Smarten
Augmented Analytics

Comprehensive Guide for Effective Visualizations

Smarten

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Author	EMTPL

A **Visualization or Data visualization** is the graphical representation of data, using charts, graphs, maps, plots and other visualizations, to make complex information more understandable. It aids in highlighting patterns, trends, and changes in data, enabling quicker decision-making by business users.

In a usual data analytics scenario, data is categorized into **dimensions** and **measures**

A **Dimension** is a structure that categorizes measures in order to enable users to answer business questions. Commonly used dimensions are people, products, place and time. On a higher level in the context of designing a visualization, Dimensions can be divided into following categories.

- **Descriptive Dimensions:** The dimensions which describe the metric. For example, Name, color, size, designation, role, etc.
- **Time-Based Dimensions:** Dimensions that are dates, timestamps or parts of dates or timestamps. For example, Year, Quarter, Order Date, Date of Birth, Week of the year, hour, minute, etc.
- **Regional Dimensions:** Dimensions that allow you to plot your data on a geographical map or a location axis. For example, latitude/longitude, state, city, country, area, etc.

A **Measure** or a Metric or a Key Performance Indicator (KPI) is a property on which calculations can be made. On a higher level in context of designing a visualization, Measures can be divided into following categories

- **Comparative Measures:** The measures that are supposed to be compared in order to understand the trend and progress of the metric against a dimension.
- **Non-comparative data:** The measures that can co-exist or can be presented separately having no correlation with each other and still can be on the same visualization against a dimension.

These two categories can be further divided into the same scale and different scale measures. So, the visualizations can have a single metric or a combination of two or more comparative/non-comparative same-scale/different-scale metrics.

- **Same scale measures:** When two or more measures used in a visualization are in the same unit scale. For example, every value is in millions for sales as well as cost. Or every quantity is in dozens for manufactured units and supplied units.
- **Different scale measures:** When two or more measures used in a visualization are of different scale or unit. For example, the quantity sold in dozens along with sales amount in millions**.**

So in conclusion, depending on the type of dimension in combination with the type of measure that we need to represent in a visualization, matters a lot while choosing the type of graph and it changes the entire representation of data when we choose a visualization that is best suited for the type of insight we wish to deliver through it.

The following are a few examples:

- A descriptive data with comparative measures is best represented in a bar chart
- A time-based data with non-comparative measures are usually depicted using line charts
- Regional data with comparative measures are visualized through maps.

Every visualization has its own pros and cons for conveying information effectively based on the purpose and data to represent.

The following section provides examples of different dimension-measure combinations with their best suited graph type/view based on the example or requirement, along with its clear advantages and disadvantages.

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Following are some recommended visualizations with explanations and examples for various cases.
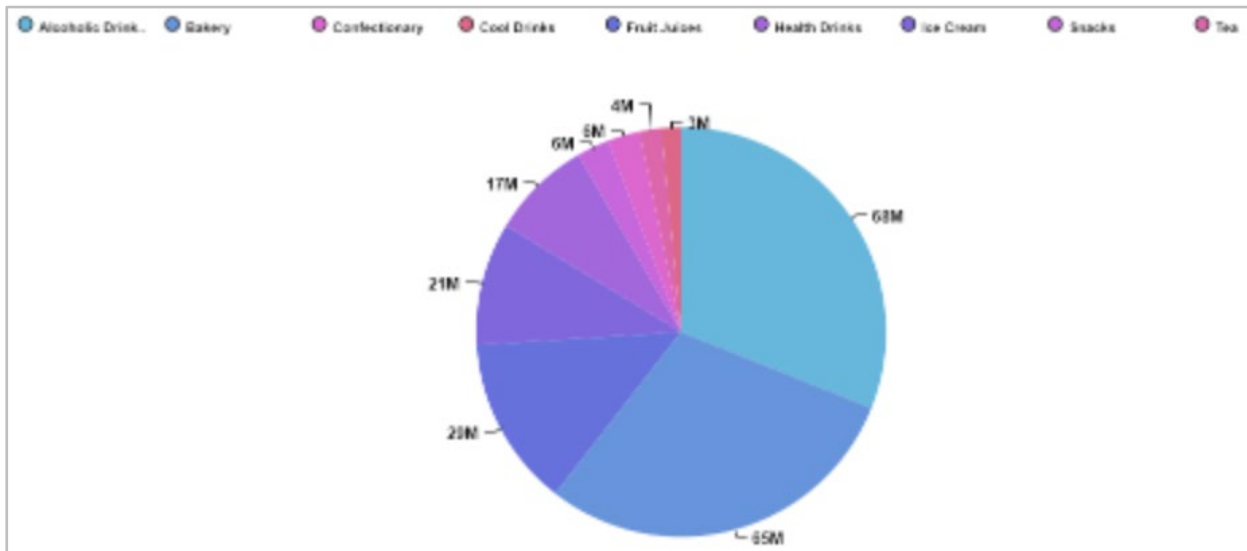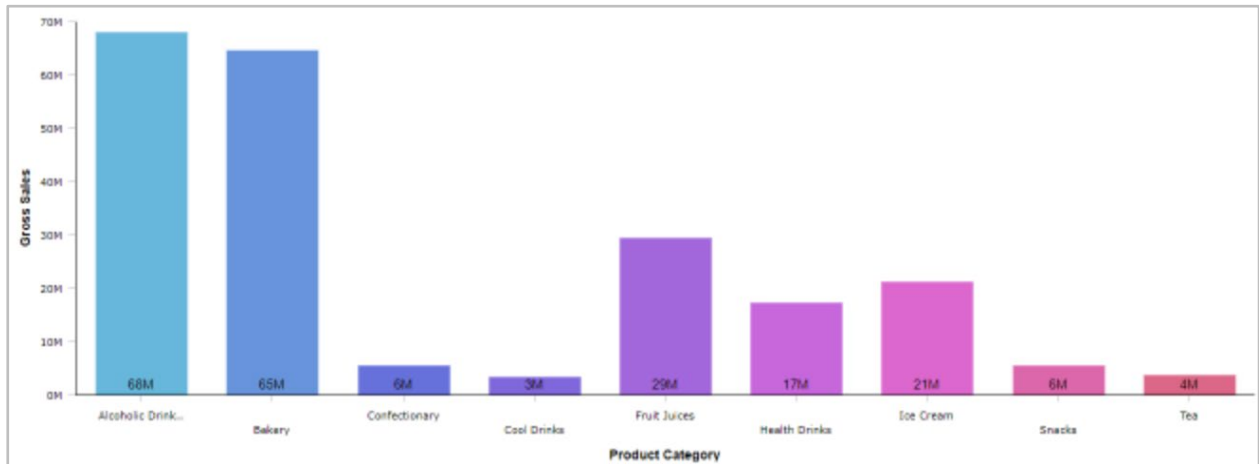
1) **Schema Combination:** 1 Dimension 1 Measure

   Types of Dimension(s): Descriptive Dimension

   Types of Measure(s): Any Measure

   Example: Category Wise Sales

   Preferred Chart Type: Pie

Pros:

- Best visualization for a single dimension against a single measure. Beneficial to show contribution in % as well.

Cons:

- In the case of many category values, the pie may look cluttered and won't give a clear picture.
- Also, in case of uneven distribution of values, the visualization might hide the smaller values from the view.

2) **Schema Combination:** 1 Dimension 1 Measure

   Types of Dimension(s): Descriptive Dimension

   Types of Measure(s): Any Measure

   Example: Category Wise Sales

   Preferred Chart Type: Vertical Bar

Pros:

- Simple and easy to understand representation.
- Allows pagination and so easy navigation.

