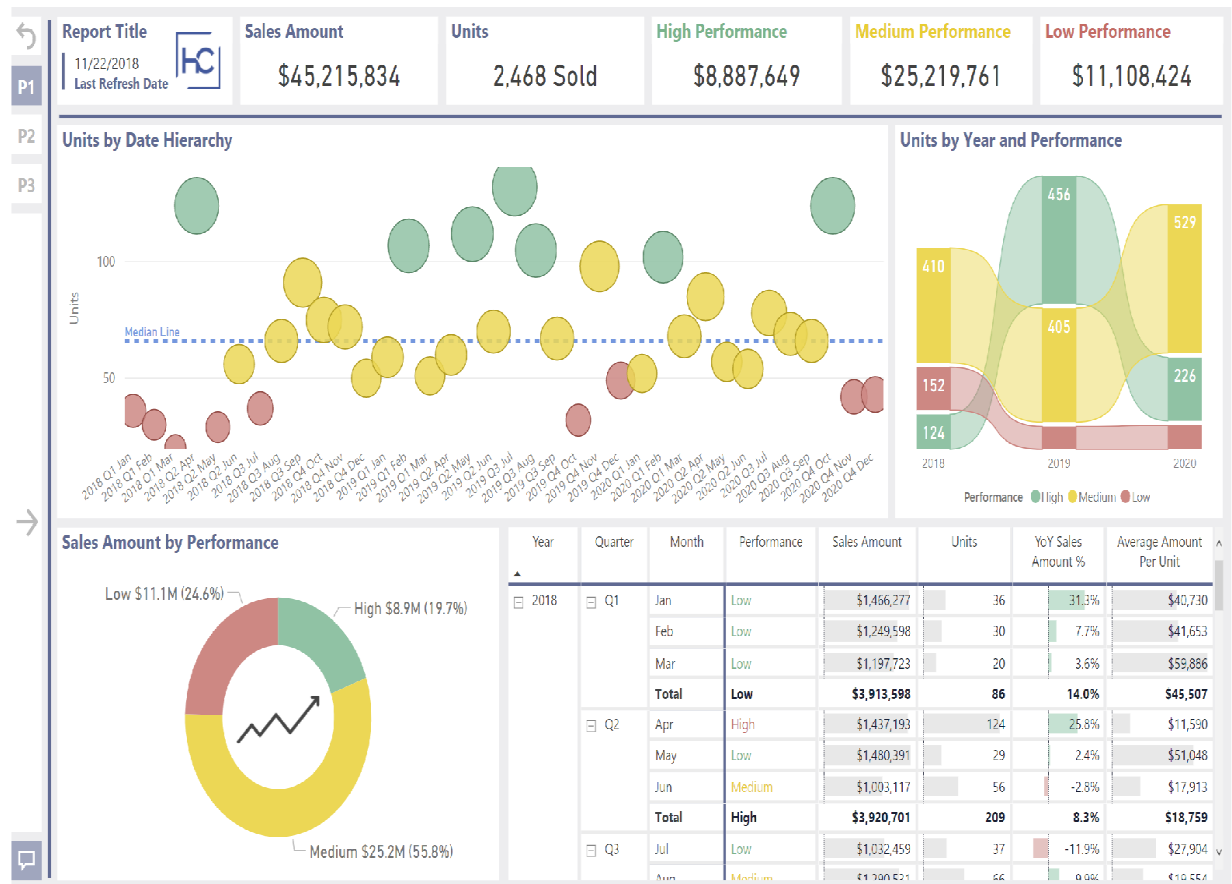


# Design Principles

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

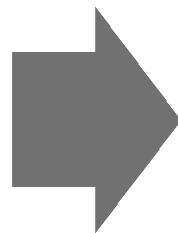


## Report with applied methodologies



# Design Principles

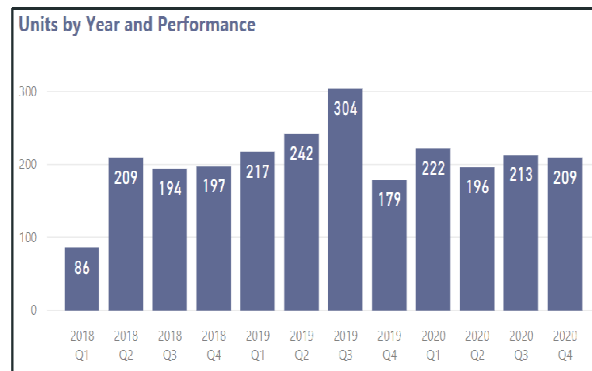
## The S.C.R.A.P Methodology ▶ Spacing



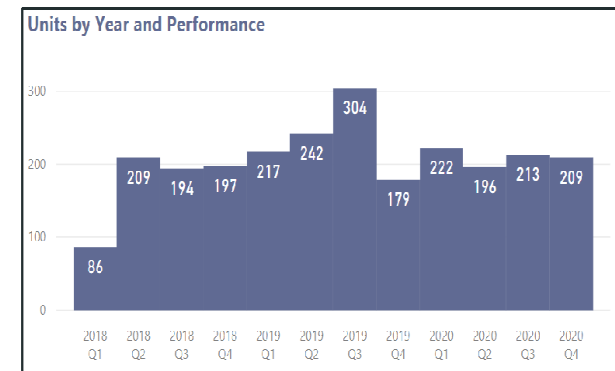
### General concept

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

