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Sensing, Seeing, and Showing: Visualizing Data in OAC

ODTUG Kscope 2019

Tim Vlamis

June 25, 2019

@VlamisSoftware

Vlamis Software Solutions

- Vlamis Software founded in 1992 in Kansas City, Missouri
- Developed 200+ Oracle BI and analytics systems
- Specializes in Oracle-based:
  - Enterprise Business Intelligence & Analytics
  - Analytic Warehousing
  - Data Mining and Predictive Analytics
  - Data Visualization
- Multiple Oracle ACEs, consultants average 15+ years
- www.vlamis.com (blog, papers, newsletters, services)
- Co-authors of book “Data Visualization for OBI”
- Co-author of book “Oracle Essbase & Oracle OLAP”
- Oracle University Reseller
- Oracle Gold Partner

ORACLE Gold Partner
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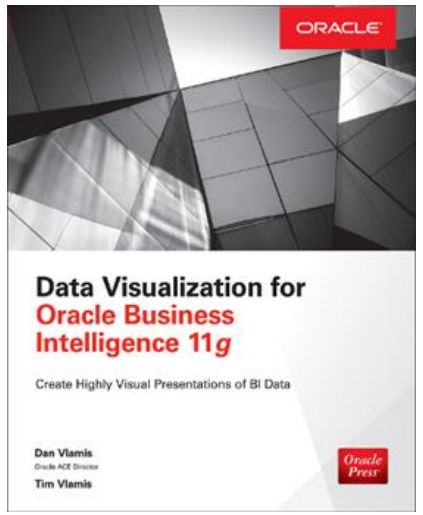

ORACLE ACE Director

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ORACLE EDUCATION RESELLER

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Tim Vlamis

Vice President & Analytics Strategist

- 30+ years in business modeling and valuation, forecasting, and scenario analyses
- Oracle ACE
- Instructor for Oracle University's Predictive Analytics, Data Mining Techniques and Oracle R Enterprise Essentials Courses
- Professional Certified Marketer (PCM) from AMA
- MBA Kellogg School of Management (Northwestern University)
- BA Economics Yale University

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Presentation Agenda

- Explanation vs. Exploration vs. Extrapolation
- Dashboards and Analyses in the legacy OBIEE interface
- Data exploration in the Oracle Data Visualization interface
- Strategies for dimensional visualizations
- Using Sankey, parallel coordinates, and network visualizations
- Designing Narratives and visual guides
- Standards and conventions

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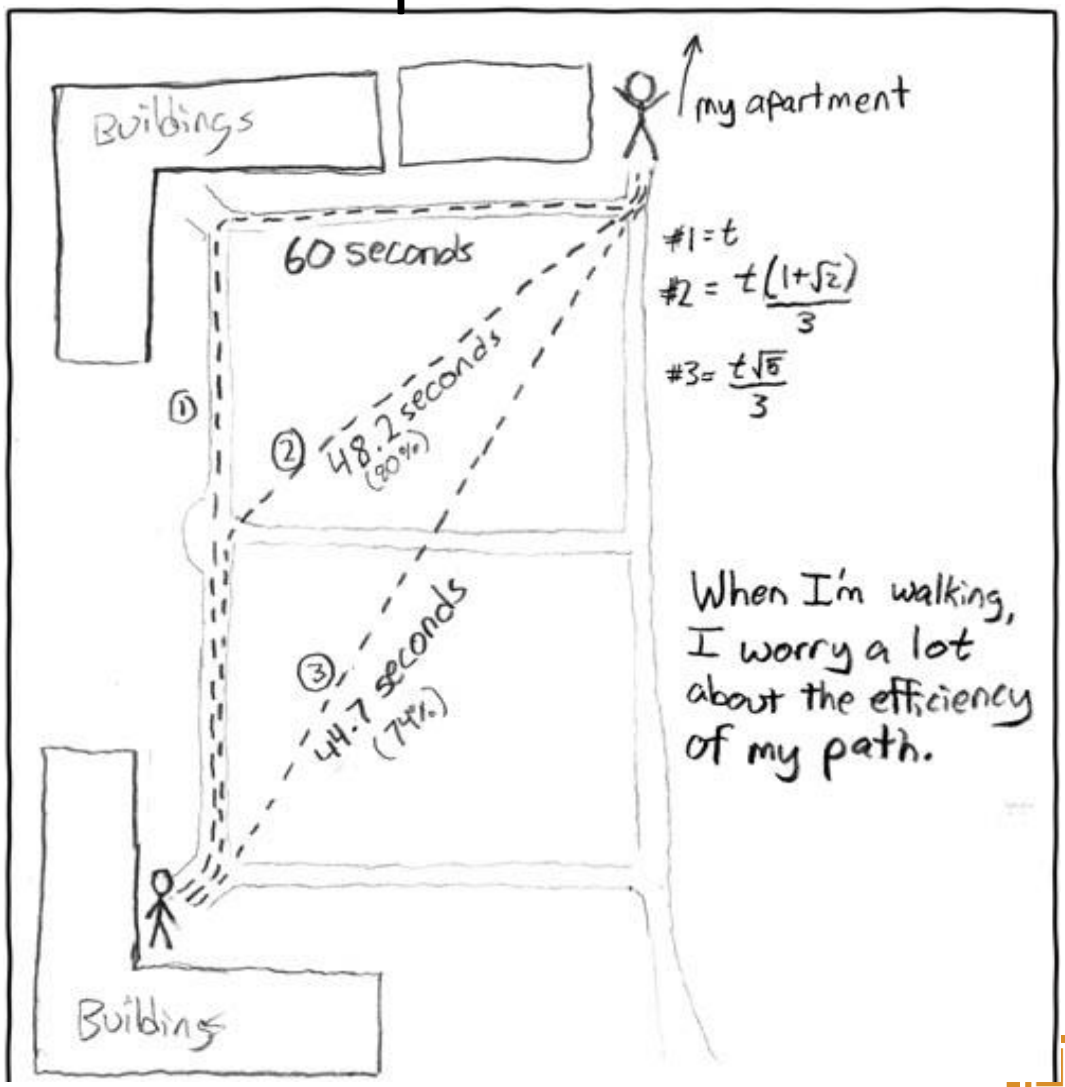
Three Main Functions of Analytics Systems

Exploration

Explanation



xkcd.com

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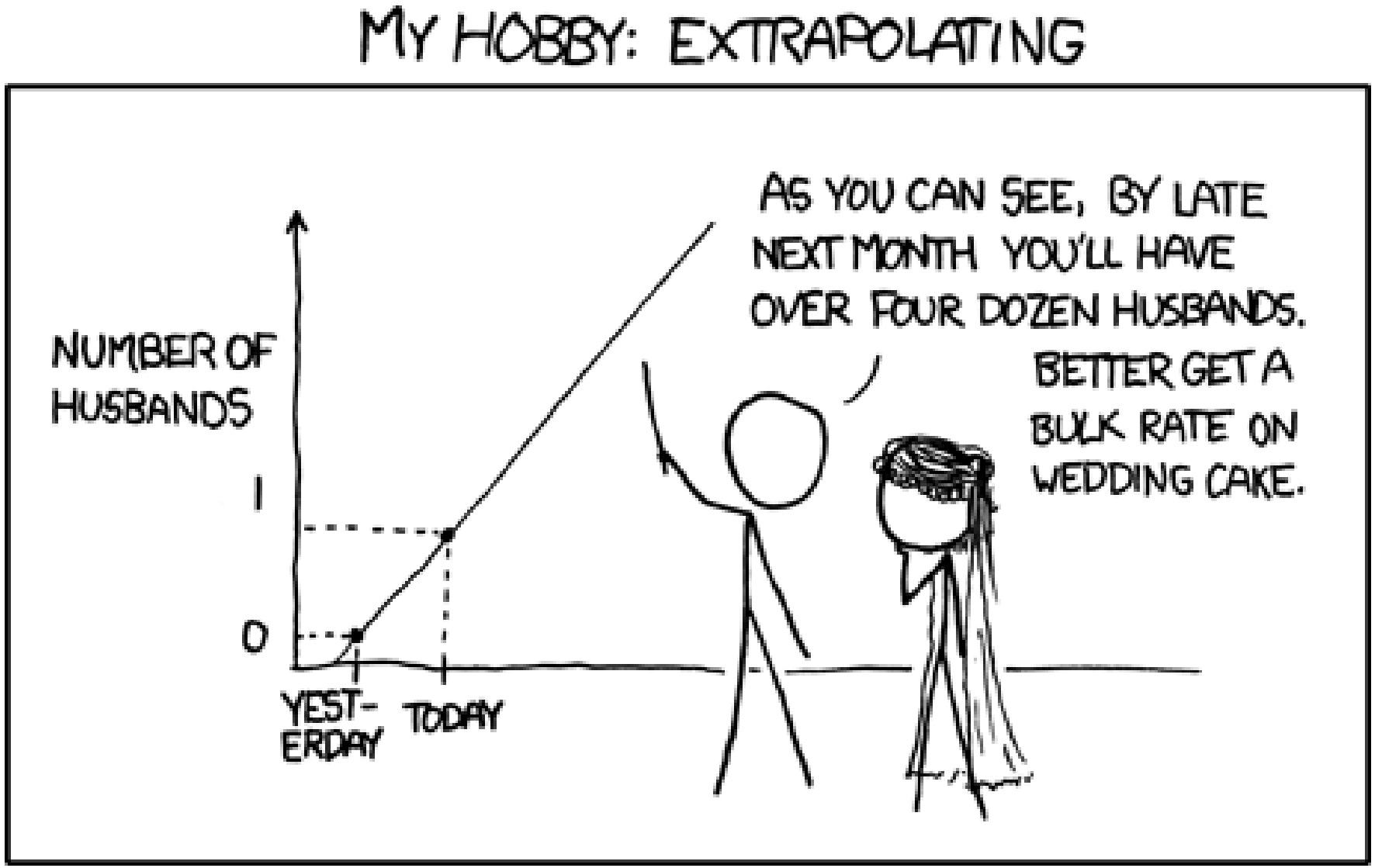
Extrapolation



https://xkcd.com/605/

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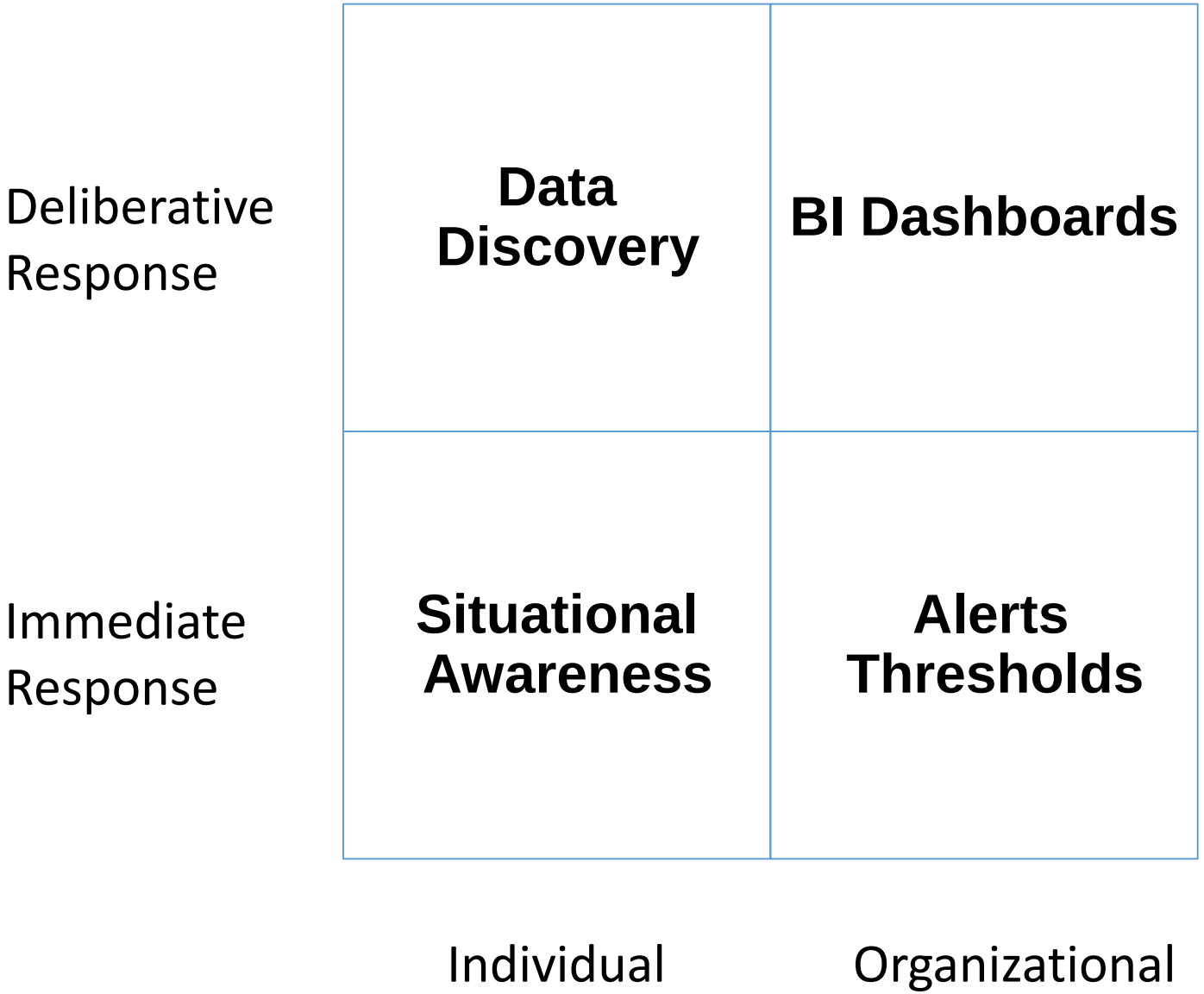
Data Visualization Scenarios



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Dashboard Definition

A Dashboard is a visual presentation of current summary information needed to manage and guide an organization or activity.

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Dashboard Definition

BI Dashboards should be designed to drive organizational coherence through a shared understanding of organizational position, performance, flows, and influencers.