Cons:

- May need more space in case of many category axis values.
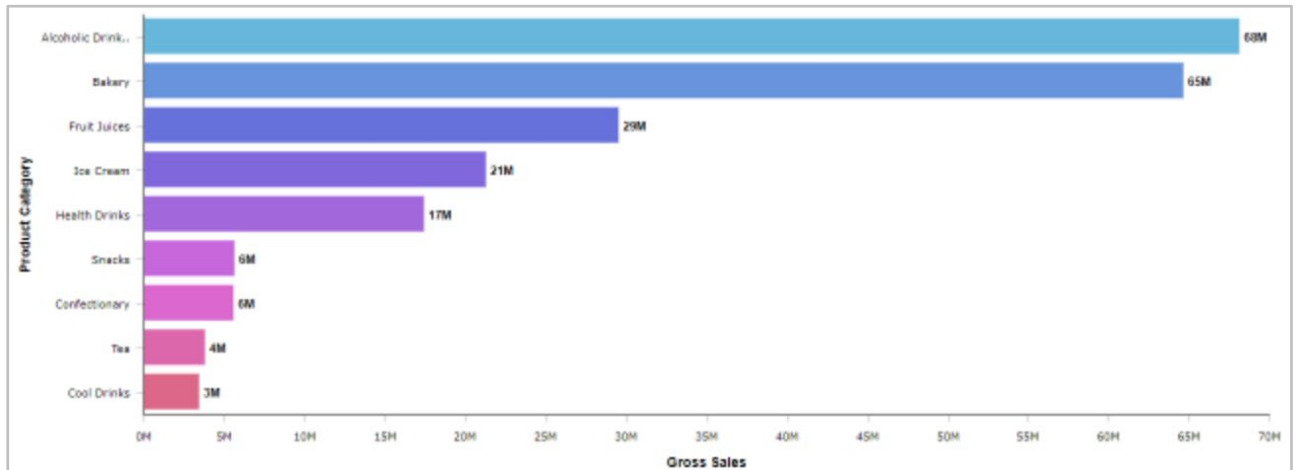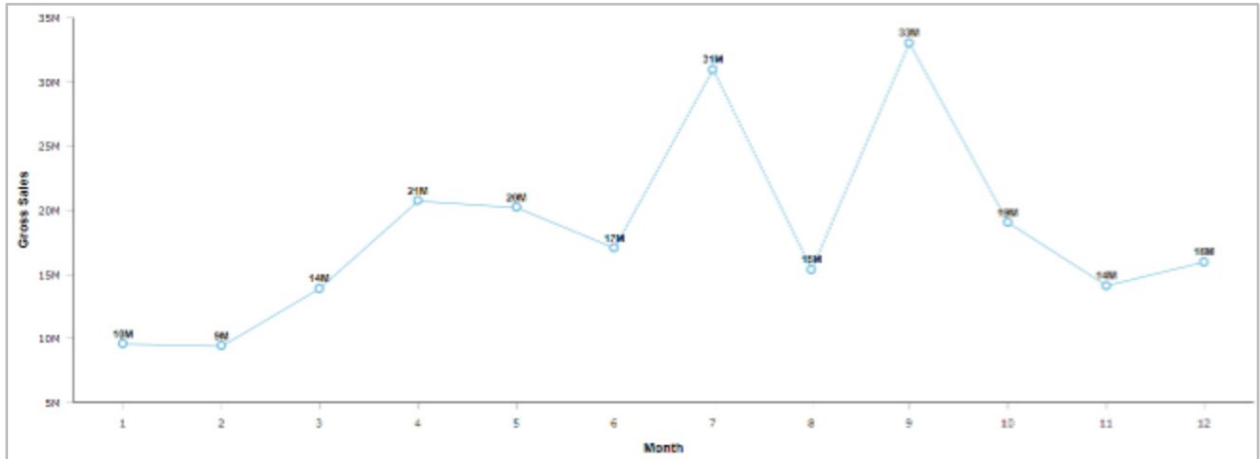- Data values may result in cluttered display in case of many bars.

3) **Schema Combination:** 1 Dimension 1 Measure

Types of Dimension(s): Descriptive Dimension

Types of Measure(s): Any Measure

Example: Category Wise Sales

Preferred Chart Type: Horizontal Bar

Pros:

- Simple and easy to understand representation.
- Allows pagination and so easy navigation.

Cons:

- May need more space in case of many category axis values.
- Data values may result in cluttered displays in case of many bars.

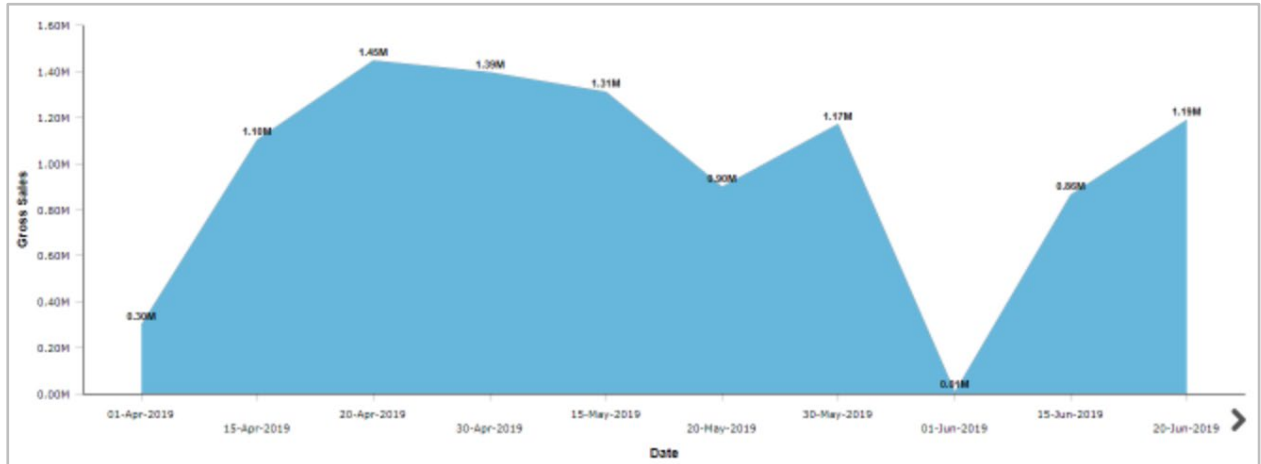4) **Schema Combination:** 1 Dimension 1 Measure

   Types of Dimension(s): Time Series Dimension

   Types of Measure(s): Any Measure

   Example: Monthly Sales

   Preferred Chart Type: Line

Pros:

• Effective for showing the trend and growth of a variable across timelines or in case of showing a trend across a sequence of dimension values.

Cons:

• Maybe misleading if the axis values are not interlinked or if the values don't follow a particular sequence.
• May need more space in case of many category axis values.
• Data values may result in cluttered display in case of many bars.

5) **Schema Combination:** 1 Dimension 1 Measure

   Types of Dimension(s): Time Series Dimension

   Types of Measure(s): Any Measure

   Example: Daily Profit

   Preferred Chart Type: Area

Pros:

- Effective for showing the trend as well as the impact and growth of a variable across timelines or in case of showing a trend or impact across a sequence of dimension values.

Cons:

- Maybe misleading if the axis values are not interlinked or if the values don't follow a particular sequence.
- May need more space in case of many category axis values.
- Data values may result in cluttered display in case of many bars.