### Spacing

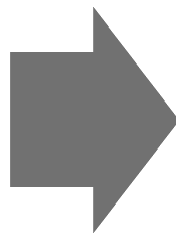


### No Spacing



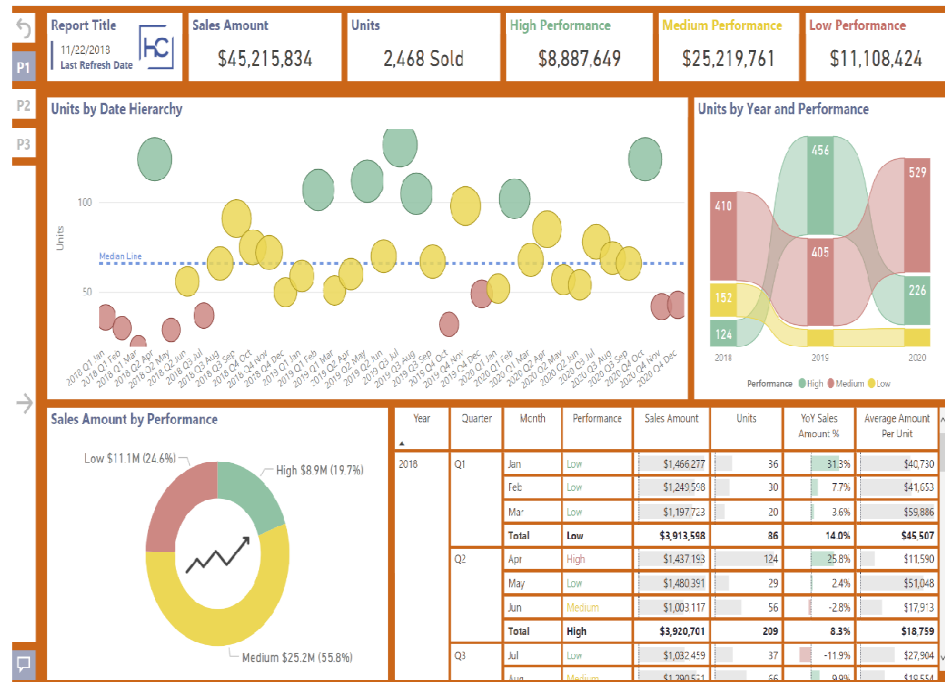
# Design Principles

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



## General concept

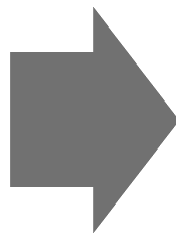
- **Space surrounding** or **between** the objects. Also known as **negative space**
- **Increases readability** by showing boundaries within objects
- Creates **clear boundaries** between objects