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AMC Food and Beverage Analytics

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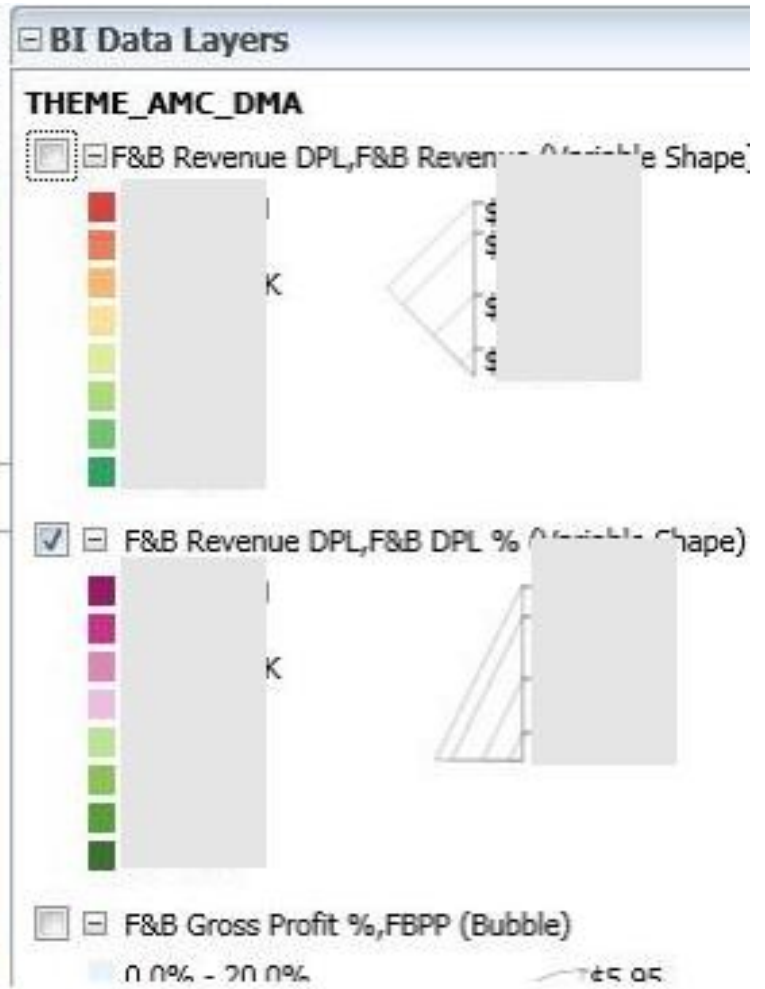
AMC Food and Beverage Analytics



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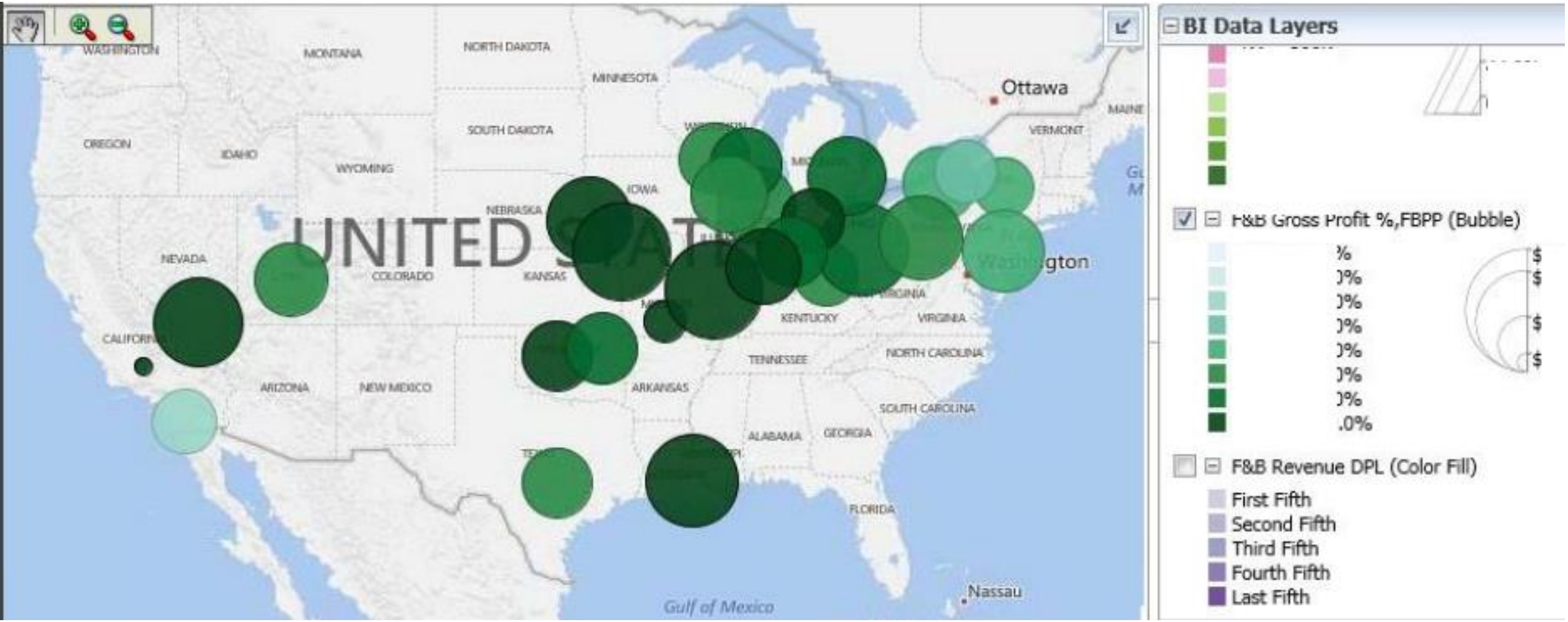
AMC Food and Beverage Analytics



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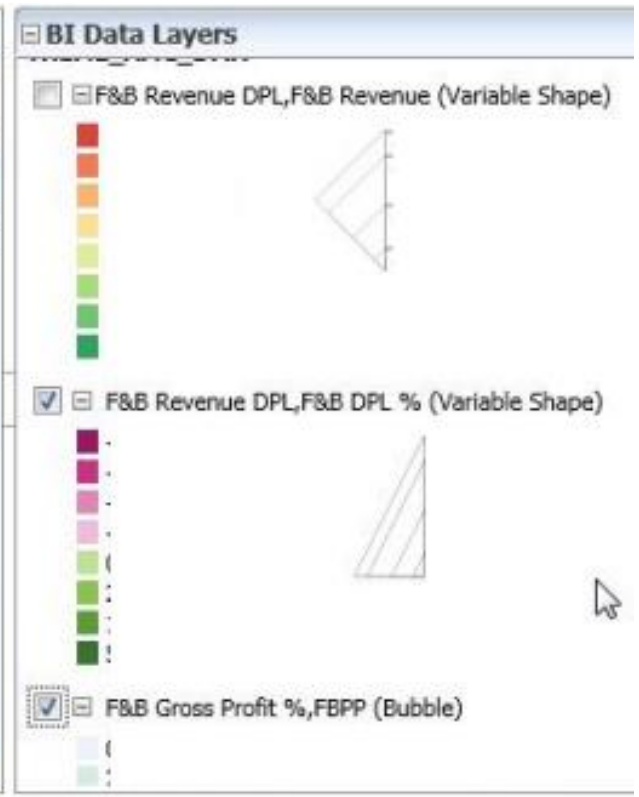
AMC Food and Beverage Analytics



DMA AMC Name	F&B Revenue DPL	FBPP	F&B Gross Profit %	F&B Cost Impact	F&B Revenue	F&B DPL %
Atlanta, GA						
Austin, TX						
Baltimore, MD						
Baton Rouge, LA						
Binghamton, NY						
Boston, MA						
Buffalo, NY						
Cedar Rapids, IA						
Champaign, IL						

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Exec Dashboard Issues Never Talked About

- Too many prompts
- Too much raw data without comparisons
  - Lack of normalization
  - Lack of differencing
- Lack of exception analysis
- Data views out of scale with each other
- Data scale not matched to decision scale

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Discovery - Explore vs Pioneer

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True Discovery

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Data Discovery Steps

- Read through data in Data Prep view
- Determine what defines a record
- Identify facts and dimensions
- Use “Explain” with fact(s) to reveal important dimensions
- Build major dimension summary view

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Data Discovery Sequence

- "Skim" the entire data set to get a sense of its size and scope
- "Read" the data set a **second** time more carefully
  - Identify facts/measures
  - Transaction/event records included?
  - Identify major dimensions
- Make a list of potentially important or interesting business issues/implications
- Compare your original business issues with your new list
- Apply useful frameworks
- Transform data and add new data
- Apply useful frameworks

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Differencing (aka variance)

- How does the raw data differ from a comparative?
  - Difference from the average?
  - Difference by time?
  - Difference from a baseline?
- Graph differences when change or context is important.

Tables of raw data are difficult to interpret in terms of insights.

Profit by Product Category, Ship Date (Month of Year)

Ship Date (Year): 2016

	January	February	March	April	May	June	July	August	September	October	November	December
	Profit	Profit	Profit	Profit	Profit	Profit	Profit	Profit	Profit	Profit	Profit	Profit
Furniture	15,319.52	-6,521.75	-6,036.51	-3,840.61	815.26	786.44	-1,495.06	4,773.15	6,144.44	1,592.76	11,754.98	14,248.85
Office Supplies	1,304.85	4,328.80	18,881.06	15,416.42	6,415.03	10,620.04	10,439.39	13,747.45	7,426.44	8,987.29	39,365.44	20,105.56
Technology	20,072.05	9,937.51	21,529.90	10,436.88	15,091.24	15,696.36	17,631.00	33,250.75	20,419.80	11,012.20	34,628.01	40,749.94

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Profit by Profit, Product Category, Ship Date (Month of Year)

Ship Date (Year): 2016

	January	February	March	April	May	June	July	August	September	October	November	December
	Profit	Profit	Profit	Profit	Profit	Profit	Profit	Profit	Profit	Profit	Profit	Profit
Furniture	15,319.52	-6,521.75	-6,036.51	-3,840.61	815.26	786.44	-1,495.06	4,773.15	6,144.44	1,592.76	11,754.98	14,248.85
Office Supplies	1,304.85	4,328.80	18,881.06	15,416.42	6,415.03	10,620.04	10,439.39	13,747.45	7,426.44	8,987.29	39,365.44	20,105.56
Technology	20,072.05	9,937.51	21,529.90	10,436.88	15,091.24	15,696.36	17,631.00	33,250.75	20,419.80	11,012.20	34,628.01	40,749.94

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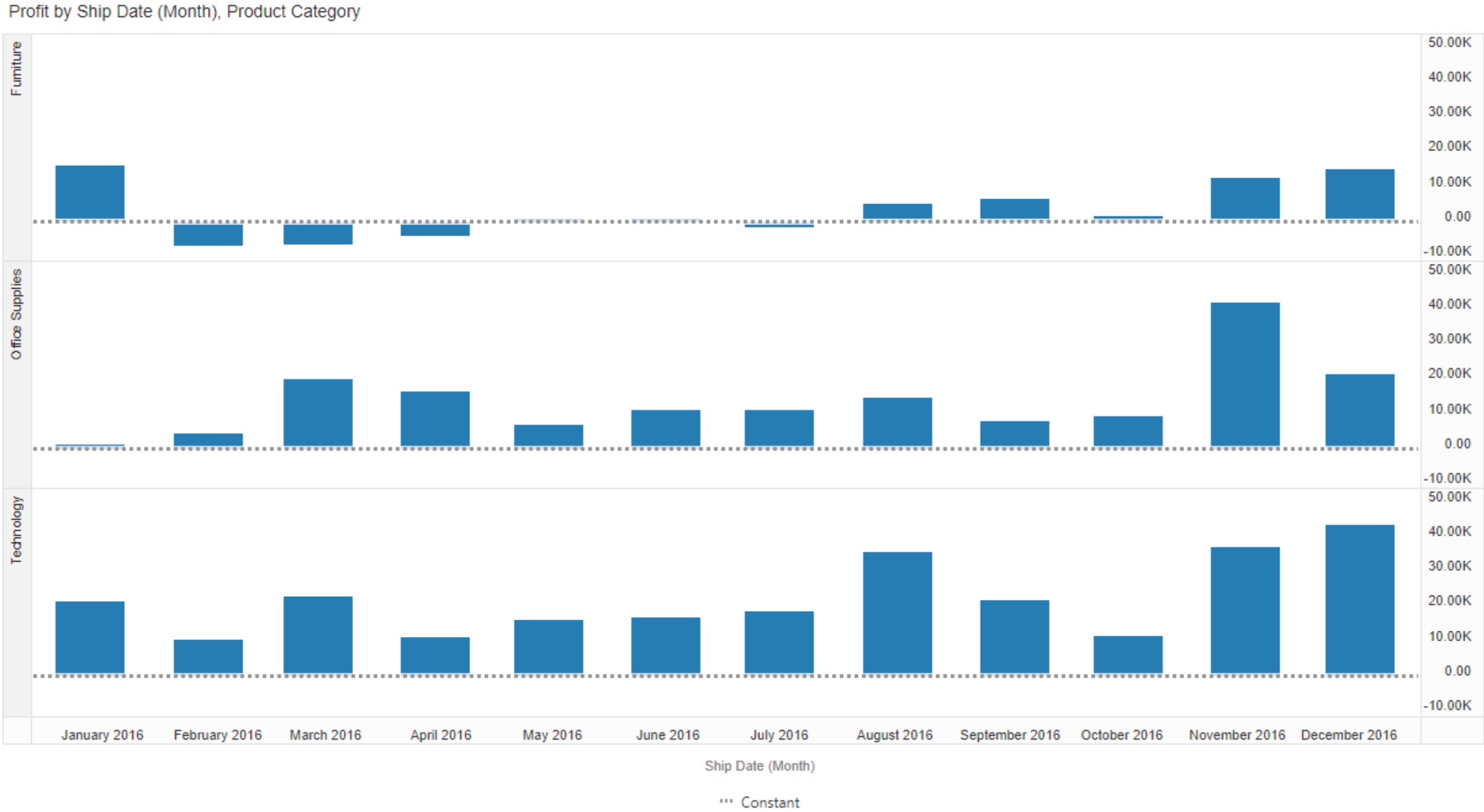

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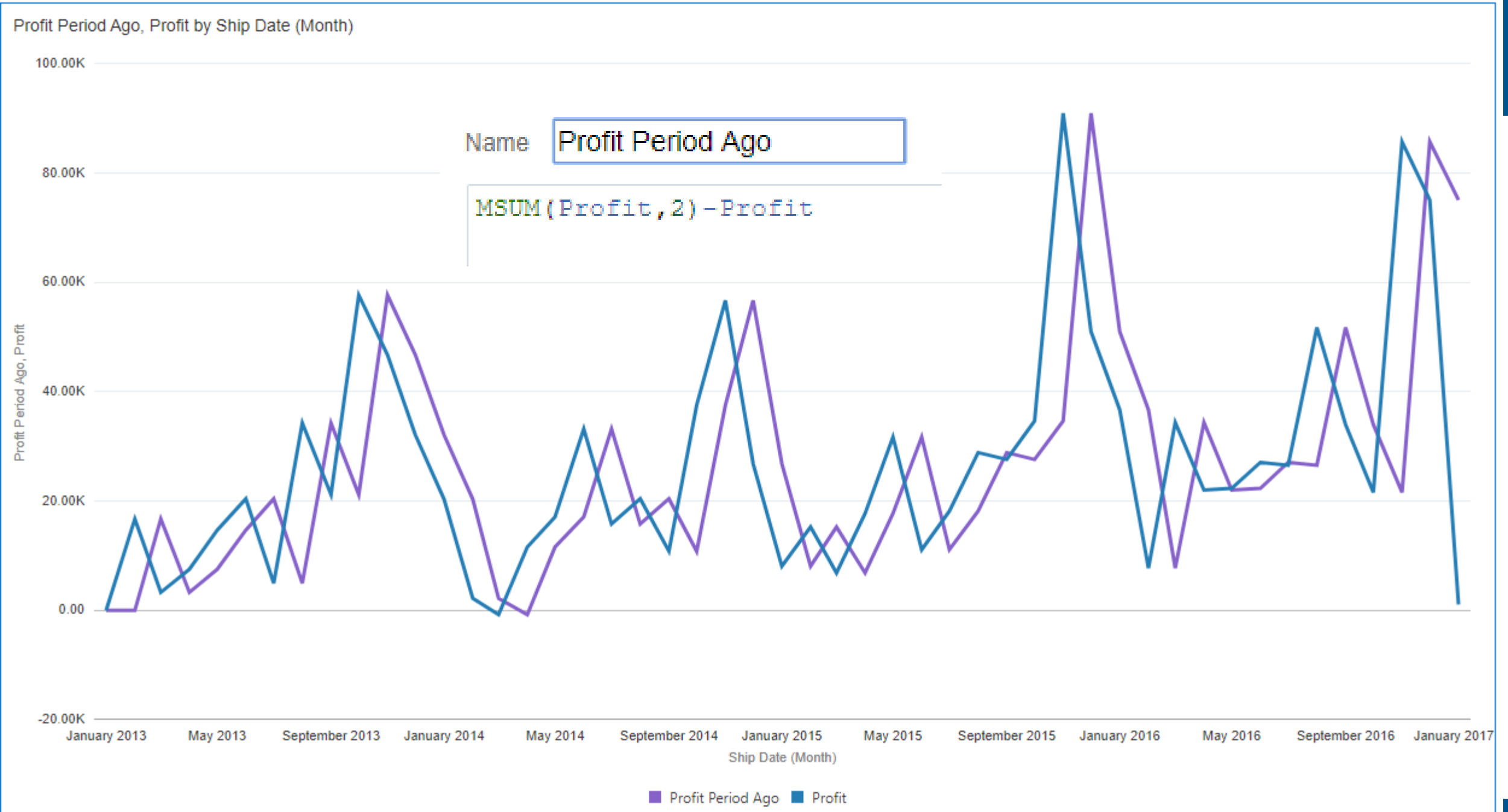