6) **Schema Combination:** 1 Dimension 1 Measure

    Types of Dimension(s): Geographic Dimension

    Types of Measure(s): Any Measure

    Example: Regional Sales

    Preferred Chart Type: GeoMap
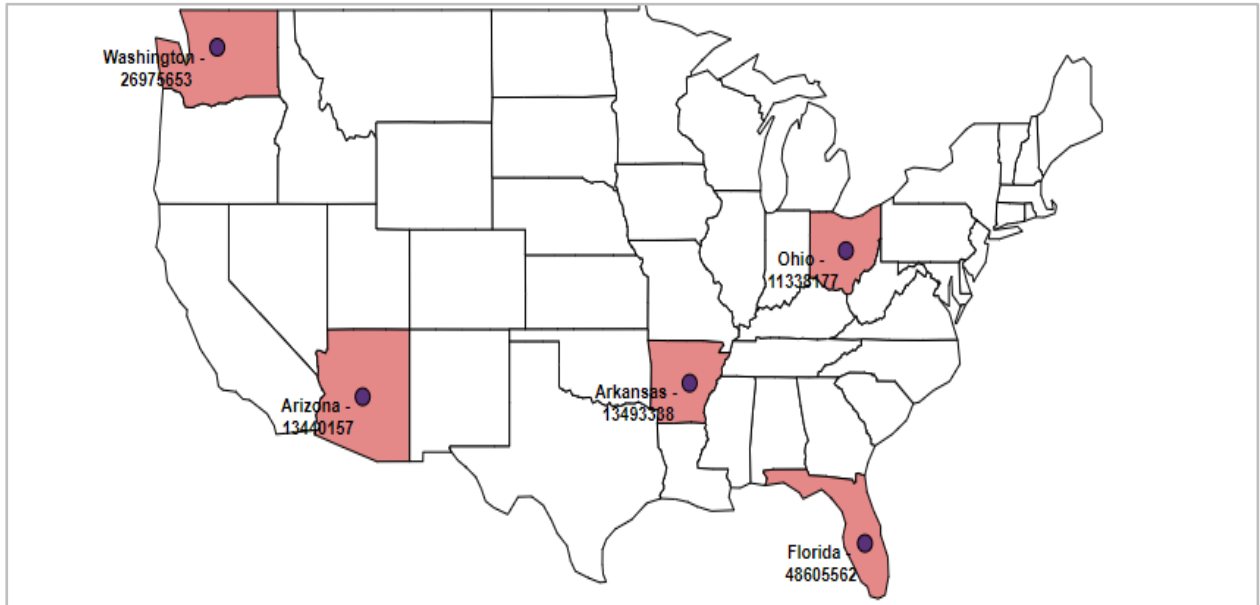
Pros:

- Best option when the dimension is a geo column.
- Allows to show data on a map along with spot lighters highlighting the affected and impacted areas as per the values.

Cons:

- Only plausible in case of geographic columns.
- May look cluttered if the geo coordinates are too many or are too closely plotted on the map.

7) **Schema Combination:** 2 Dimension 1 Measure

Types of Dimension(s): Descriptive Dimensions

Types of Measure(s): Any Measure

Example: Product Wise Employee Wise Sales

Preferred Chart Type: Bubble
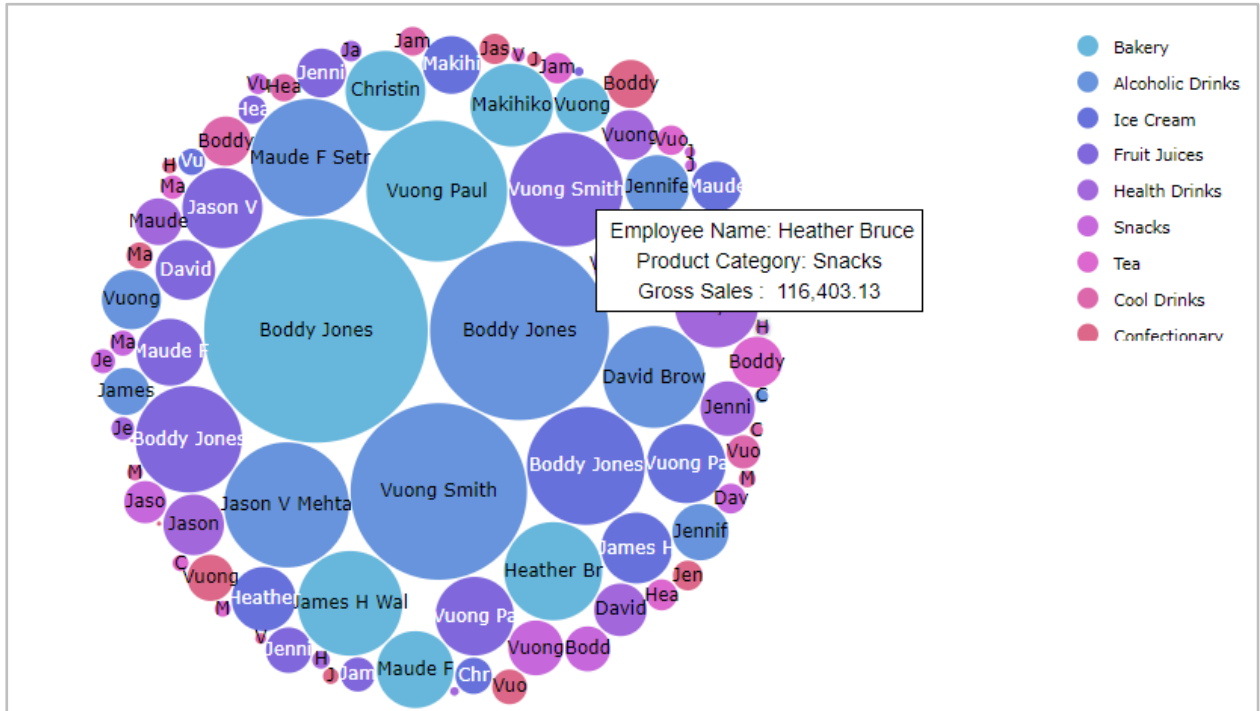
Pros:

- Shows sub-category distribution of values with color and size bifurcation within a category.

Cons:

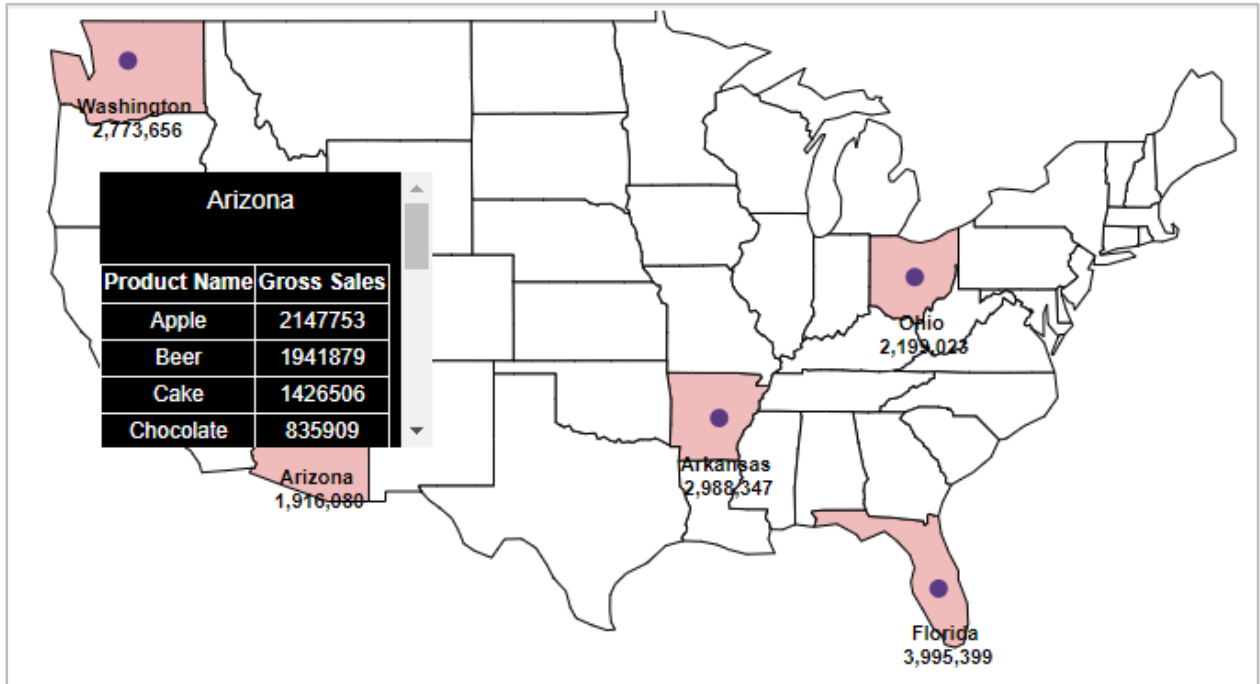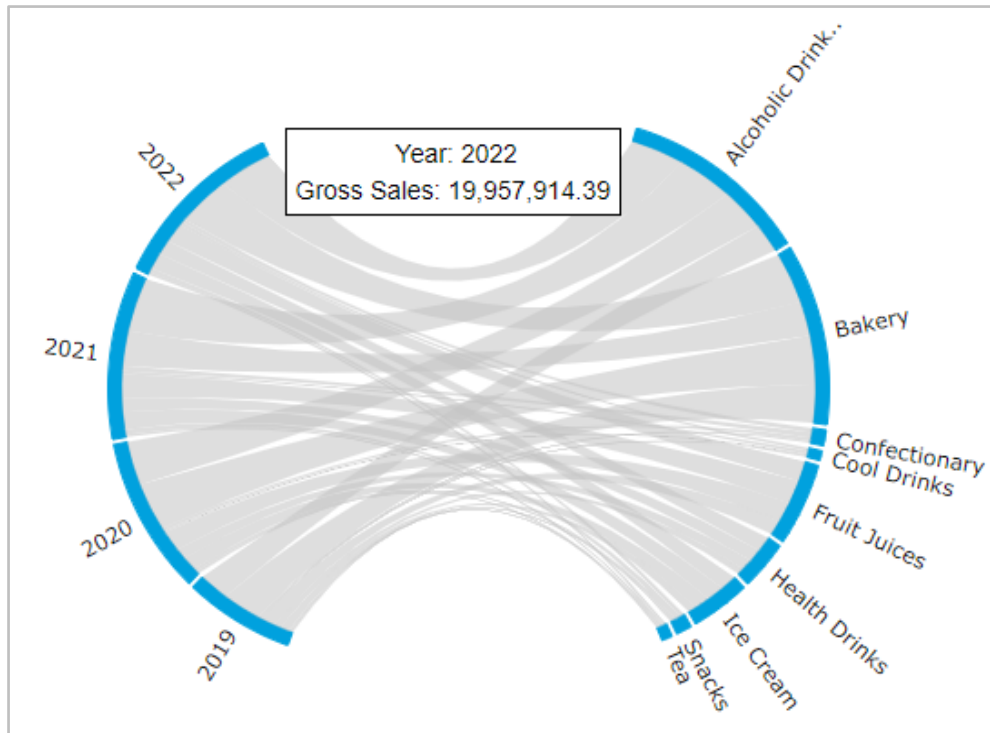- Can be highly cluttered in case of many dimension values.