# Design Principles

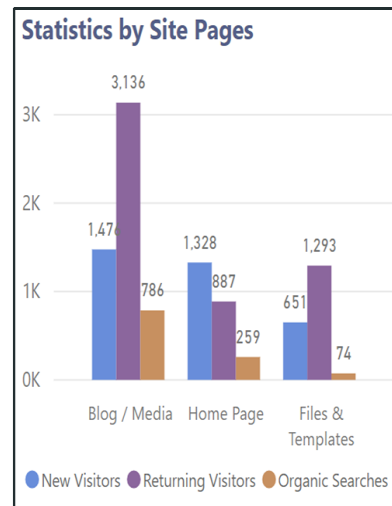
The S.C.R.A.P Methodology ▶ Contrast



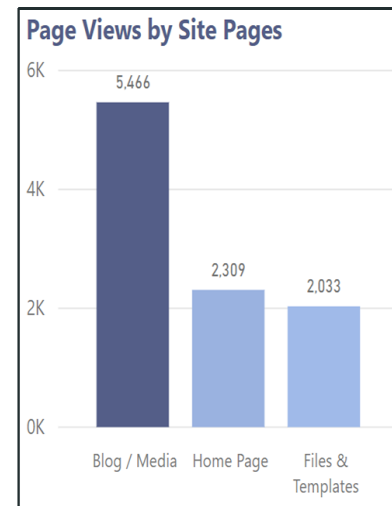
## General concept

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

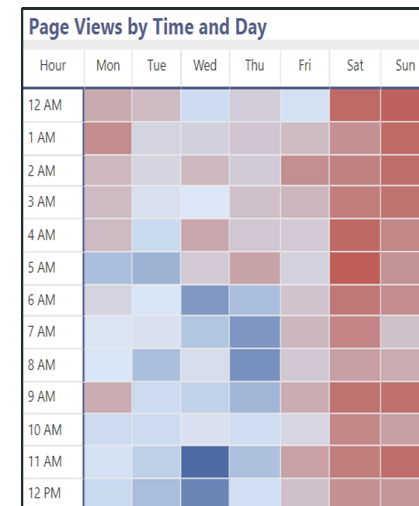
### Categorical Colors



### Sequential Colors

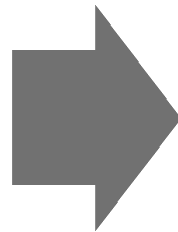


### Diverging Colors



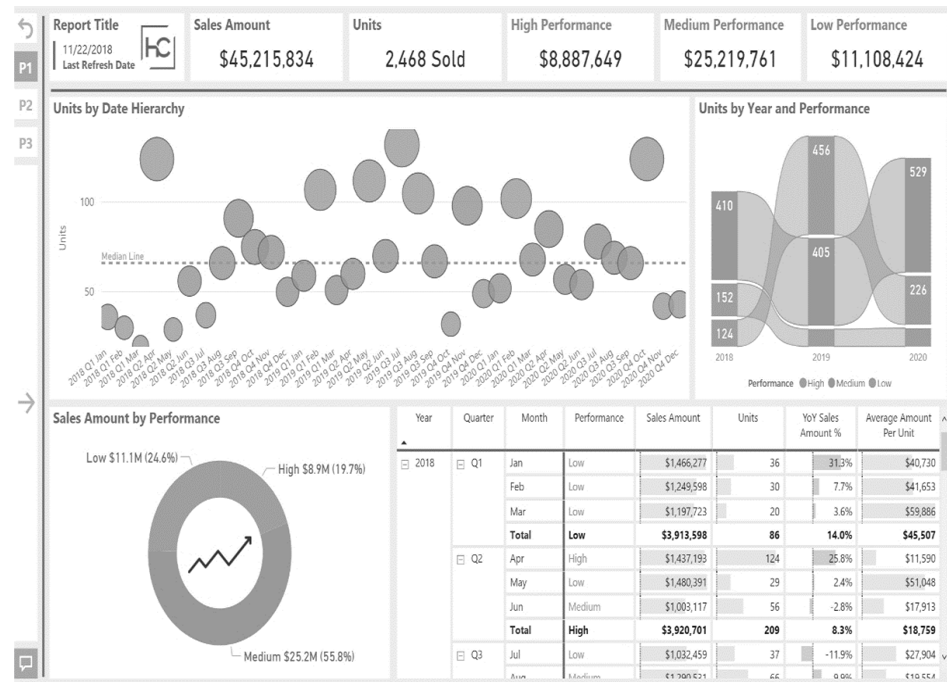
# Design Principles

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



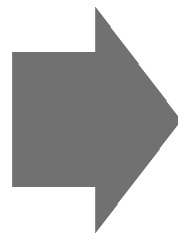
## General concept

- 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



Spacing



Contrast



Repetition



Alignment



Proximity



### General concept

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

Repetition



Repetition

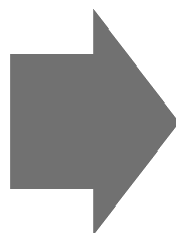


No Repetition



# Design Principles

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



### General concept

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

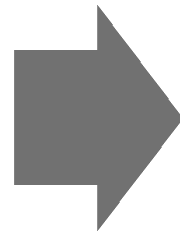
### No Repetition



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
<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