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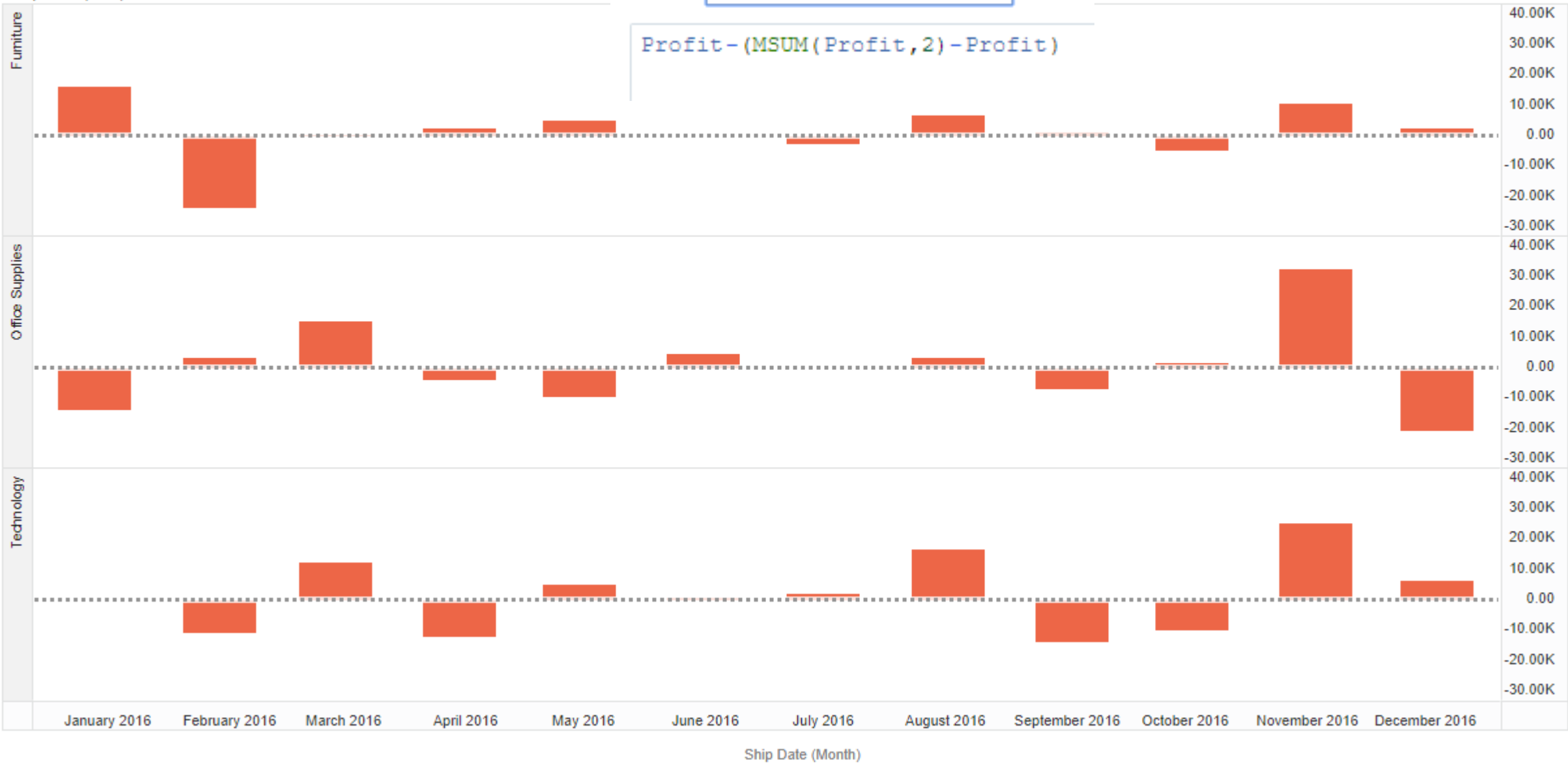
Profit Diff by Ship Date (Month), Product Category

Ship Date (Year): 2016

Name: Profit Diff

```
Profit-(MSUM(Profit,2)-Profit)
```



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Ship Date (Year): 2016 | Sales: Top 50 | Ship Date (Month): February 2016

Horizontal Bar

Trellis Columns

Trellis Rows

Values (X-Axis)
- Profit Diff

Category (Y-Axis)
- Product Name

Color

Size (Width)

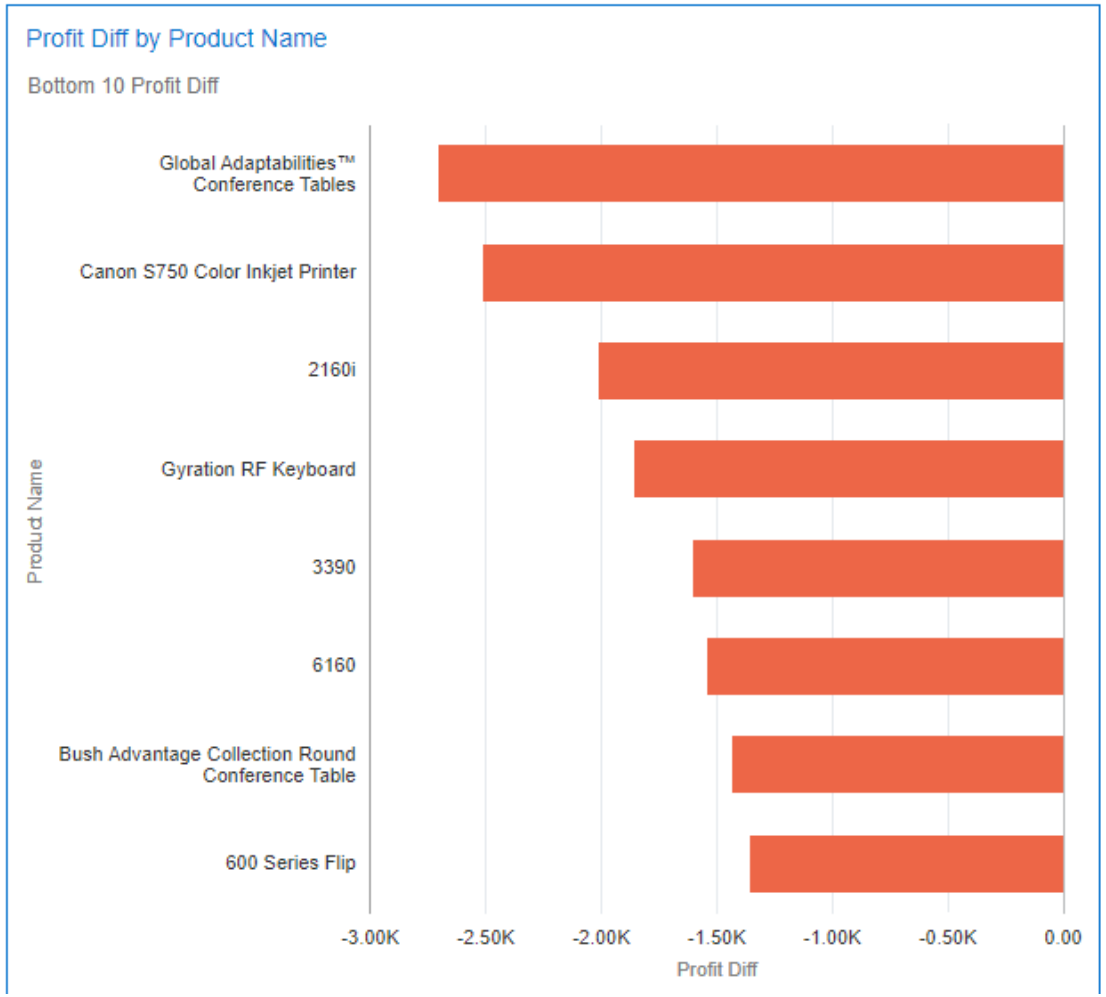
Tooltip

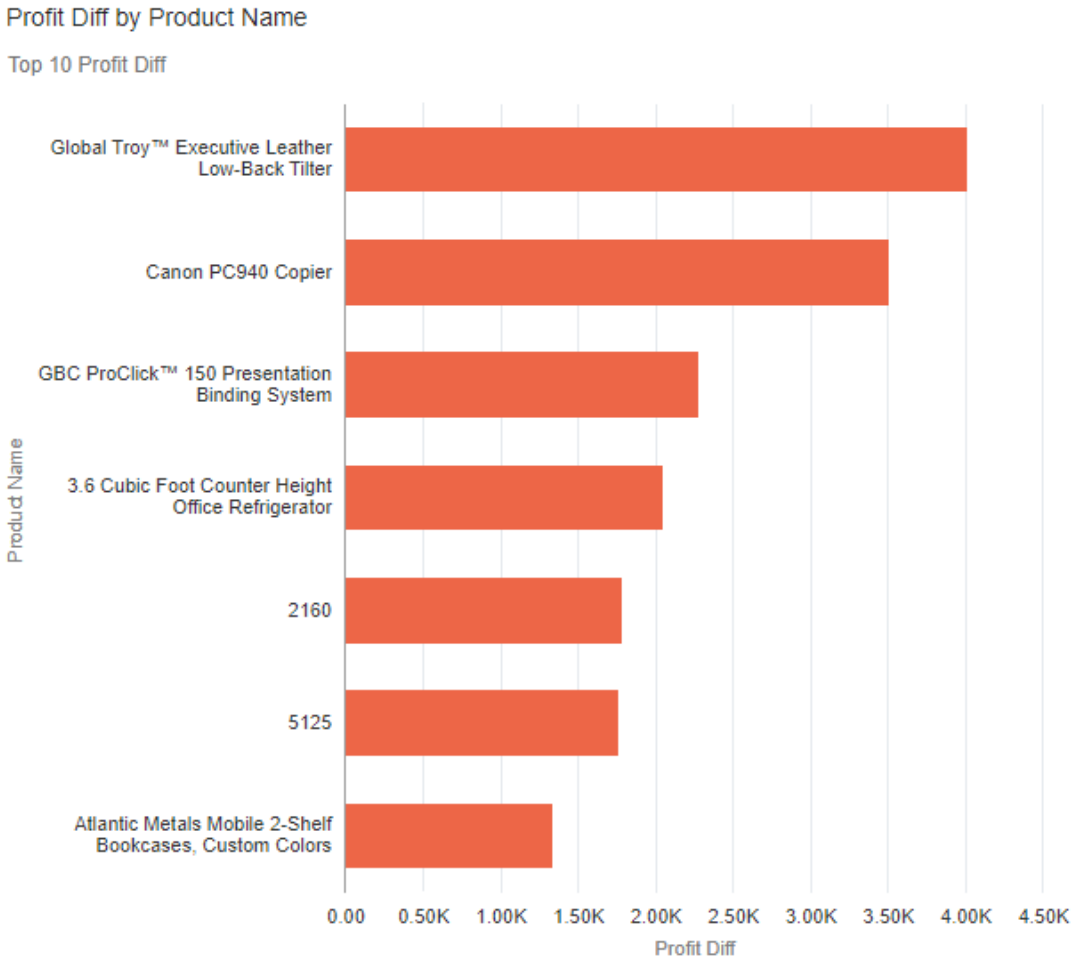
Detail

Filters
- Profit Diff

Biggest Profit Movers By Month

Top 50 Products by Sales





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Bar

Trellis Columns

Trellis Rows

Product Cate...

Values (Y-Axis)

Profit Diff

Category (X-Axis)

Ship Date (M...

Color

Size (Width)

Tooltip

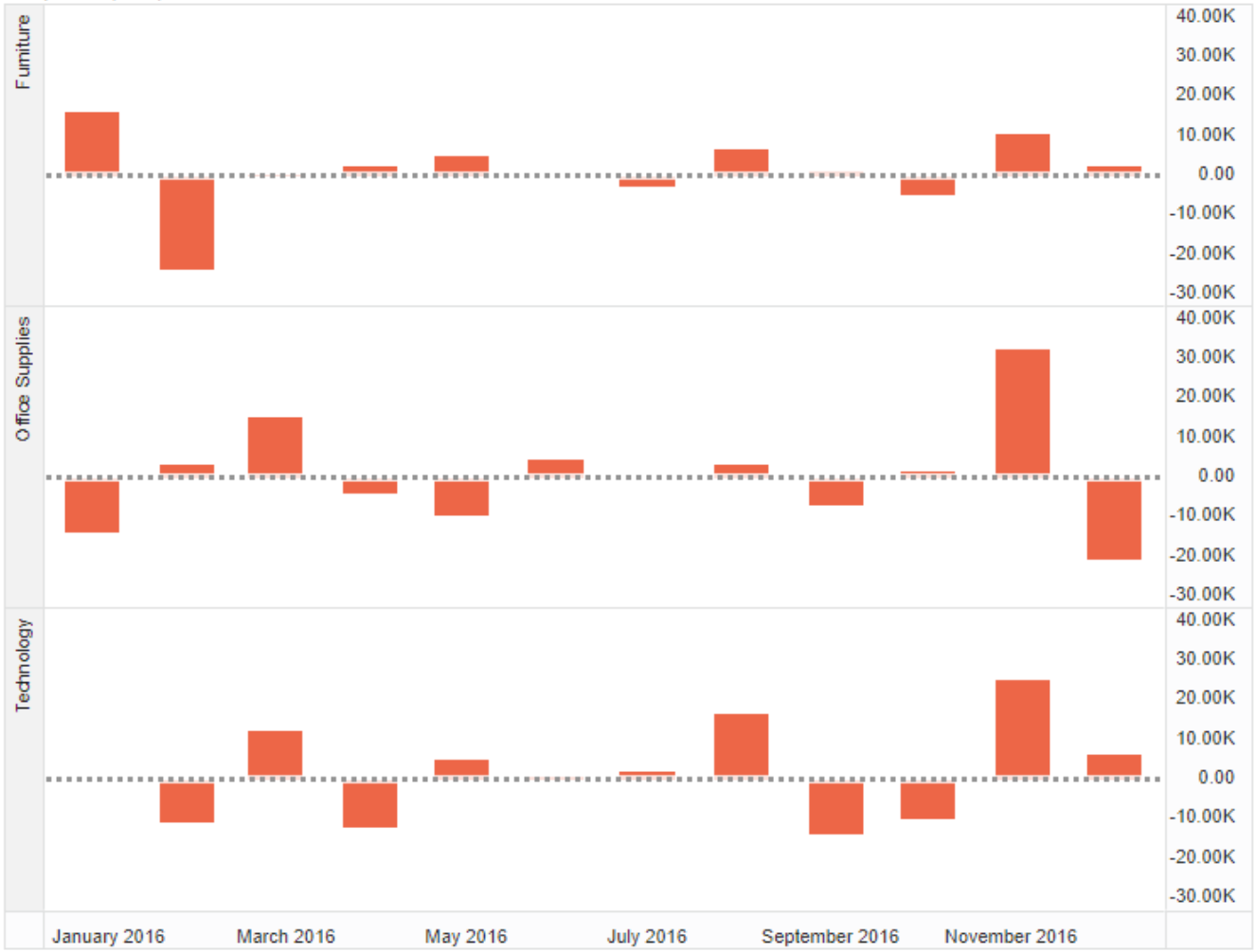
Detail

Filters

Ship Date (Ye...