8) **Schema Combination:** 2 Dimension 1 Measure

Types of Dimension(s): Descriptive & Geographic Dimensions

Types of Measure(s): Any Measure

Example: Product Wise Regional Sales

Preferred Chart Type: Geo Map

Pros:

- Best option when the dimension is a geo column.
- Allows to show data on a map along with spot lighters highlighting the affected and impacted areas as per the values.
- Wraps values of multiple sub-categories in a table to be displayed on a single marker.

Cons:

- Only plausible in case of geographic columns.
- May look clutter if the geo coordinates are too many or are too closely plotted on the map.
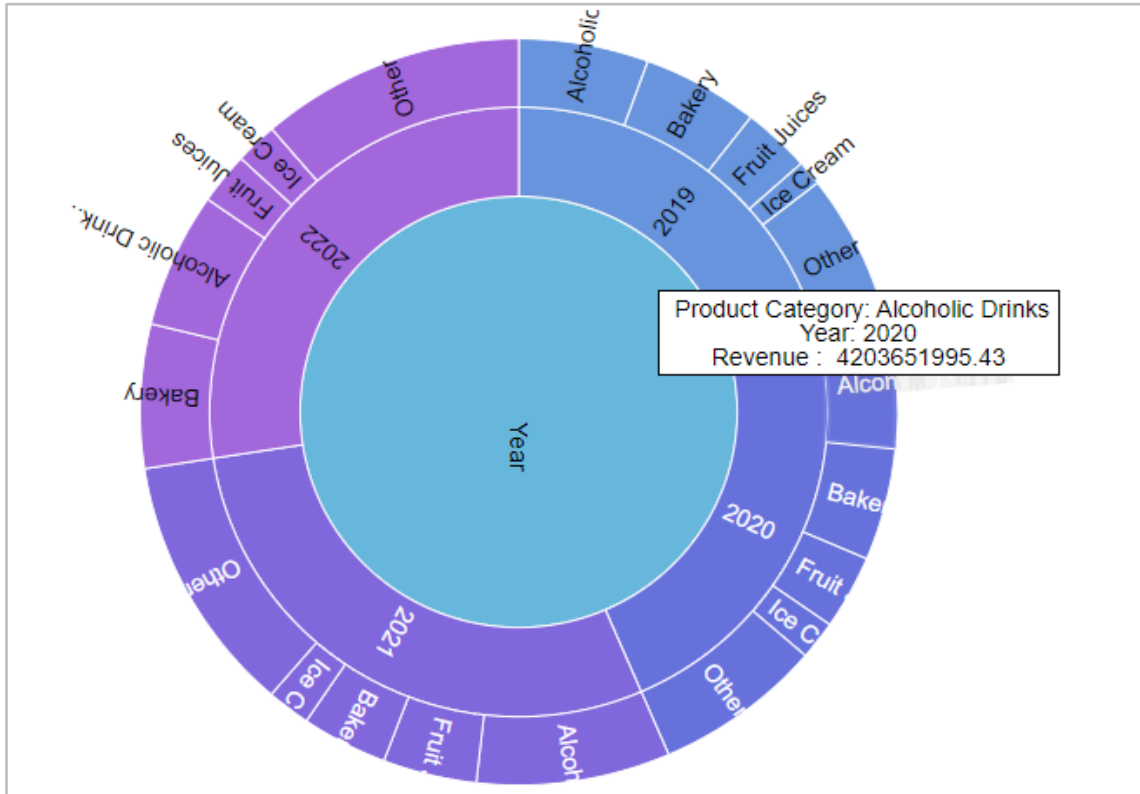
9) **Schema Combination:** 2 Dimension 1 Measure

   Types of Dimension(s): Descriptive & Time Series Dimensions

   Types of Measure(s): Any Measure

   Example: Product Wise Yearly Sales

   Preferred Chart Type: Chord

Pros:

- Depicts the strength of the values between two dimensions with the size of the arc.

Cons:

- Not a feasible option for many dimension values.
- Makes sense only when all the values of one dimension are related to all the values of other dimension.

10) **Schema Combination:** 2 Dimension 1 Measure

Types of Dimension(s): Descriptive & Time Series Dimensions

Types of Measure(s): Any Measure

Example: Yearly Departmental Revenue Contribution

Preferred Chart Type: Sunburst

Pros:

- Beneficial in showing the distribution within a category. The size depicts the contribution.

Cons:

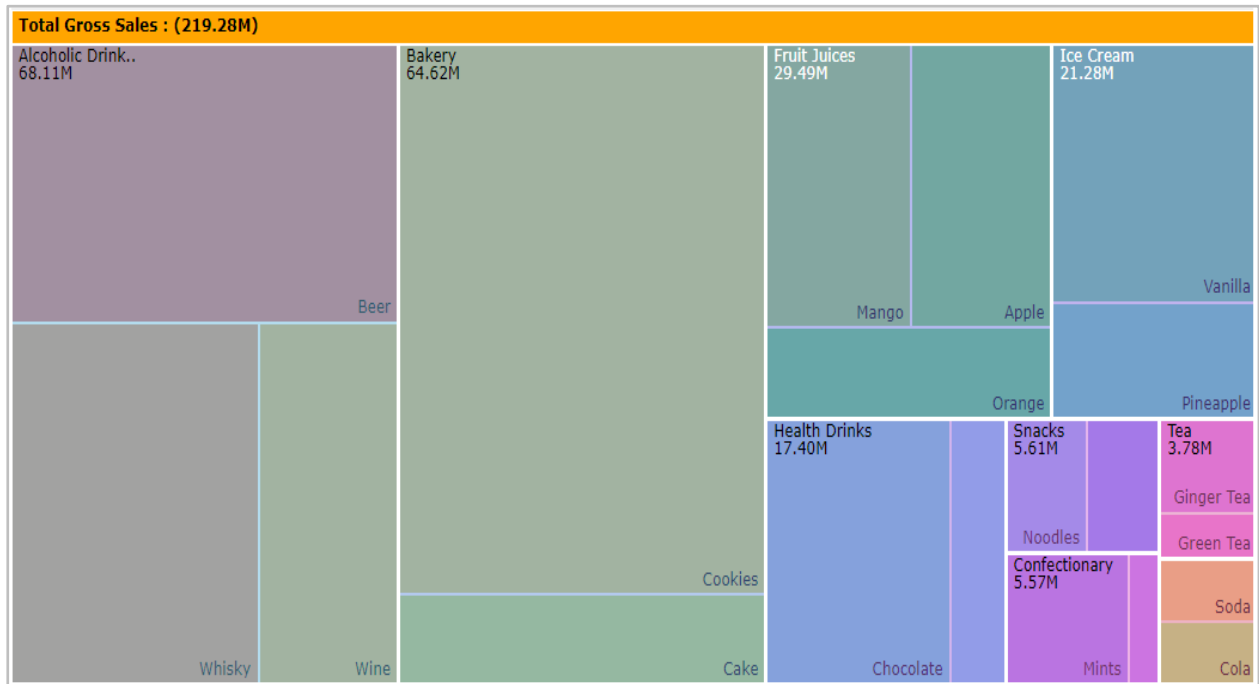- Easily looks cluttered in case of many dimension values doesn't make sense in case of improper distribution of category values.