Spacing



Contrast



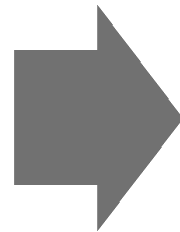
Repetition



Alignment



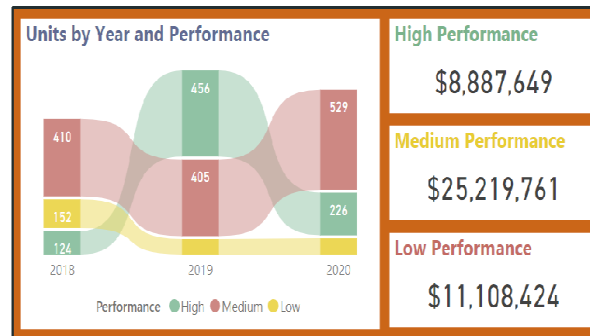
Proximity



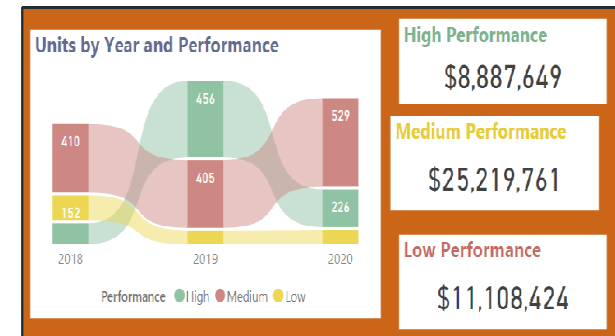
## General concept

- **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

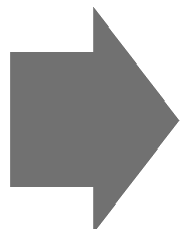


### No Alignment



# Design Principles

The S.C.R.A.P Methodology ▶ Proximity



## 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

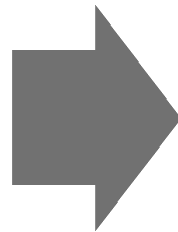
New Site Visitors 5,268 	Returning Visitors 7,317 	Organic Searches 2,712 	<b>Total Visitors</b> 12,585 
---	---	---	---





# Design Principles

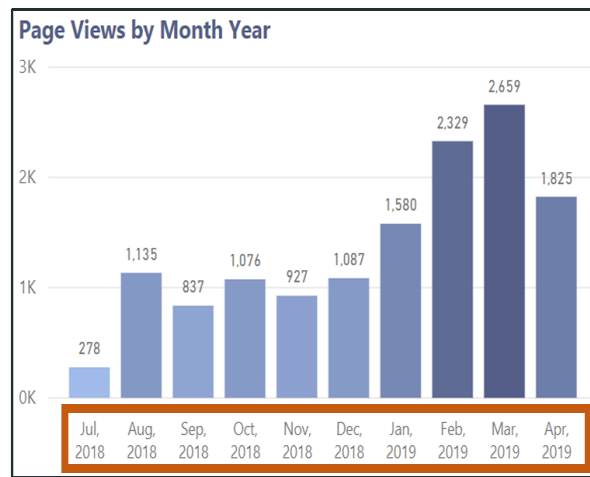
The S.C.R.A.P Methodology ► Proximity



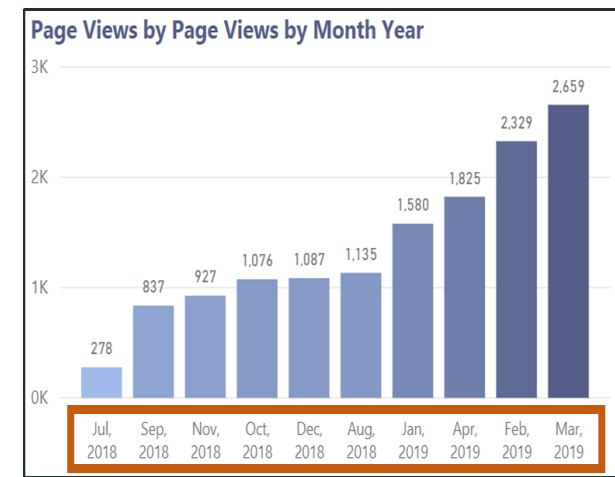
## General concept

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

### Proximity



### No Proximity

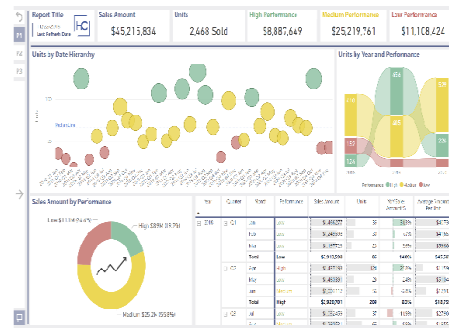
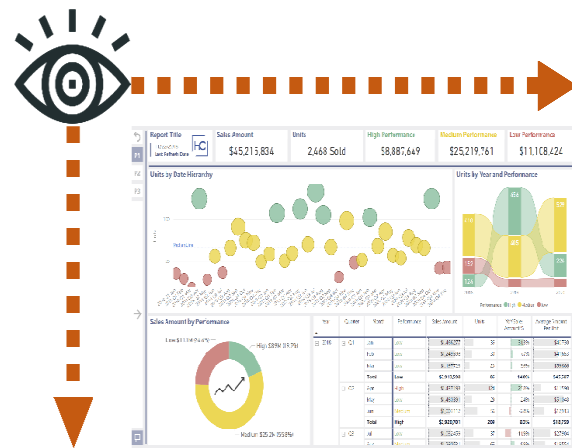