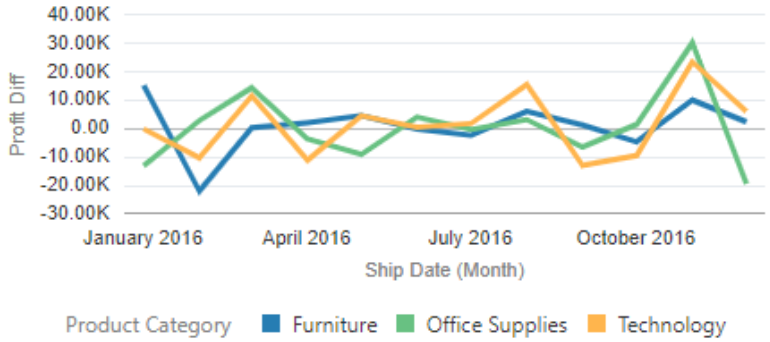
Profit Diff by Ship Date (Month), Product Category

Ship Date (Year): 2016



Profit Diff by Ship Date (Month), Product Category

Ship Date (Year): 2016



Product Category Furniture Office Supplies Technology

Profit by Profit, Ship Date (Month of Year), Product Category

Ship Date (Year): 2016

	Furniture	Office Supplies	Technology
	Profit	Profit	Profit
January	15,319.52	1,304.85	20,072.05
February	-6,521.75	4,328.80	9,937.51
March	-6,036.51	18,881.06	21,529.90
April	-3,840.61	15,416.42	10,436.88
May	815.26	6,415.03	15,091.24
June	786.44	10,620.04	15,696.36
July	-1,495.06	10,439.39	17,631.00
August	4,773.15	13,747.45	33,250.75
September	6,144.44	7,426.44	20,419.80
October	1,592.76	8,987.29	11,012.20
November	11,754.98	39,365.44	34,628.01
December	14,248.85	20,105.56	40,749.94

Profit -7K 41K

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Dimensional Analysis

- Use brushing and selection with multiple graph layouts.
  - Build four or five graphs with related attributes or measures.
  - Too many graphs or several highly dense graphs exceed limitations
- Consider alternative graph types
  - Scatter plots
  - Trellis charts
  - Sankey graphs
  - Parallel coordinates

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Dimensional Analysis

- Order of importance for Scatter Plots
  1. Y Axis typically has the “response variable”, i.e. highest interest
  2. X axis has the “independent variable”.

  3. Color (can be categorical or numeric)
  4. Size
  5. Trellis by category
  6. Shape
  7. Filters
- Use logarithmic scale for “long tail” distributions or break into two or more graphs.

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Trellis Charts

- Make sure that the major axis of interest is aligned with Trellis chart choice.
  - Vertical when X axis is important
    - Example: compare patterns over time
    - Compare length of horizontal bar graph
  - Horizontal when Y axis important
    - Compare lengths of vertical bar graphs
- Use horizontal for long, scrolling trellis charts with many members
- Use both to create a table of graphs

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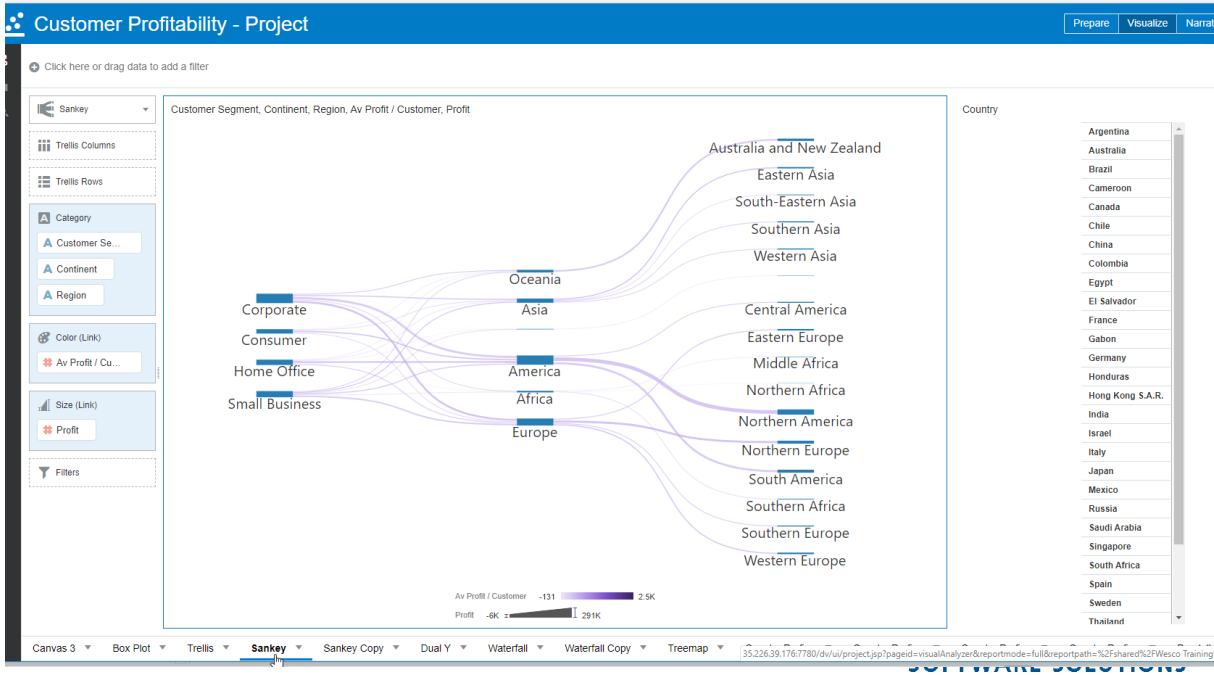
Sankey Graphs

- Used in “flow” analyses and comparative analyses
- Used to show relative strengths of relationships between attributes
- Line weight and size are proportional to flow/relational measure
- Hover and click on lines to show relationships
- Sort order is very important



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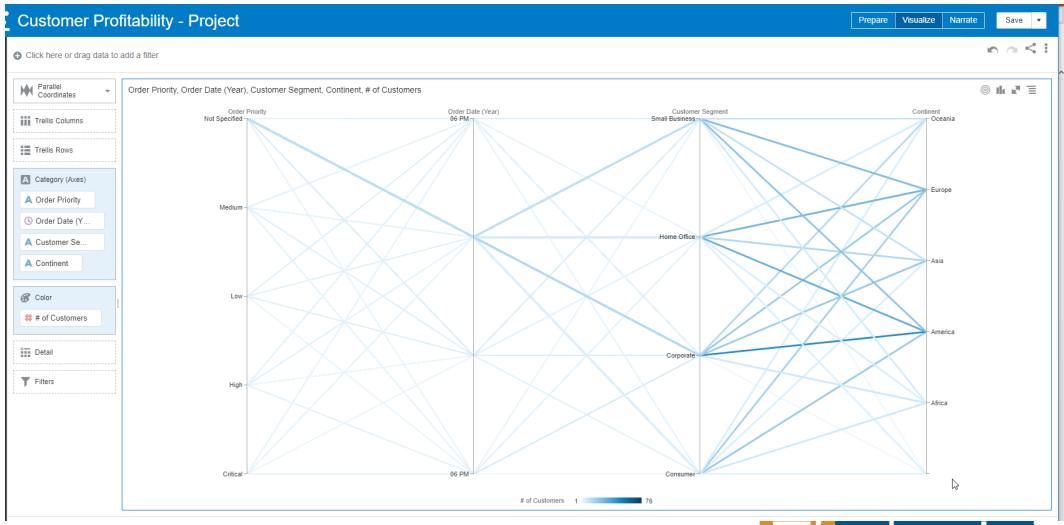
Parallel Coordinates Graphs

- Used to show otherwise disparate relationships
- “Custom join graph”
- Each line represents a record in the **active** data set
- Sort order is extremely important
- Highly interactive
- Not recommended for general users



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Customer Profitability - Project

Prepare | Visualize | Narrate | Save

Click here or drag data to add a filter

Scatter

Trellis Columns

Trellis Rows

Values (Y-Axis)
Profit

Values (X-Axis)
Sales

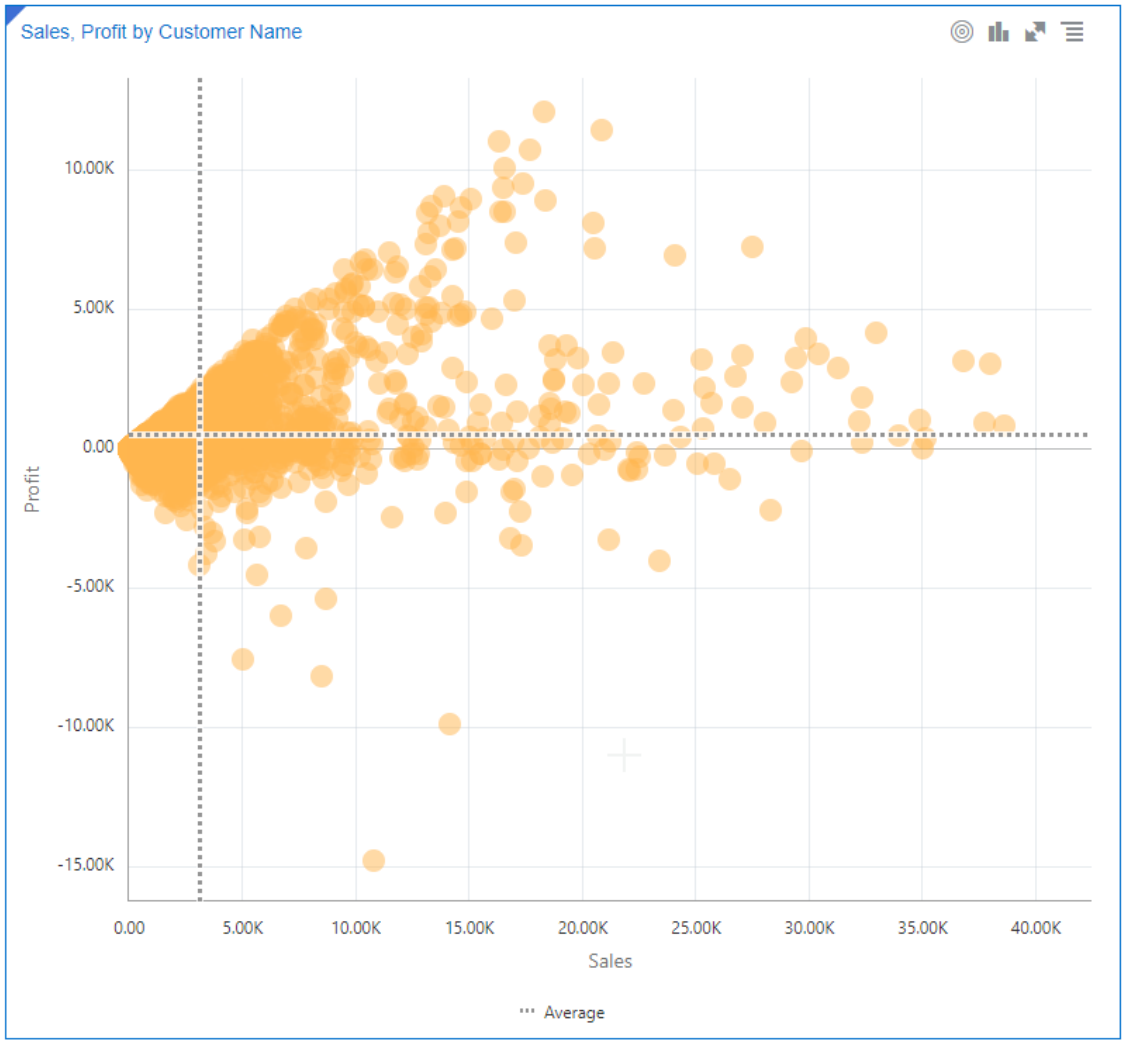
Category (Points)
Customer N...

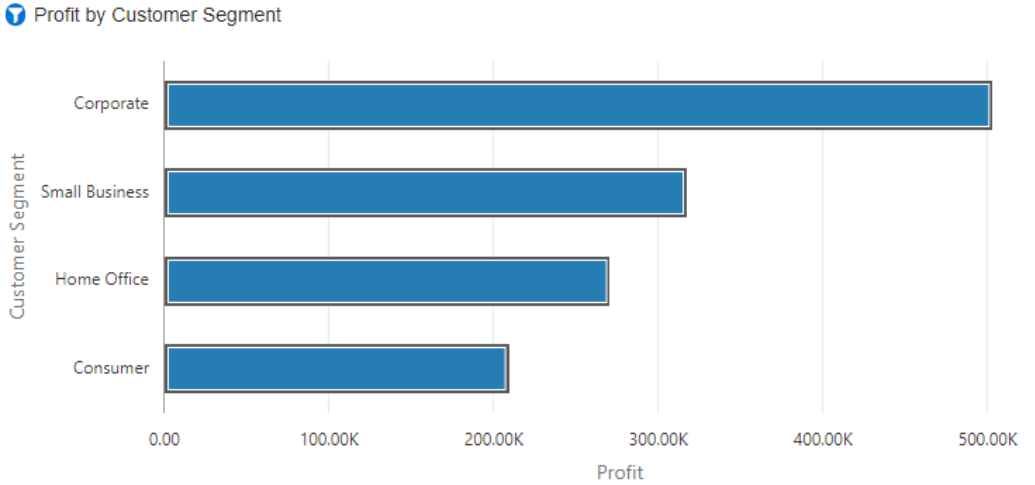
Color

Size

Shape

Filters





Canvas 3 | Box Plot | Trellis | Sankey | Sankey Copy | Dual Y | Waterfall | Waterfall Copy | Treemap | Country Profi... | Country Profi... | Country Profi... | Country Profi... | Paralell

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Customer Profit Analysis

- Highlight **Customer Segment** and **Profit** and drag to canvas.
  - Horizontal bar chart
  - Set “Use as Filter”
- Create new column “**Customer Profit Bin**” and “**Gross Profit**”
- Highlight **Sales**, **Profit**, **Customer Profit Bin** and **Gross Profit** and drag to canvas.
  - Bar graph Sales and Profit, color as “Gross Profit”
- Highlight **Profit**, **Sales**, and **Customer Name** and drag to canvas.
  - Scatter plot and add reference lines.