11) **Schema Combination:** 2 Dimension 1 Measure

   Types of Dimension(s): Descriptive Dimensions

   Types of Measure(s): Any Measure

   Example: Category Wise and Sub Category Wise Sales Distribution

   Preferred Chart Type: Hierarchy Tree

Pros:

- Best option to show pictorial representation of percentage distribution of sub-category values within a range of category values.

Cons:
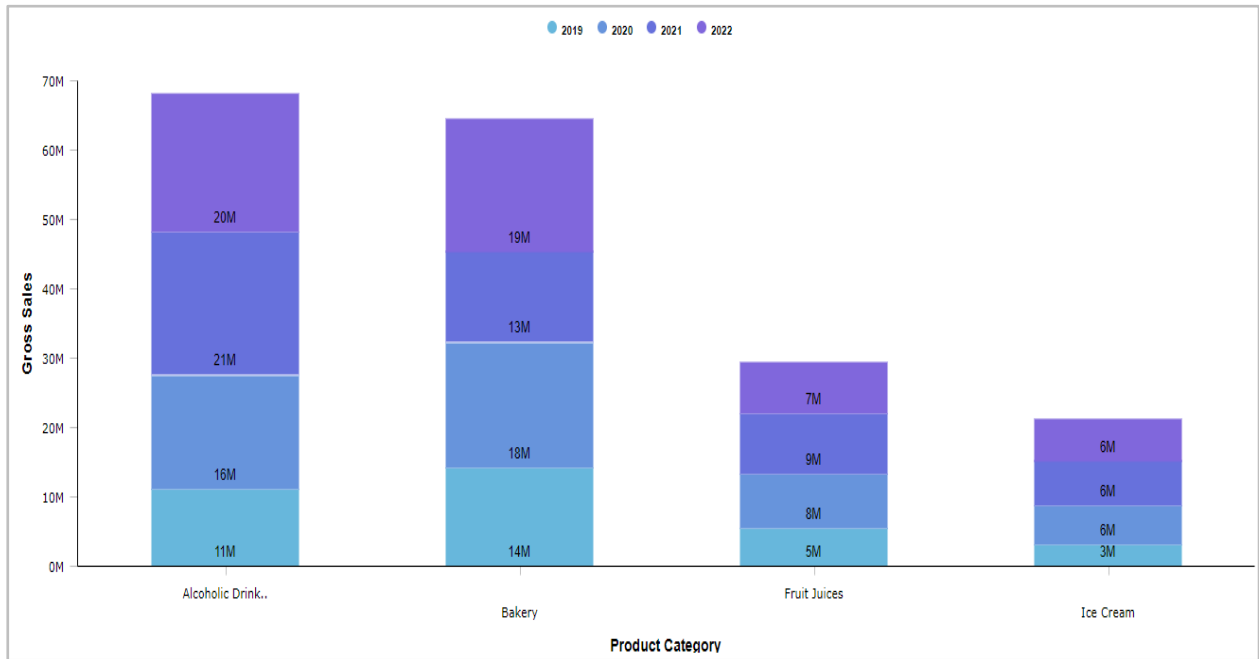
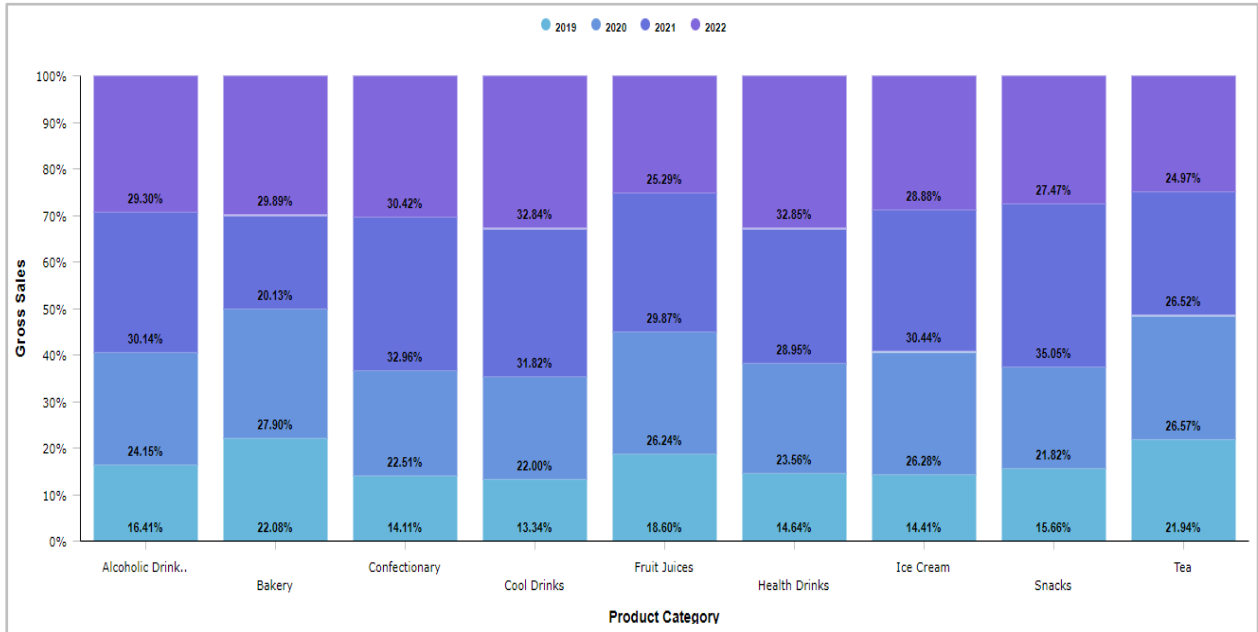- Hard to depict smaller values between the larger values.

12) **Schema Combination:** 2 Dimension 1 Measure

Types of Dimension(s): Descriptive & Time Series Dimensions

Types of Measure(s): Any Measure

Example: Product Wise Yearly Sales

Preferred Chart Type: Stacked Vertical Bar Graph

Pros:

- Simple and easy to understand representation of x-axis values along with contribution of each z-axis value.
- Allows pagination and so is easy to navigate.