# Design Principles

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

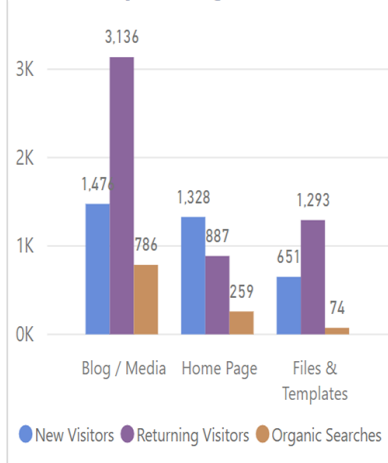
What are the **three types of color contrast** that can be used to distinguish elements?

Categorical

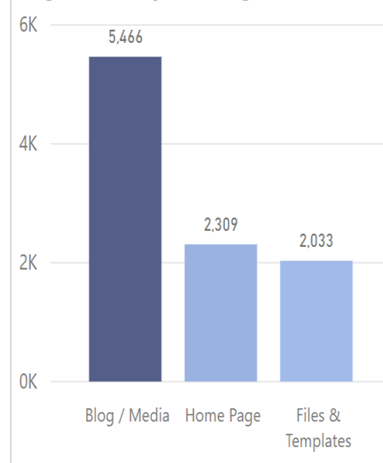
Sequential

Diverging

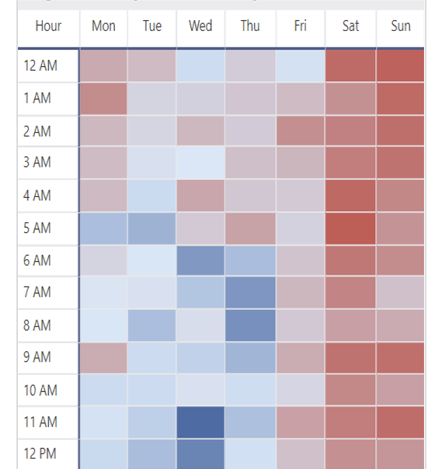
Statistics by Site Pages



Page Views by Site Pages



Page Views by Time and Day



Knowledge  
Check



Questions?