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Customer Profitability - Project

Prepare | Visualize | Narrate | Save

Click here or drag data to add a filter

Scatter

Trellis Columns
- Customer Segment

Trellis Rows

Values (Y-Axis)
- Profit

Values (X-Axis)
- Gross Profit %

Category (Points)
- Customer Name

Color
- Customer Segment

Size
- Discount

Shape

Customer Pr... | **Trellis** | Sankey | Sankey Copy | Dual Y | Box Plot | Waterfall | Waterfall Copy | Treemap | Country Prof... | Country Prof... | Country Prof... | Country Prof... | Canvas

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Customer Profitability - Project

Prepare | Visualize | Narrat

Click here or drag data to add a filter

Sankey

Trellis Columns

Trellis Rows

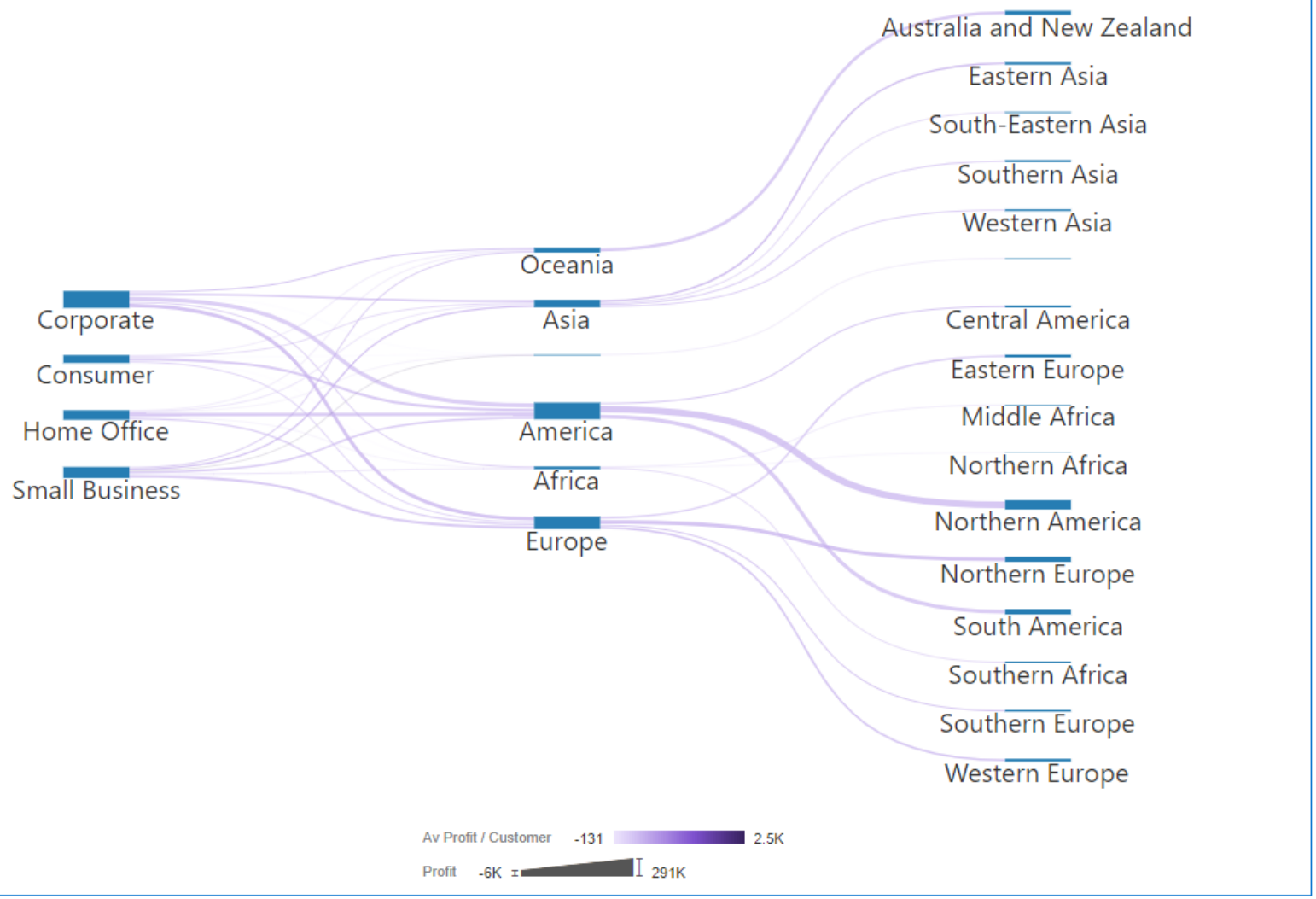
Category
- Customer Se...
- Continent
- Region

Color (Link)
- Av Profit / Cu...

Size (Link)
- Profit

Filters

Customer Segment, Continent, Region, Av Profit / Customer, Profit



Country

- Argentina
- Australia
- Brazil
- Cameroon
- Canada
- Chile
- China
- Colombia
- Egypt
- El Salvador
- France
- Gabon
- Germany
- Honduras
- Hong Kong S.A.R.
- India
- Israel
- Italy
- Japan
- Mexico
- Russia
- Saudi Arabia
- Singapore
- South Africa
- Spain
- Sweden
- Thailand

Canvas 3 | Box Plot | Trellis | **Sankey** | Sankey Copy | Dual Y | Waterfall | Waterfall Copy | Treemap

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Customer Profitability - Project

Country
United States

Sankey

Trellis Columns

Trellis Rows

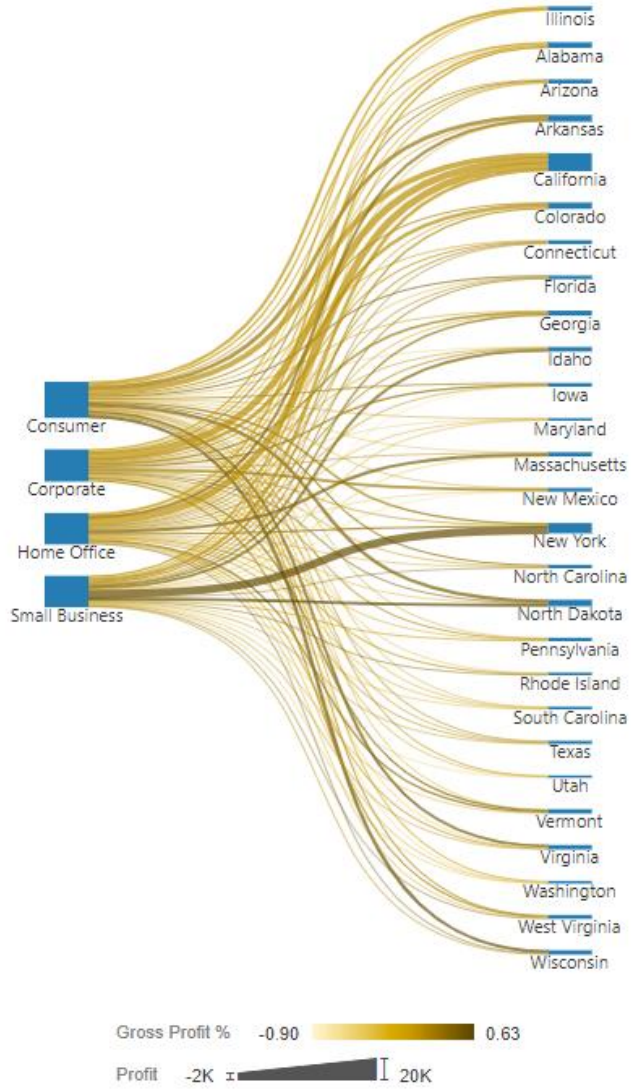
Category
Customer Se...
State

Color (Link)
Gross Profit %

Size (Link)
Profit

Filters

Customer Segment, State, Gross Profit %, Profit



Country

Canvas 3 | Box Plot | Trellis | Sankey | **Sankey Copy** | Dual Y | Waterfall | Waterfall Copy | Treemap

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Customer Profitability - Project

Prepare | Visualize | Narrate | Save

Click here or drag data to add a filter

Box Plot

Trellis Columns

Trellis Rows

Values (Y-Axis)

Profit

Category (X-Axis)

Customer Se...

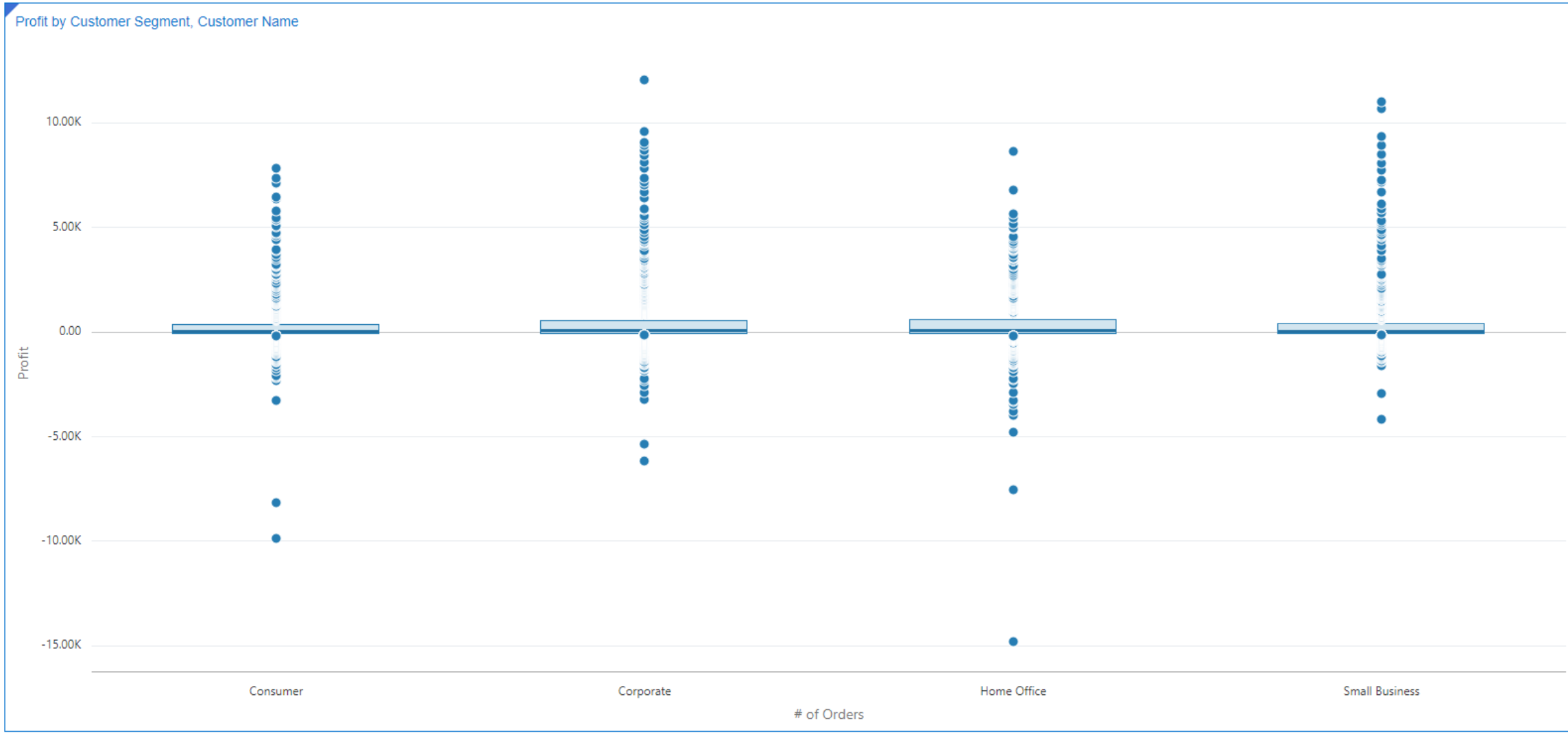
Color

Size (Width)

Detail (Box)

Customer Na...

Filters



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Click here or drag data to add a filter

Combo

Trellis Columns

Trellis Rows

Values (Y-Axis)

Sales

Gross Prof...

Category (X-Axis)

Order Date (...

Color

Size (Width)

Detail

Filters

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Customer Profitability - Project

Prepare | Visualize | Narrate | Save

Click here or drag data to add a filter

Waterfall

Trellis Columns

Trellis Rows

Values (Y-Axis)

Profit

Category (X-Axis)

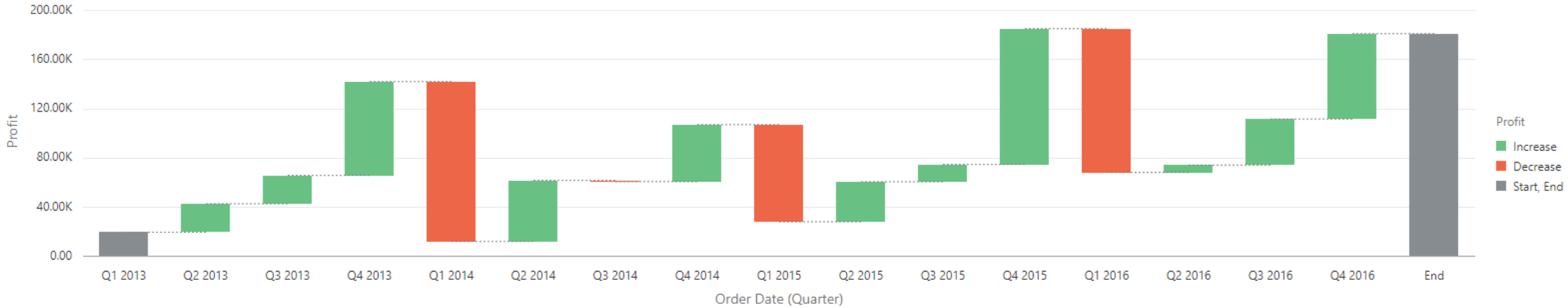
Order Date (...