Cons:

- May need more space in case of many category axis values.
- Data values result in cluttered display.
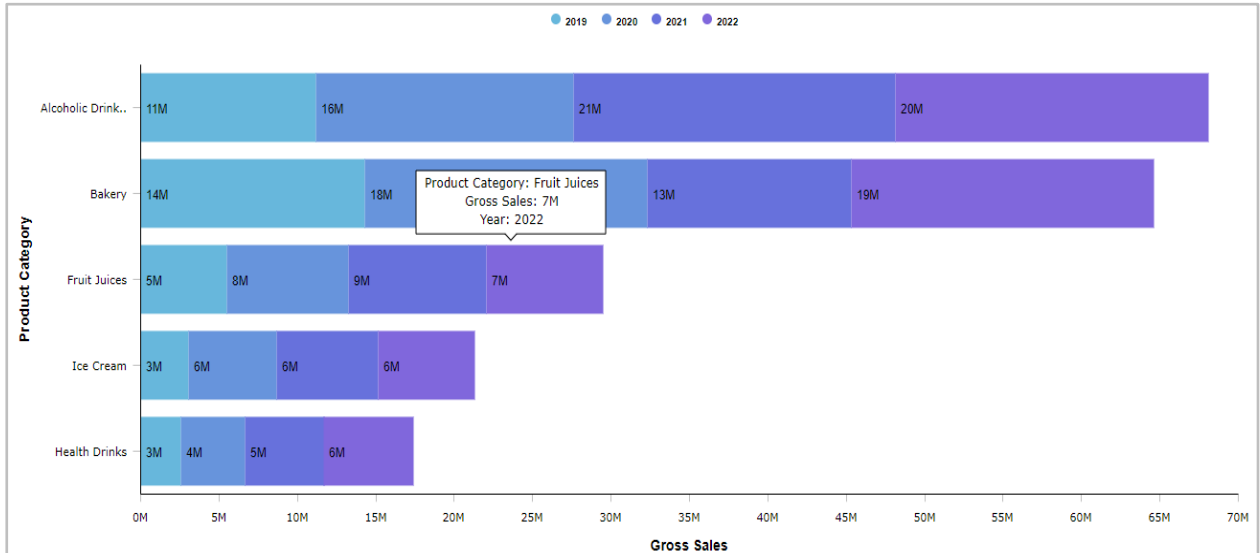- Negligible Values may seem to be hidden.

13) **Schema Combination:** 2 Dimension 1 Measure

Types of Dimension(s): Descriptive & Time Series Dimensions

Types of Measure(s): Any Measure

Example: Product Wise Yearly Sales

Preferred Chart Type: Percentage Vertical Bar Graph

Pros:

- Simple and easy to understand representation of x-axis values along with contribution of each z-axis value in %.
- Allows pagination and so is easy to navigate.

Cons:

- May need more space in case of many category axis values.
- Data values result in cluttered display.
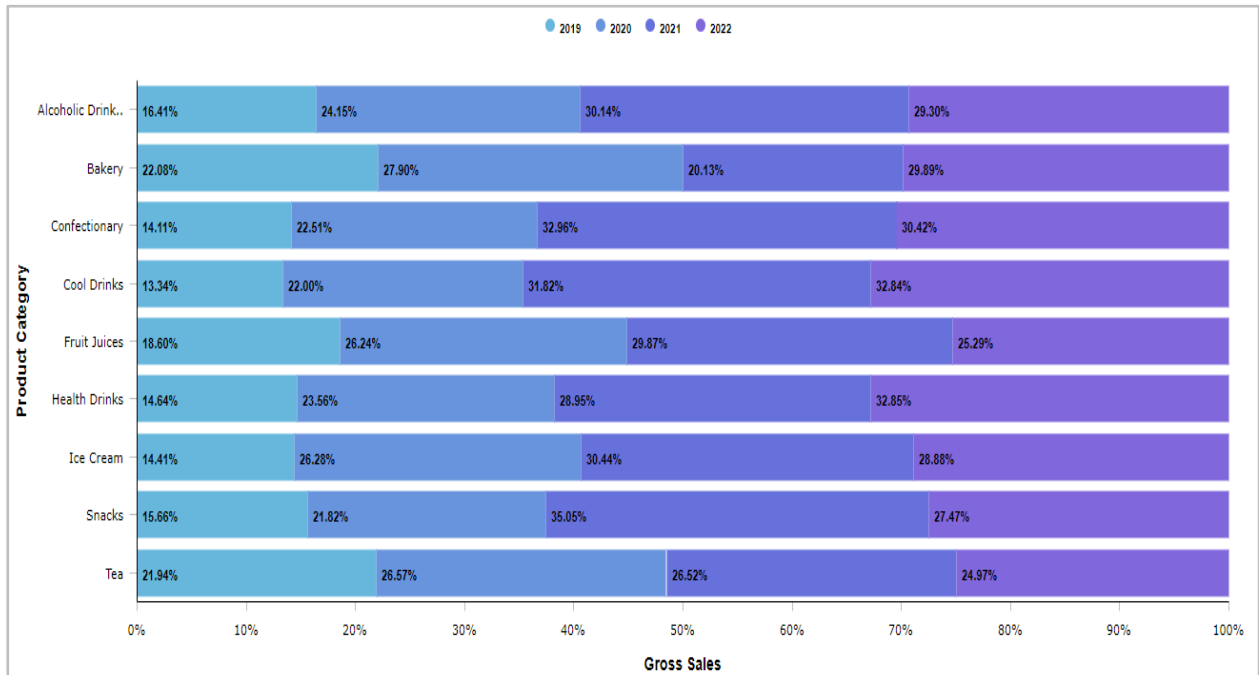- Negligible Values may seem to be hidden.

14) **Schema Combination:** 2 Dimension 1 Measure

Types of Dimension(s): Descriptive & Time Series Dimensions

Types of Measure(s): Any Measure

Example: Product Wise Yearly Sales

Preferred Chart Type: Stacked Horizontal Bar Graph

Pros:

- Simple and easy to understand representation of x-axis values along with contribution of each z-axis value.
- Allows pagination and so is easy to navigate.

Cons:

- May need more space in case of many category axis values.
- Data values result in cluttered display.
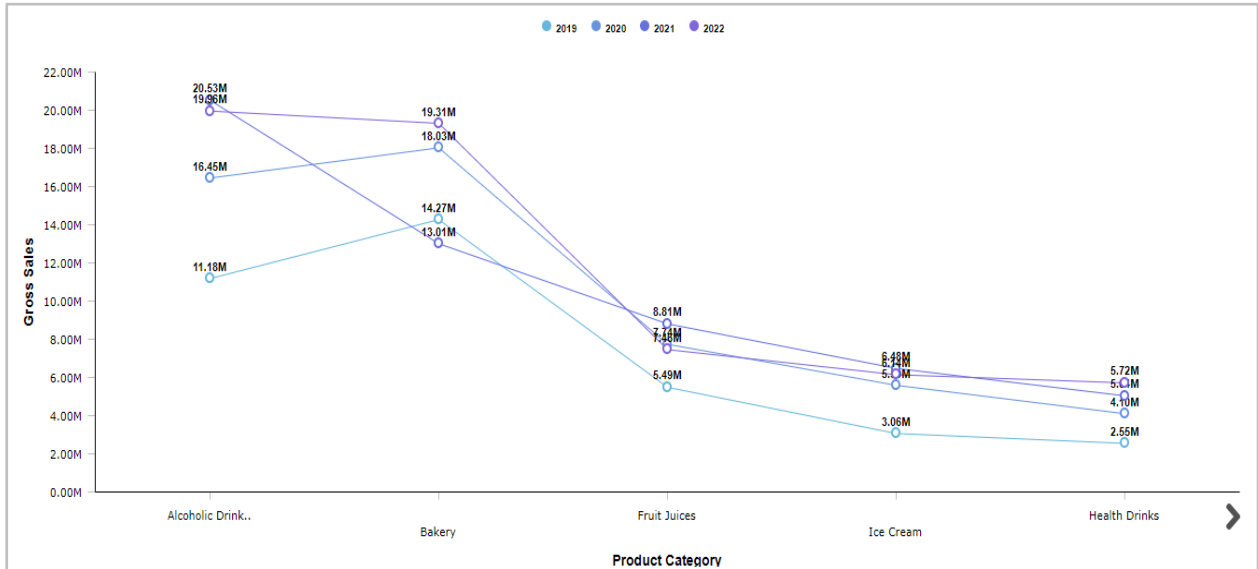- Negligible Values may seem to be hidden.

15) **Schema Combination:** 2 Dimension 1 Measure

   Types of Dimension(s): Descriptive & Time Series Dimensions

   Types of Measure(s): Any Measure

   Example: Product Wise Yearly Sales

   Preferred Chart Type: Percentage Horizontal Bar Graph

Pros:

- Simple and easy to understand representation of x-axis values along with contribution of each z-axis value in %.
- Allows pagination and so is easy to navigate.