# Data Visualization

- Methodologies for creating impactful visualizations

# Design Principles

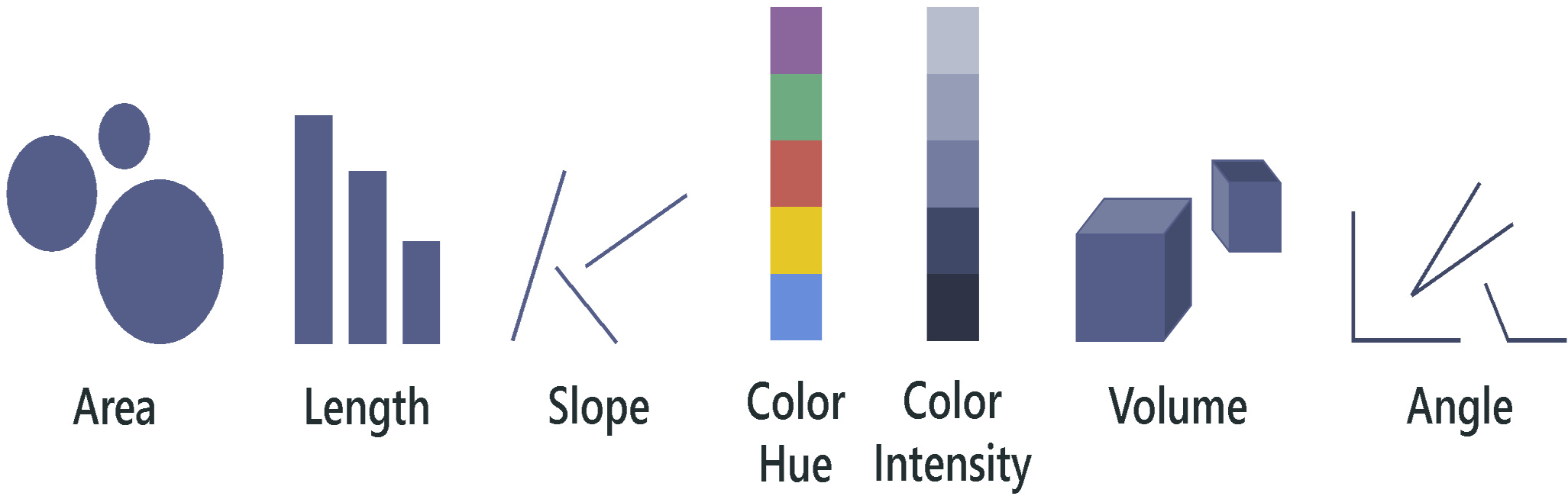
## Visual Cues

### 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

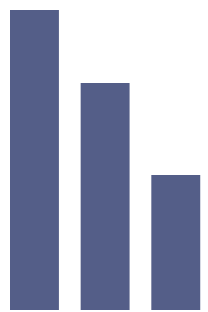
Visual Cues ▶ Ranked

## General methodology

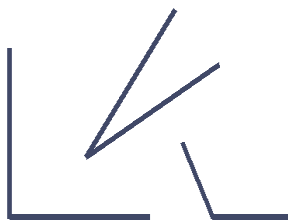
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- Each visual cue is **interpreted** differently by the human brain



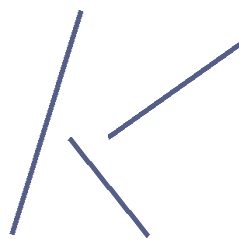
## Visual cues ranked by accuracy



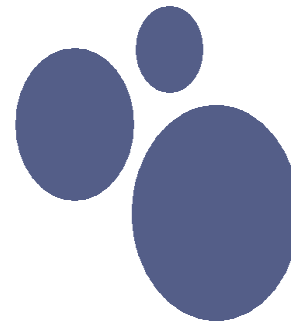
Length



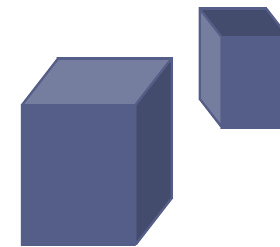
Angle



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)

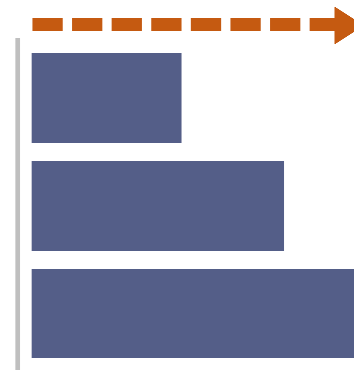


Tree Map

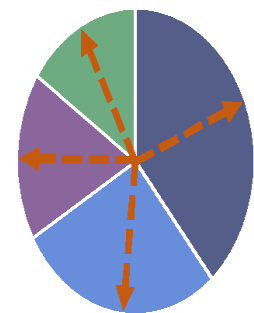


#### Direction

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



Bar  
Chart



Pie  
Chart



# Design Principles

## Visual Categories



# 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 Akevelon
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 Akevelon
KPI Column by MAQ	Scatter Chart by Akevelon	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
Acterys 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
Characterist BarChart	CharAccount 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



# THE VISUALS REFERENCE

— FOR MICROSOFT POWER BI —

SEP. 2018

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

### 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



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# Design Principles

## Visual Categories



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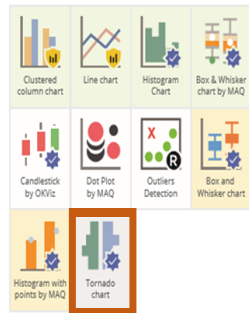
### PART-TO-WHOLE