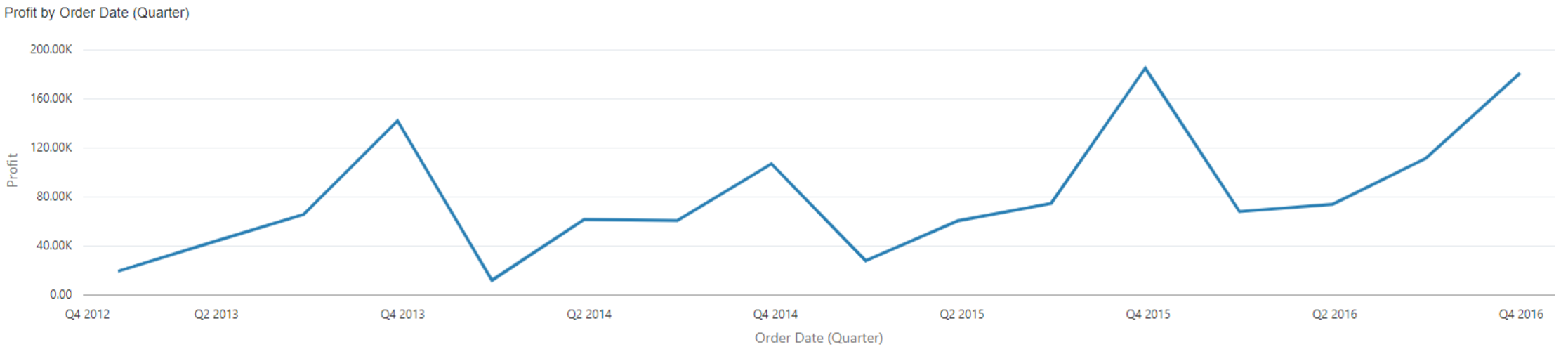
Color

Size (Width)

Detail

Filters





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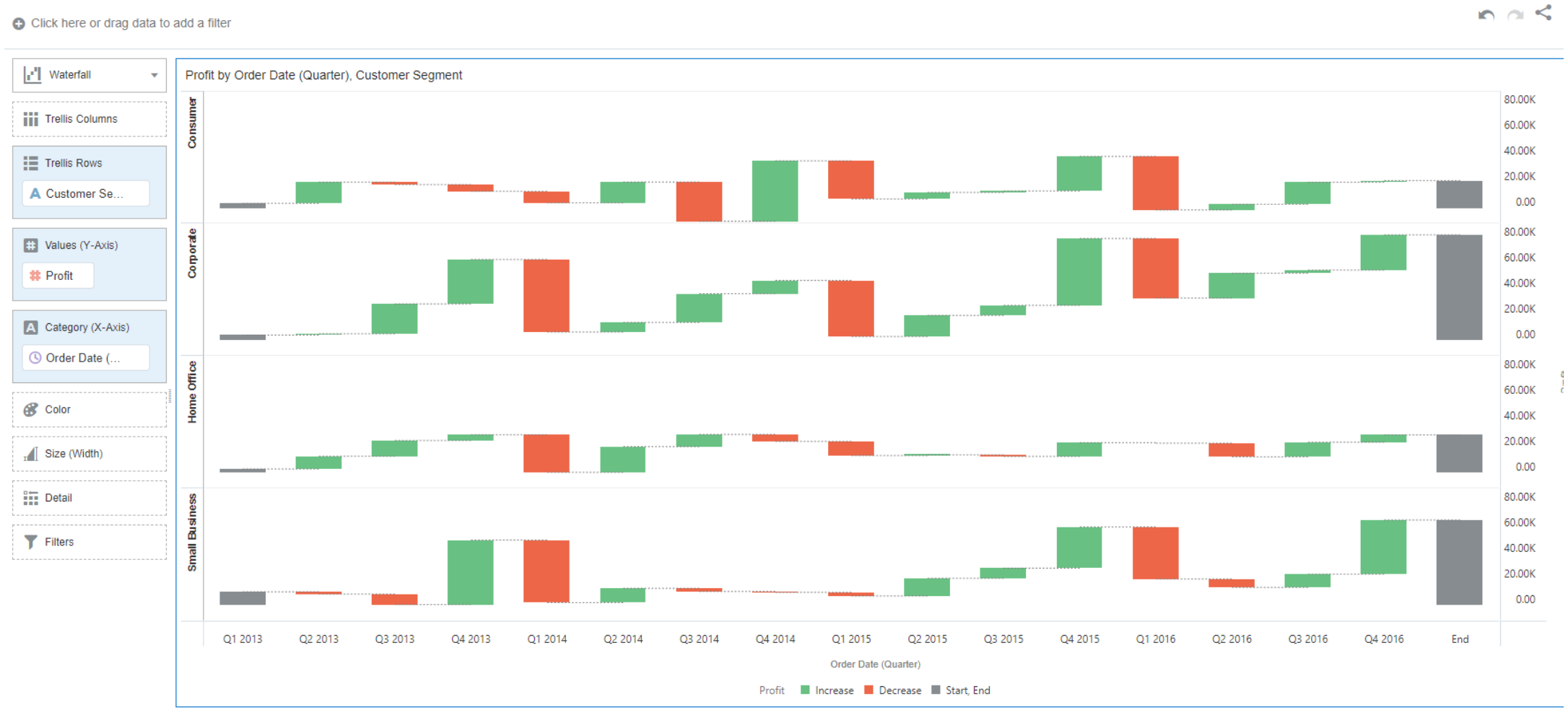

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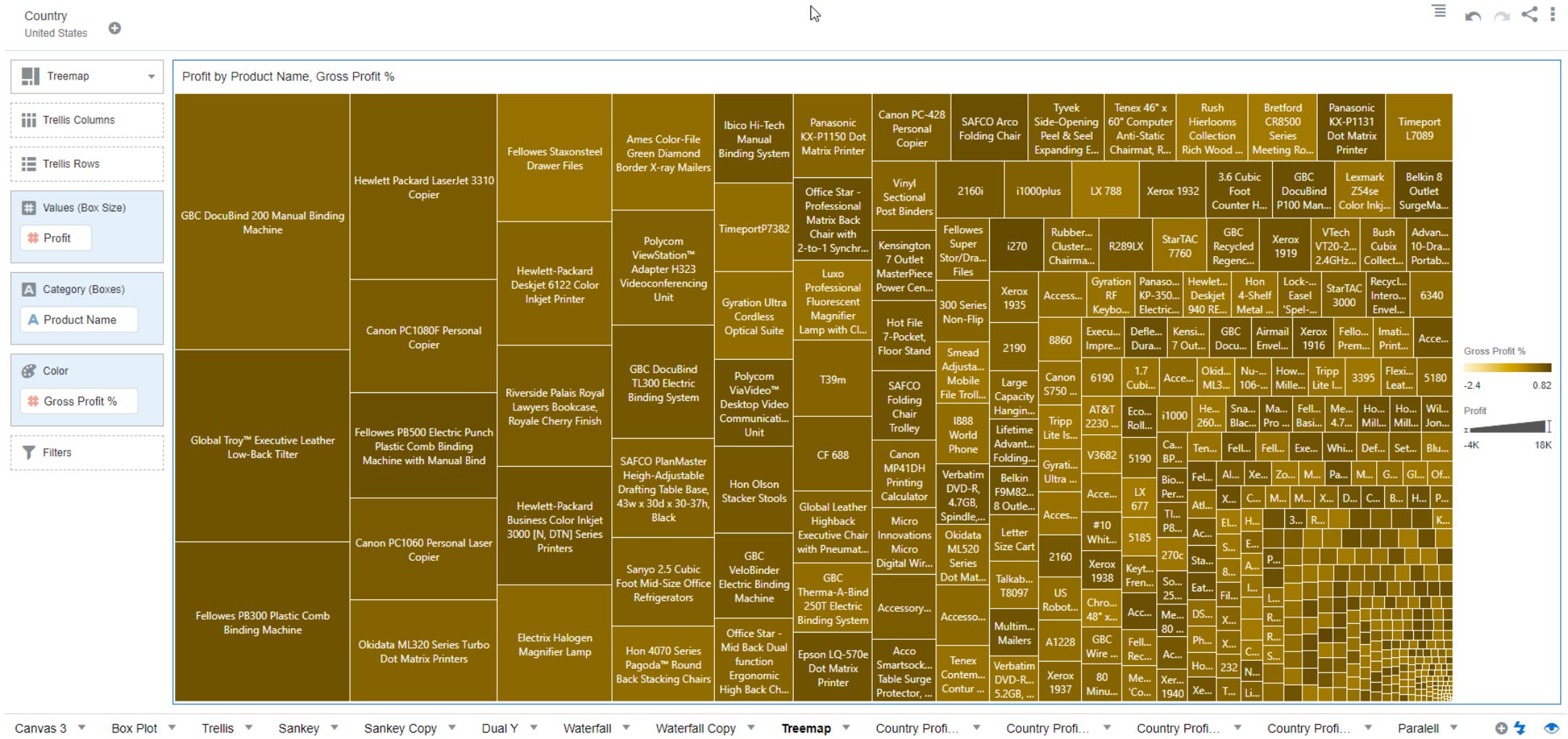

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Click here or drag data to add a filter

Scatter

Trellis Columns

Trellis Rows

Values (Y-Axis)

Profit / Sales

Values (X-Axis)

Profit

Category (Points)

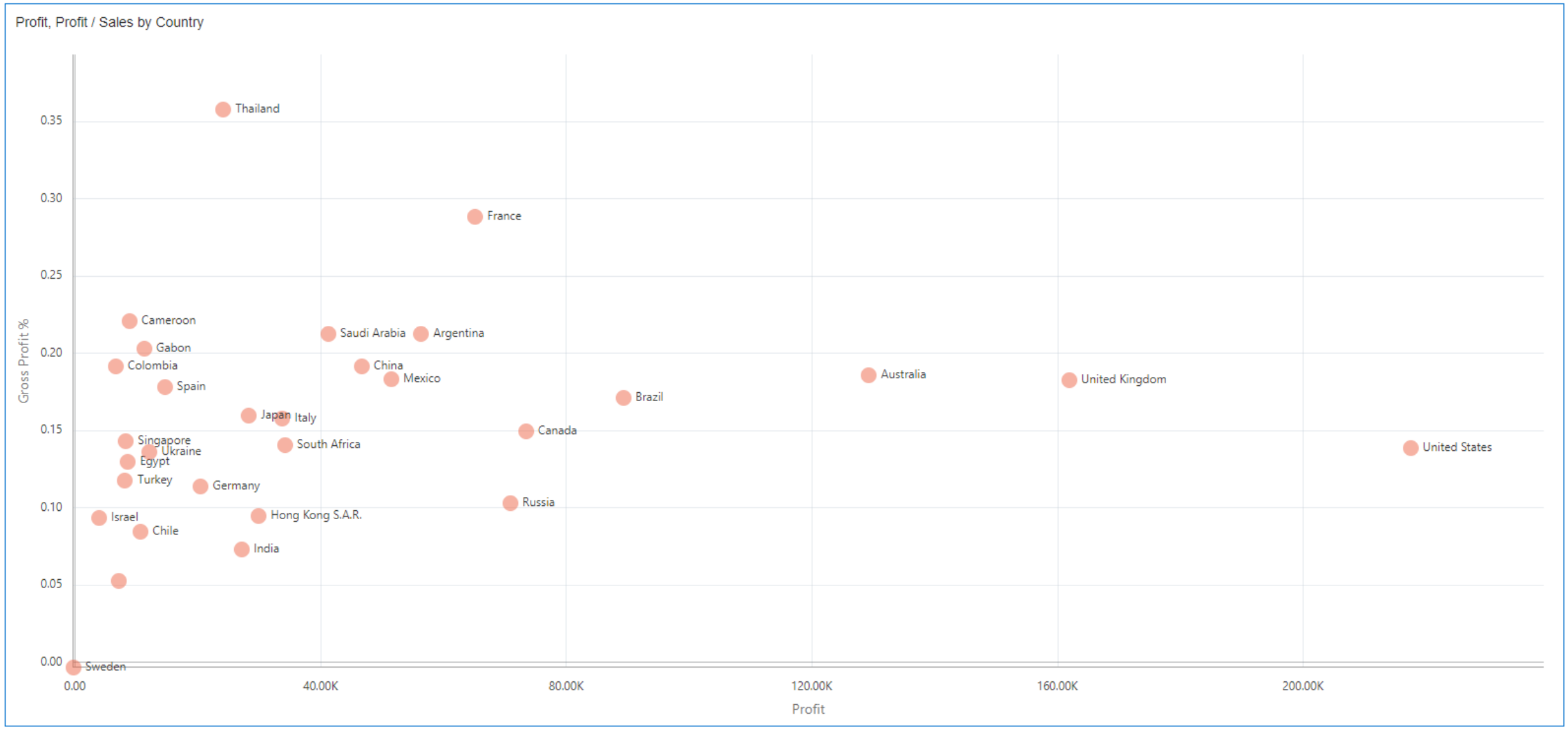
Country

Color

Size

Shape

Filters



Waterfall Copy | Treemap | **Country Pro...** | Country Profi... | Country Profi... | Country Profi... | Paralell

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Customer Profitability - Project

Prepare | Visualize | Narrate | Save

Order Date (Year): All
Order Date (Quarter): All
Order Date (Month): All
Customer Segment: All
Continent: All
Region: All
Country: All

Scatter

Trellis Columns

Trellis Rows

Values (Y-Axis): Gross Profit %

Values (X-Axis): Av Profit / Cu…

Category (Points): Country

Color: Continent

Size

Shape

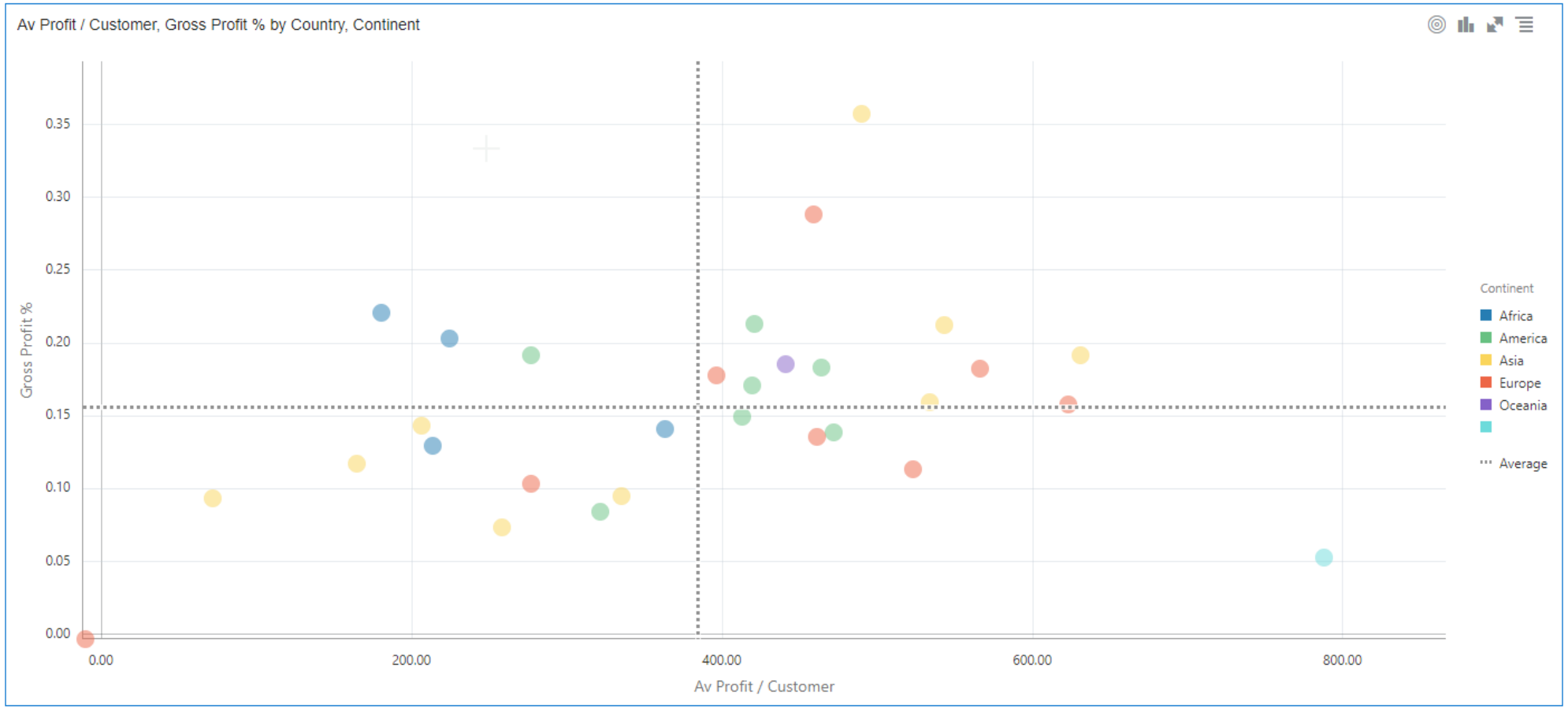
Filters

Country

Country
Argentina
Australia
Brazil
Cameroon
Canada
Chile
China
Colombia
Egypt
El Salvador
France
Gabon
Germany
Honduras
Hong Kong S.A.R.
India
Israel
Italy
Japan
Mexico
Russia
Saudi Arabia
Singapore
South Africa
Spain
Sweden