Cons:

- May need more space in case of many category-axis values.
- Data values result in cluttered display.
- Negligible Values may seem to be hidden.

16) **Schema Combination:** 2 Dimension 1 Measure

   Types of Dimension(s): Time Series & Descriptive Dimension

   Types of Measure(s): Any Measure

   Example: Year Wise Product Sales

   Preferred Chart Type: Line Graph

Pros:

- Effective for showing the trend and growth of a variable across timelines or in case of showing a trend across a sequence of dimension values compared to other z-axis values.

Cons:

- Maybe misleading if the axis values are not interlinked or if the values don't follow a particular sequence.
- May need more space in case of many category axis values.
- Data values may result in cluttered display in case of many bars.
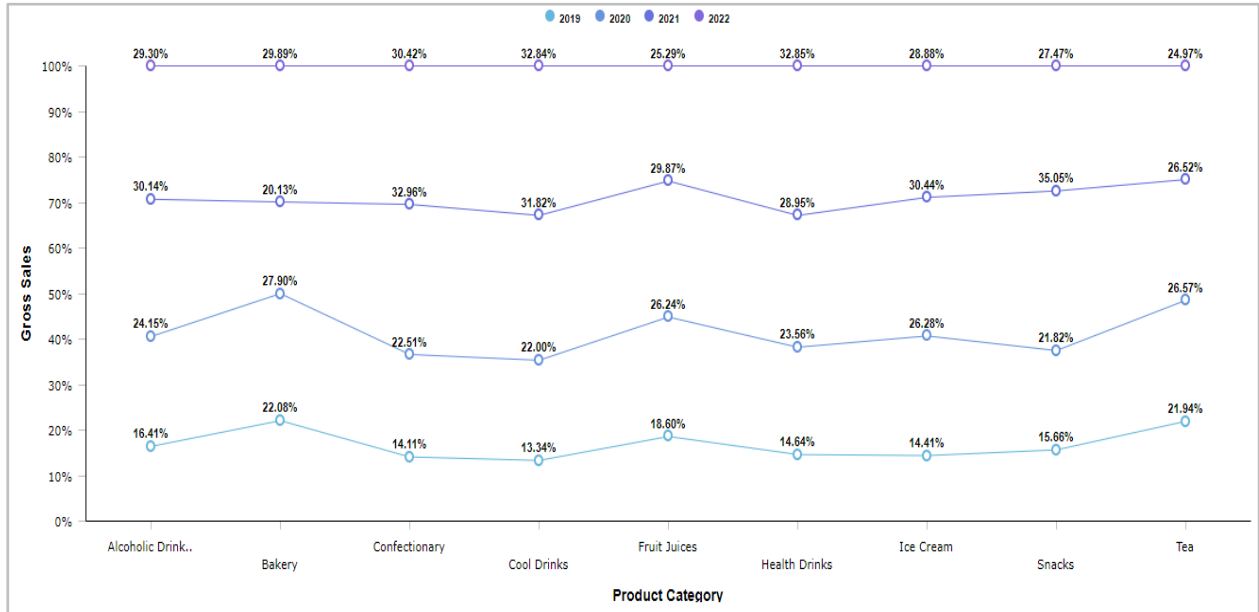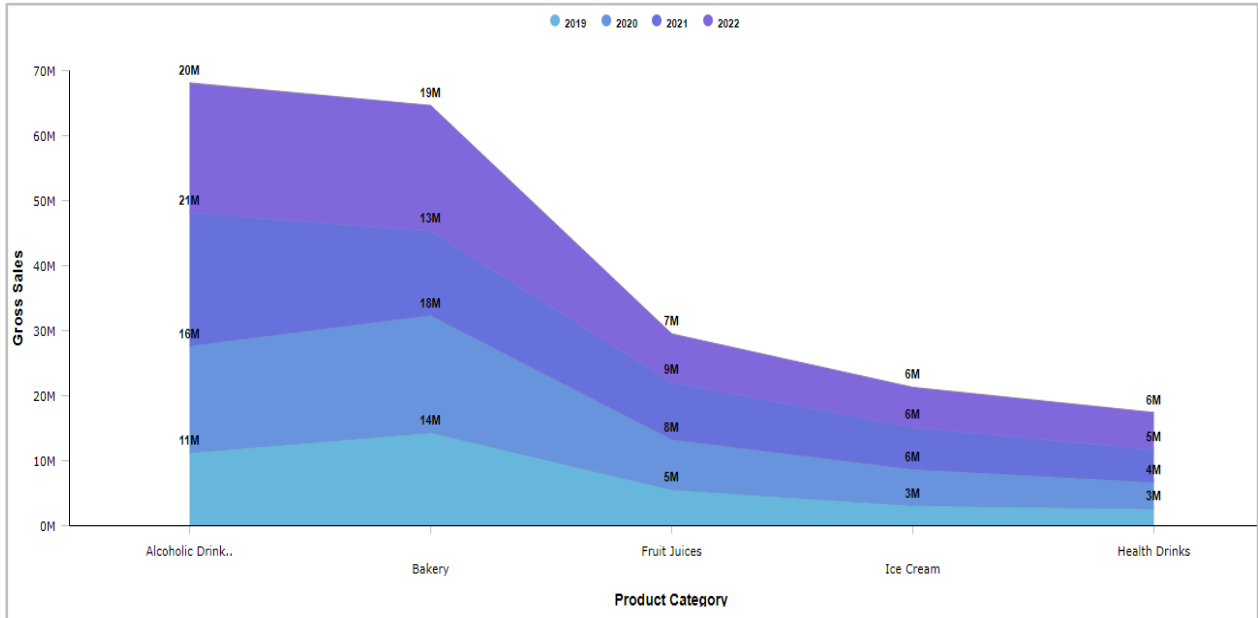
17) **Schema Combination:** 2 Dimension 1 Measure

Types of Dimension(s): Time Series & Descriptive Dimensions

Types of Measure(s): Any Measure

Example: Year Wise Product Sales

Preferred Chart Type: Percentage Line Graph

Pros:

- Effective for showing the trend and growth in form of % contribution of a variable across timelines or in case of showing a trend across a sequence of dimension values compared to other z-axis values.

Cons:

- Maybe misleading if the axis values are not interlinked or if the values don't follow a particular sequence.
- May need more space in case of many category axis values.
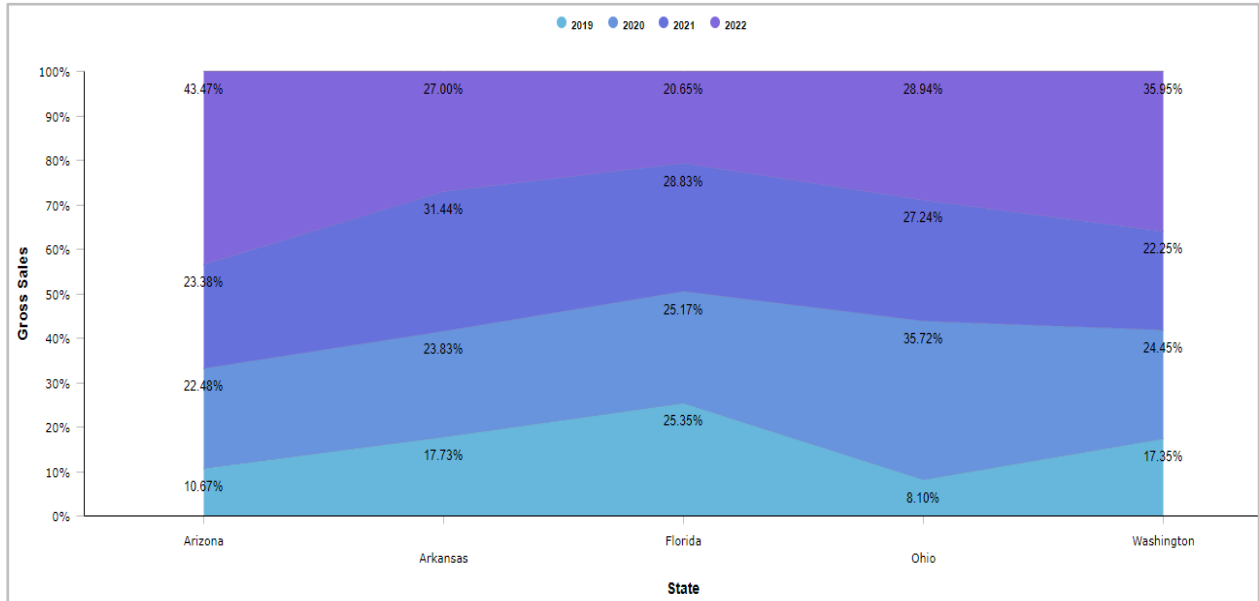- Data values may result in cluttered display in case of many bars.