Display the parts of a measure



### DISTRIBUTION

Display the distribution of a measure



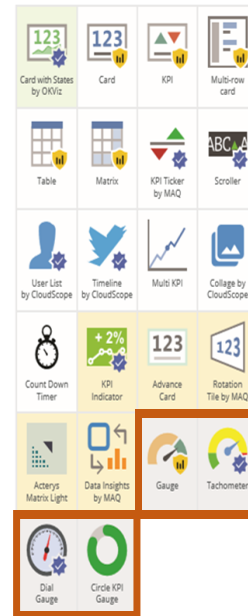
### CORRELATION

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

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Built-in visual

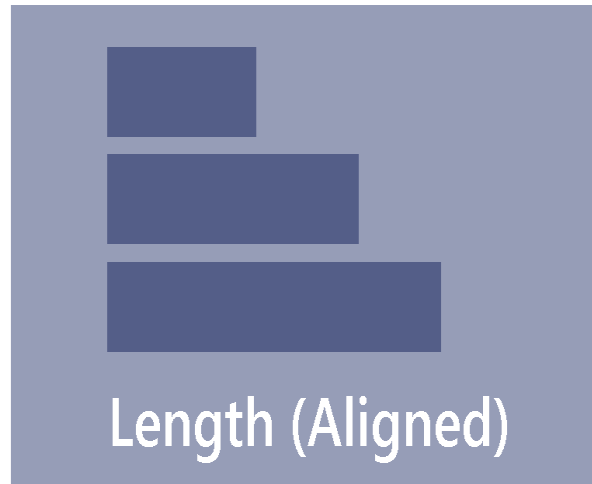
Certified visual

R required

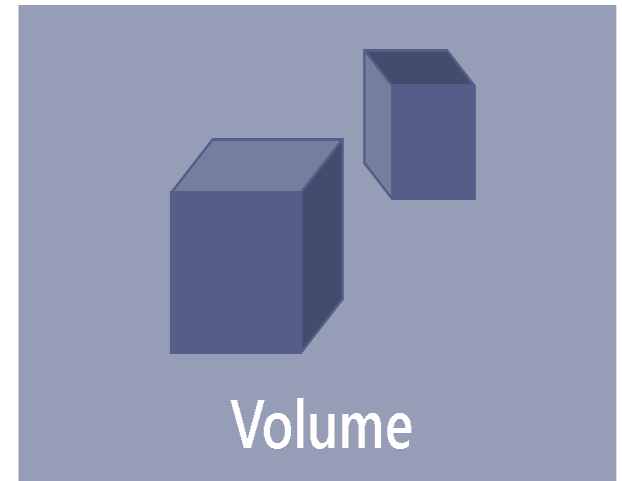


# Visual Cues

**Easiest** visual cue to process?

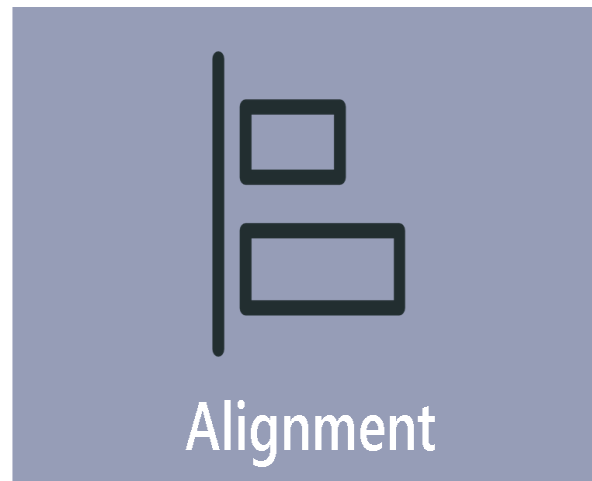


**Hardest** visual cue to process?

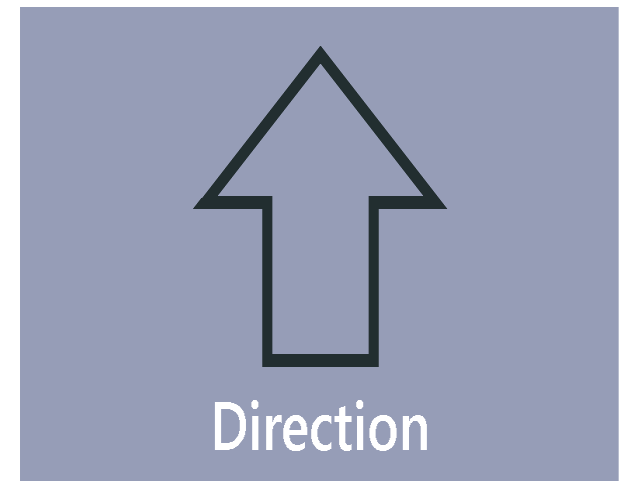


## Knowledge Check

What influences **accuracy**?

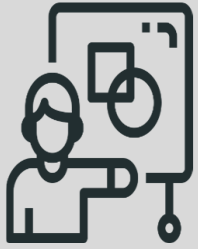


What influences **accuracy**?