Profit, Sales, Gross Profit %, Av Profit / Customer, # of Customers

Profit	Sales	Gross Profit %	Av Profit / Customer	# of Customers
1,300,000.00	8,500,000.00	0.15	484.89	2,681



Canvas 3 | Box Plot | Trellis | Sankey | Sankey Copy | Dual Y | Waterfall | Waterfall Copy | Treemap | Country Profi… | **Country Pro…** | Country Profi… | Country Profi… | Paralell

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Country
All

Table

Rows
Country

Color

Size

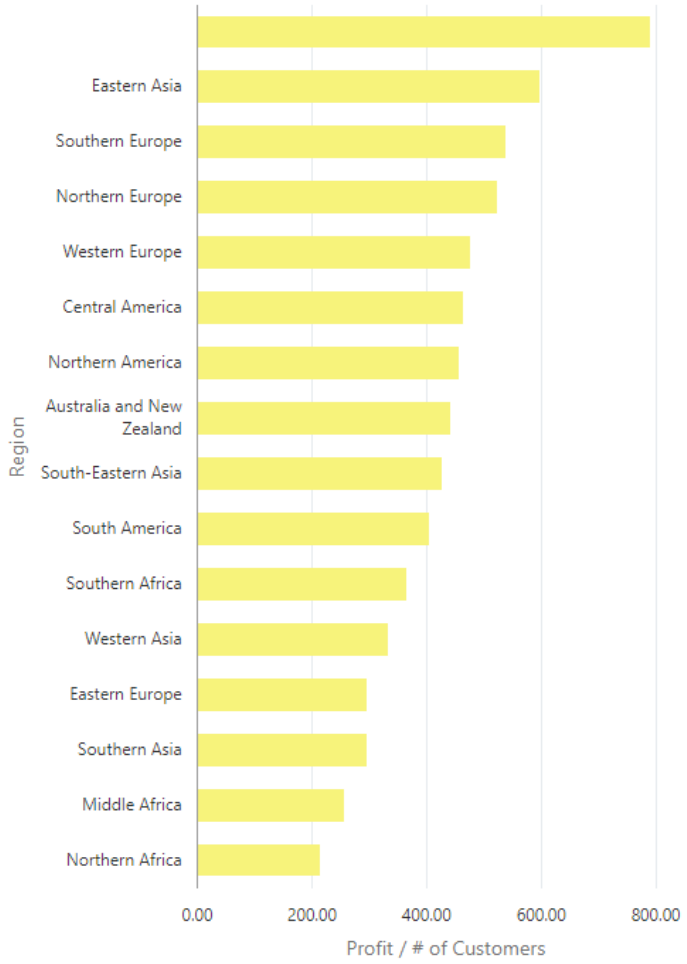
Shape

Filters

Country

Country
Argentina
Australia
Brazil
Cameroon
Canada
Chile
China
Colombia
Egypt
El Salvador
France
Gabon
Germany
Honduras
Hong Kong S.A.R.
India
Israel
Italy
Japan
Mexico
Russia
Saudi Arabia
Singapore
South Africa
Spain

Profit / # of Customers by Region



Profit, Sales, Gross Profit %, Av Profit / Customer, # of Customers

Profit	Sales	Gross Profit %	Av Profit / Customer	# of Customers
1,300,000.00	8,500,000.00	0.15	484.89	2,681

Av Profit / Customer, Gross Profit % by Country, Continent

Canvas 3 | Box Plot | Trellis | Sankey | Sankey Copy | Dual Y | Waterfall | Waterfall Copy | Treemap | Country Profi... | Country Profi... | **Country Pro...** | Country Profi... | Paralell

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Customer Profitability - Project

Prepare | Visualize | Narrate | Save

Click here or drag data to add a filter

Scatter

Trellis Columns
Order Date (Year)

Trellis Rows
Customer Segment

Values (Y-Axis)
Gross Profit %

Values (X-Axis)
Av Profit / Customer

Category (Points)
Country

Color
Continent

Size

Shape

Filters

Country

Country
Argentina
Australia
Brazil
Cameroon
Canada
Chile
China
Colombia
Egypt
El Salvador
France
Gabon
Germany
Honduras
Hong Kong S.A.R.
India
Israel
Italy
Japan
Mexico
Russia
Saudi Arabia
Singapore
South Africa
Spain
Sweden
Thailand
Turkey
Ukraine
United Kingdom
United States

Profit, Sales, Gross Profit %, Av Profit / Customer, # of Customers

Profit	Sales	Gross Profit %	Av Profit / Customer	# of Customers
1,300,000.00	8,500,000.00	0.15	484.89	2,681

Av Profit / Customer, Gross Profit % by Country, Continent, Customer Segment, Order Date (Year)

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Customer Profitability - Project

Prepare | Visualize | Narrate | Save

Click here or drag data to add a filter

Parallel Coordinates

Trellis Columns

Trellis Rows

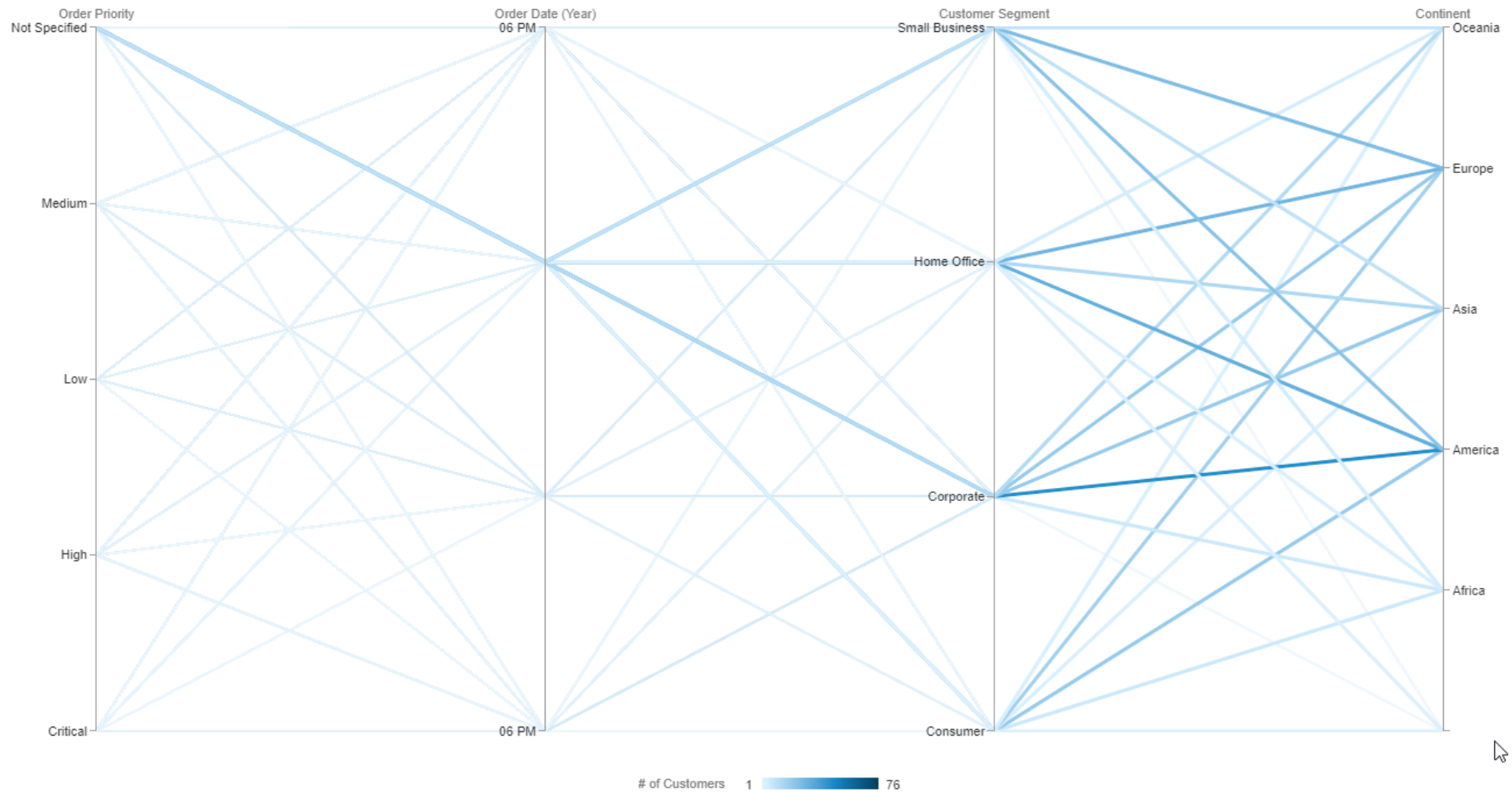
Category (Axes)
- Order Priority
- Order Date (Y...
- Customer Se...
- Continent

Color
- # of Customers

Detail

Filters

Order Priority, Order Date (Year), Customer Segment, Continent, # of Customers



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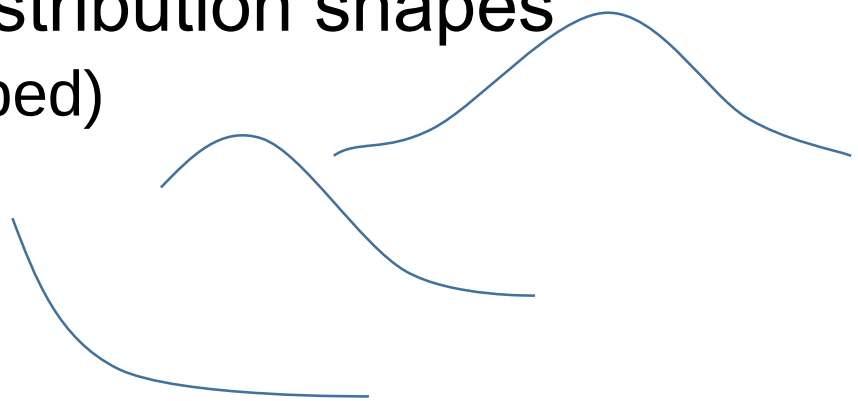
Understanding Measures for Exploration

- Aggregation method is important
- If use average, also add a bucketed measure
- Compute differences
- Understand data's natural distribution shapes
  - Normal distributions (bell shaped)
  - Log-normal distributions
  - Exponential distributions



- Average has strong meaning only for normal distributions
- Outlier identification & treatment are important for non-normal distributions

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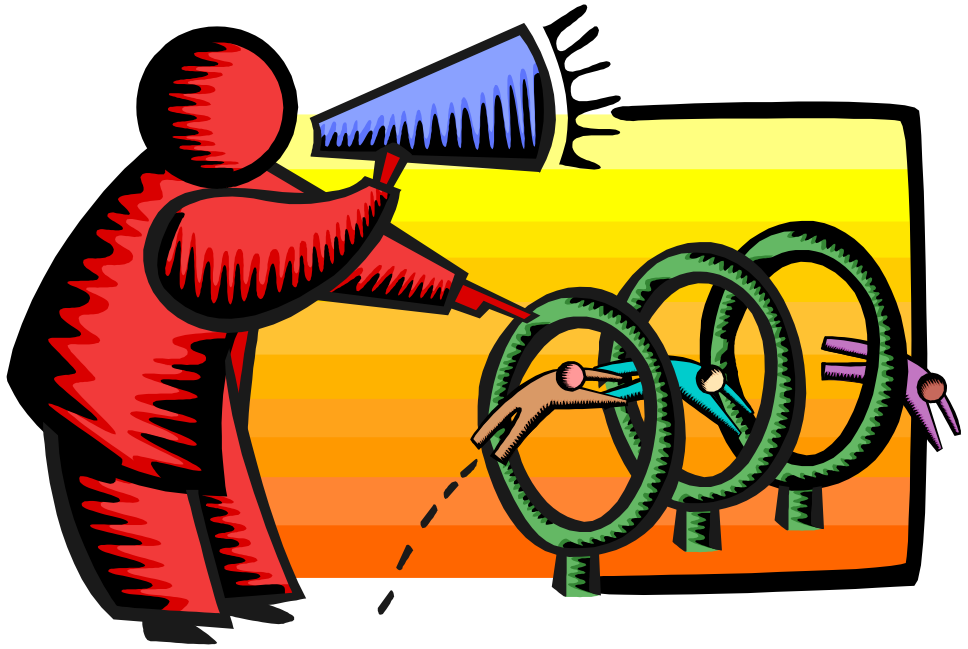
Demo



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An Example Useful Framework

Position Analysis	Performance Analysis	Flow Analysis
static	period of time	period of time
descriptive	results	change in single asset/resource
relative/comparative	fixed vs. variable	sources and uses
balance sheet	P&L	cash flow
strength/weakness	bottom line/zero based	change over time
portrait	motion picture	narrative

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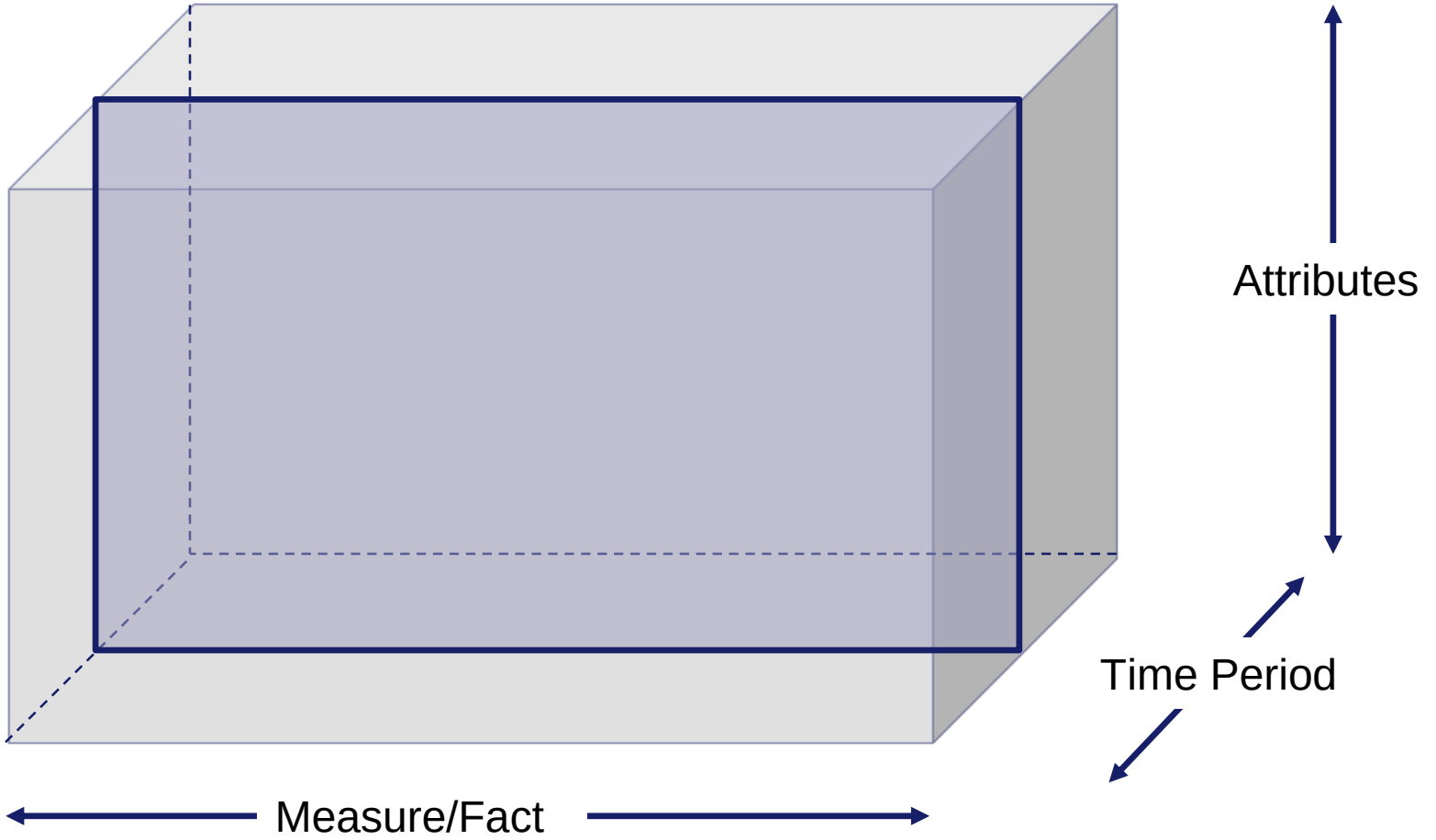
Position Analysis