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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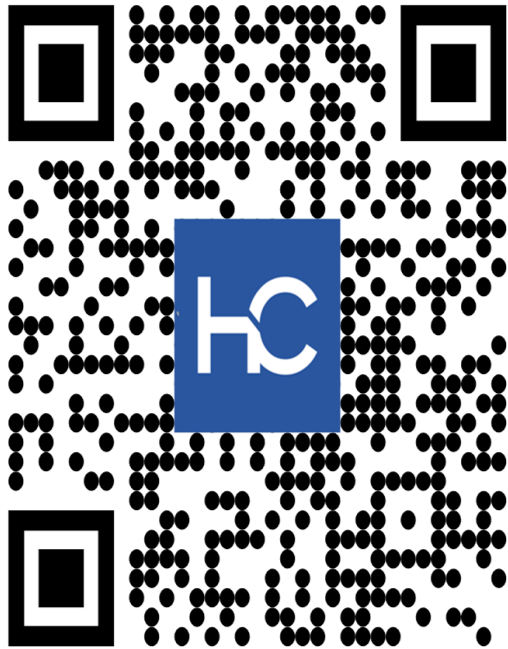
YouTube Channel

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

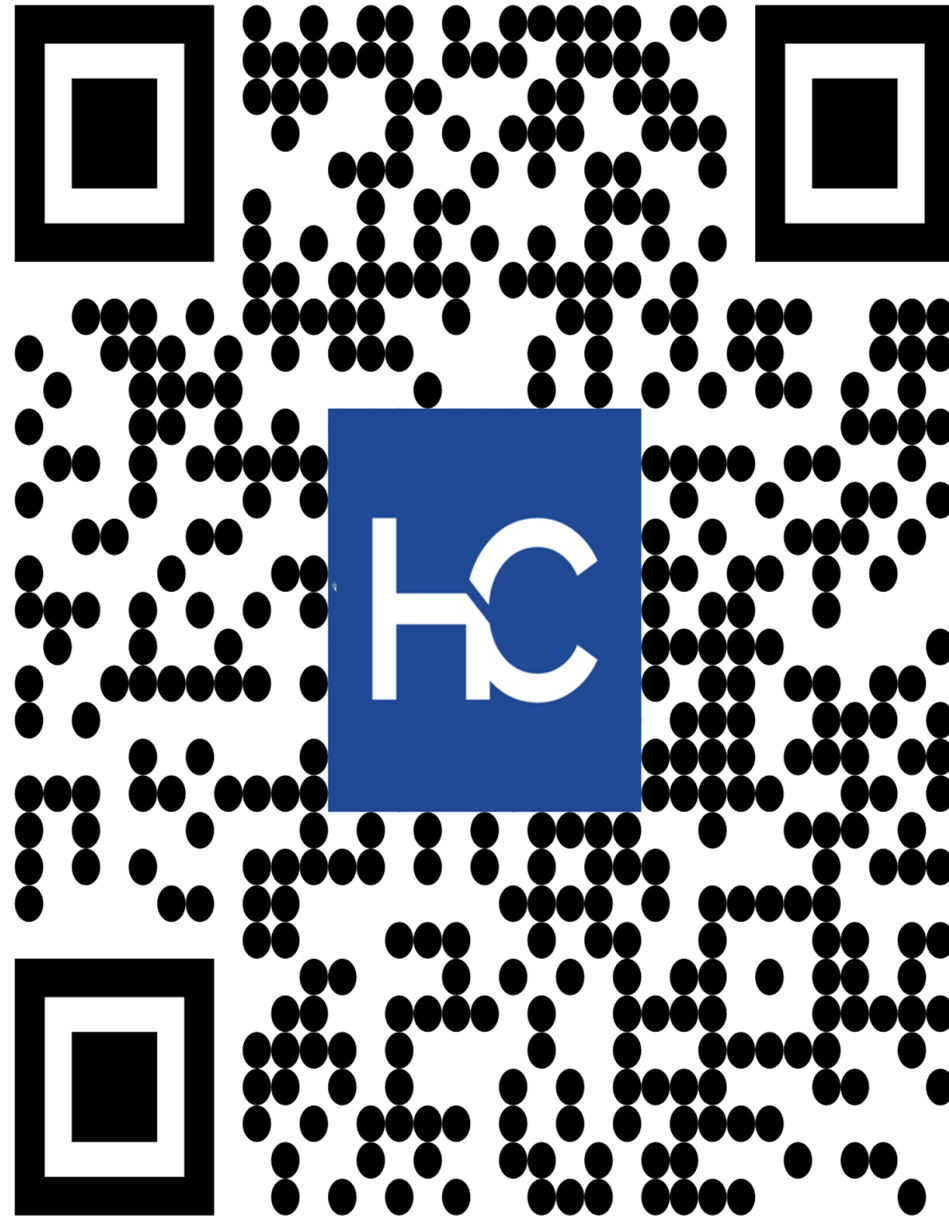


LinkedIn Page

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



# Company Website



# Blog Signup Raffle