Bar Chart
Scatter Plot
Treemap

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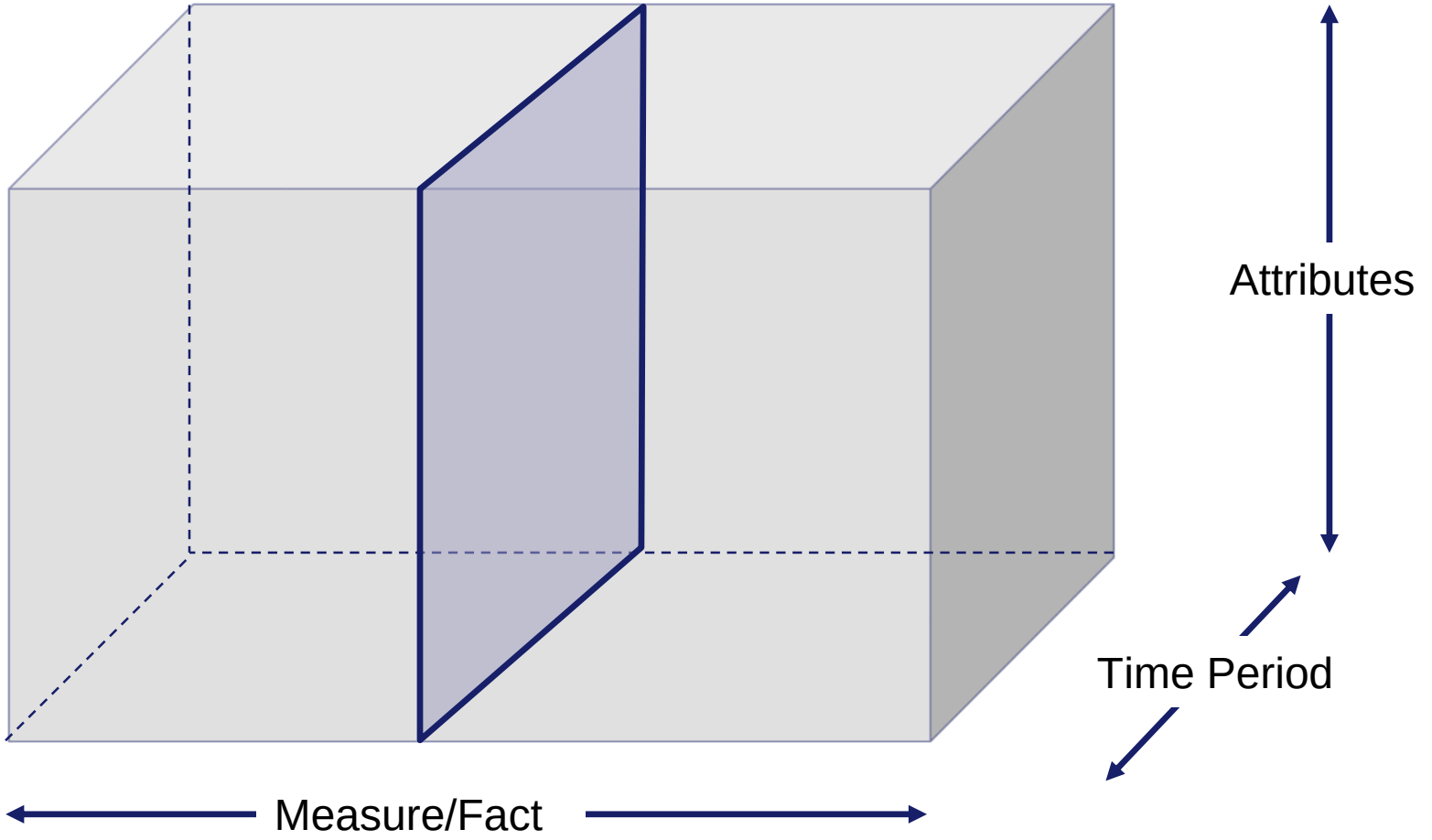
Performance Analysis



Bar Chart
Scatter Plot
Line Chart
Area Chart
Trellis

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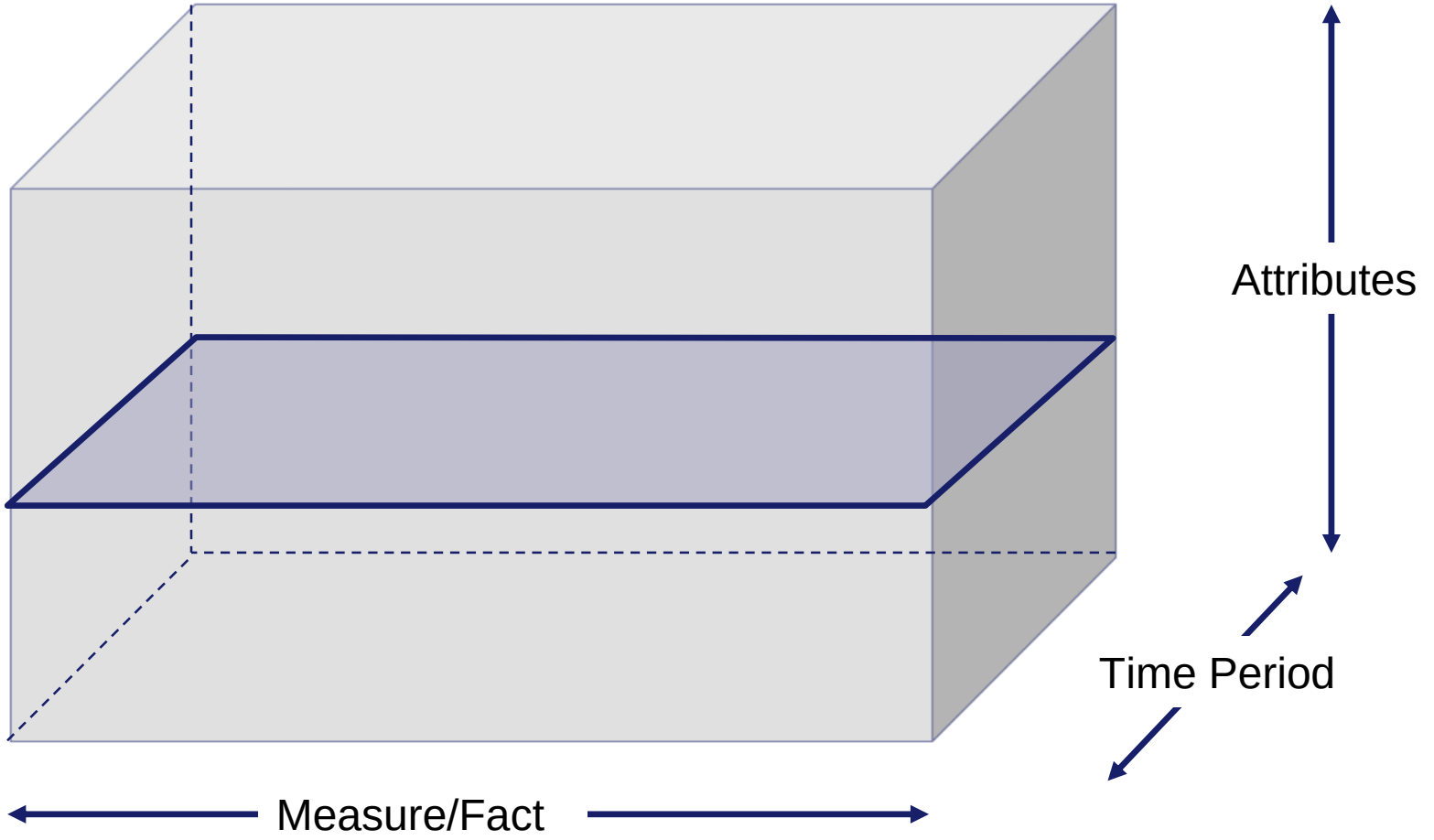
Flow Analysis



Line Chart
Area Chart
Trellis
Waterfall

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Well Established Frameworks

- Key Performance Indicator (KPI) Development (business)
- Root cause analysis (science)
- Diagnostic analytics (science)
- Five W's (who, what, when, where, why)

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Dimensional Columns

High number of factors / cardinality	**Lowest Grain**	**Trend/cycle** **Correlation** **Outlier**
Low number of factors / cardinality	**Trellis**	**Comparative** **Correlation**

Flat Shaped

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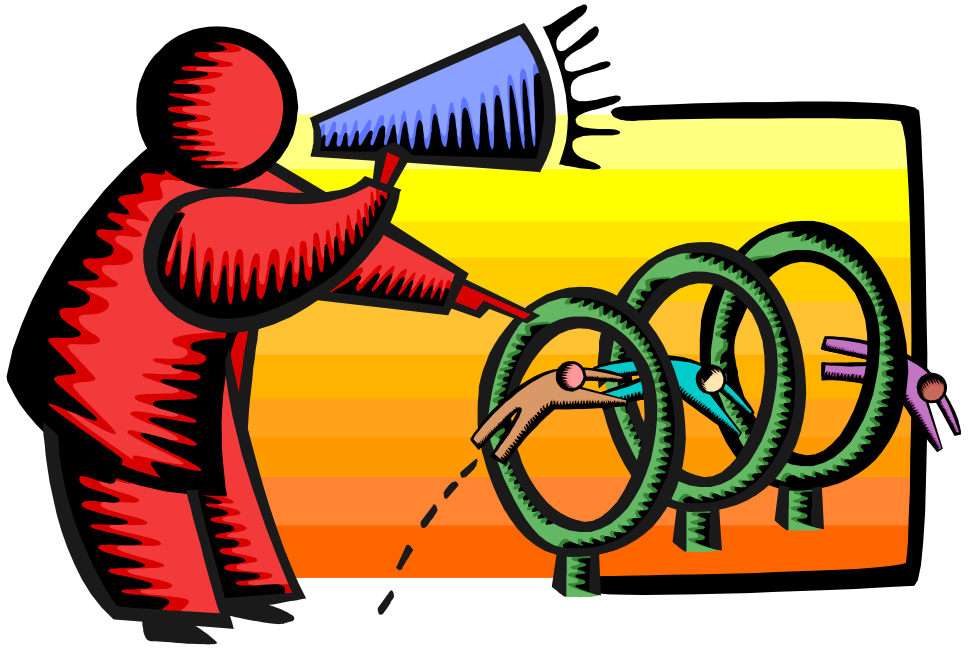
Demo



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Using Oracle Ask

- Names and organizational language
- Setting up Oracle Ask for success
- Beautiful questions

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Keys to Data Discovery

- Identify your main topic of interest with a performance tile
- Summary
- Evaluating a fact or a dimension?
  - Sales analysis
  - Customer or product analysis
- Fact analysis
  - Find lowest grain
  - Flat low distribution
  - Event or transaction
- Look for clustered distribution
    - Scatter with points as event in fact table
      - Set fact on X axis and response variable on Y axis

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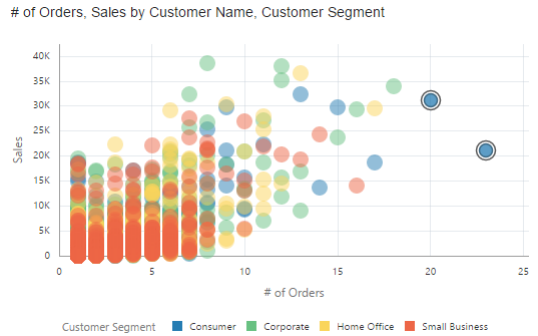
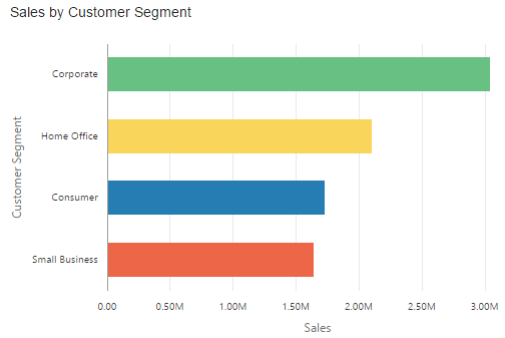
Major Types and Uses of Graphs

- Scatter plot – outlier detection



- Line graph – time based measures. Looking for trends and patterns

- Bar graph – comparison analysis



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Map Views and Location Analytics

- GeoJSON map layers
- Understanding and using built-in features of OAC
- NEW Spatial Studio

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Data Narratives/Evidence Based Stories

- Using OAC Narrative tab
- Reader/viewer experience
- Add verbiage for clarity and emphasis
- Numbers are read like words
- Graphs and visualizations are interpreted like pictures

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Starting with Data Discovery

- Begin either with a specific question or a framework
- Avoid “wandering around”
- Most of your visualizations will not produce new insights
- Move quickly through visualizations
- Be prepared to open a lot of browser tabs

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Finding is not Explaining

- Process of interaction has a huge impact on the contextual understanding of an insight
- When someone discovers something, they believe it more
- Human Cognition Biases

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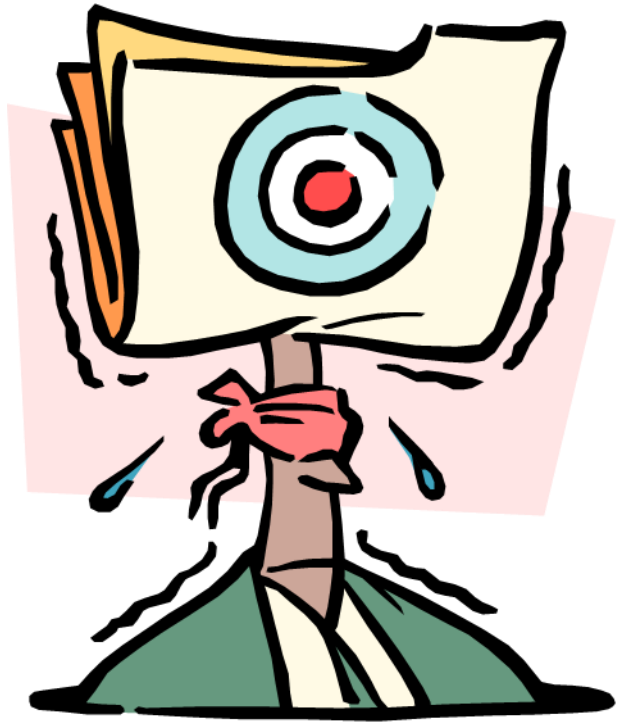
Questions?



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PLEASE FILL OUT YOUR EVALUATIONS

SEATTLE

Washington State Convention Center