18) **Schema Combination:** 2 Dimension 1 Measure

Types of Dimension(s): Time Series & Descriptive Dimension

Types of Measure(s): Any Measure

Example: Year Wise Product Sales

Preferred Chart Type: Stacked Area Graph

Pros:

- Effective for showing the trend and growth of a variable across timelines or in case of showing a trend across a sequence of dimension values compared to other z-axis values.

Cons:

- Can be misleading if the axis values are not interlinked or if the values don't follow a particular sequence.
- May need more in case of many category axis values.
- Data values may result in cluttered display in case of many bars.

19) **Schema Combination:** 2 Dimension 1 Measure

Types of Dimension(s): Time Series & Descriptive Dimensions

Types of Measure(s): Any Measure

Example: Year Wise Product Sales

Preferred Chart Type: Percentage Area Graph

Pros:

- Effective for showing the trend and growth in form of % contribution of a variable across timelines or in case of showing a trend across a sequence of dimension values compared to other z-axis values.

Cons:

- Can be misleading if the axis values are not interlinked or if the values don't follow a particular sequence.
- May need more space in case of many category axis values.
- Data values may result in cluttered display in case of many bars.

20) **Schema Combination:** 2 Dimension 1 Measure

Types of Dimension(s): Time Series & Geographic Dimensions

Types of Measure(s): Any Measure

Example: Year Wise Regional Sales

Preferred Chart Type: Radar
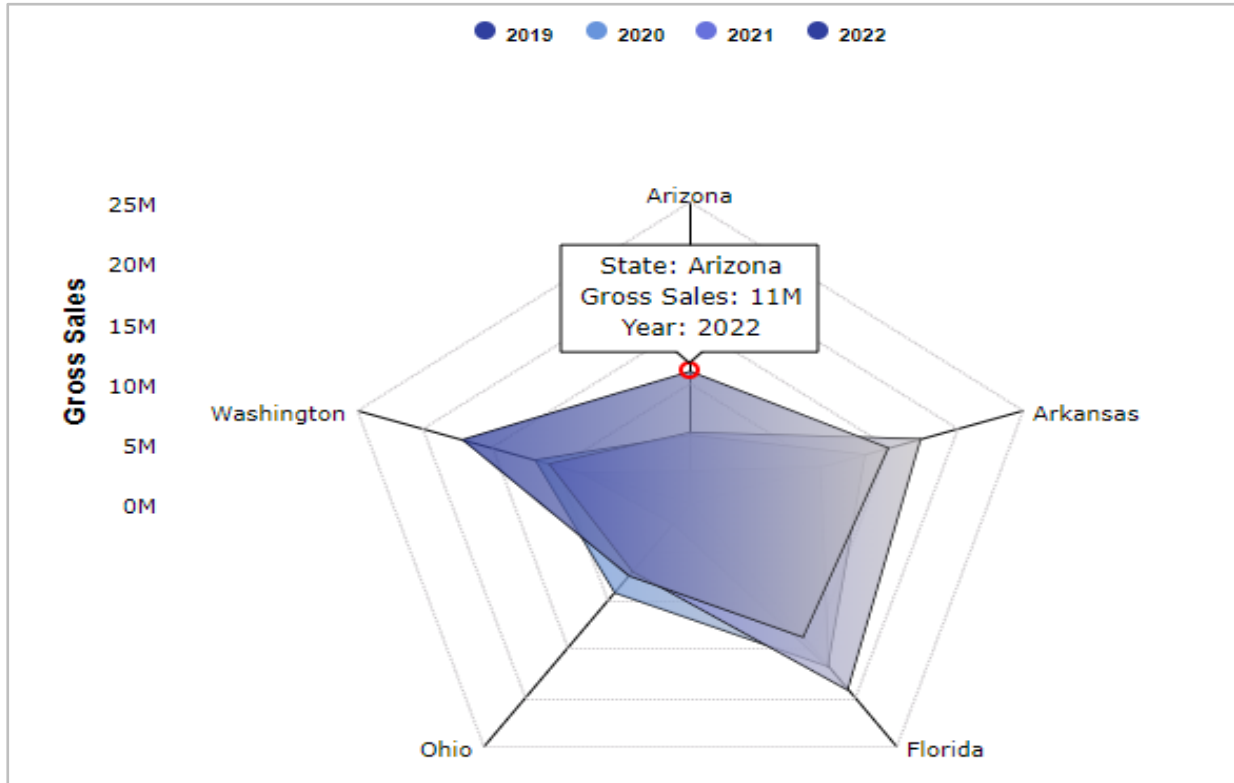
Pros:

- Allows to plot variables with disparate, non-matching scales. Shows 2D plot of distribution and allows to show where the impact is higher.

Cons:

- May be misleading to some who don't share the same definition of the plots for the visual understanding of values. The plot may vary based on understanding of each scenario.
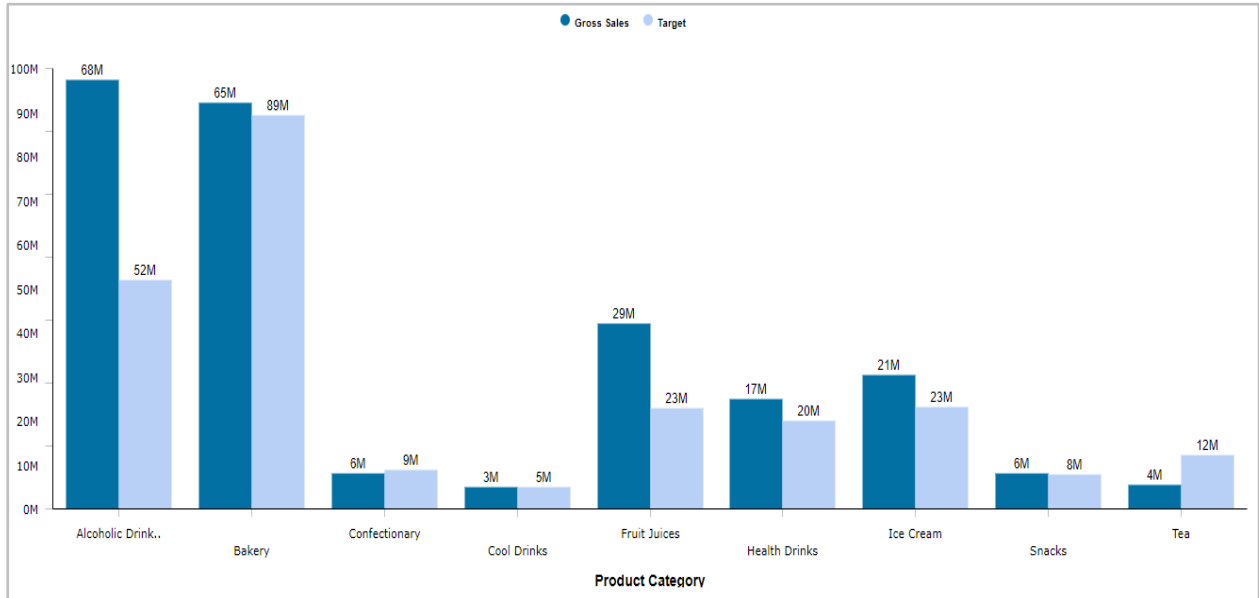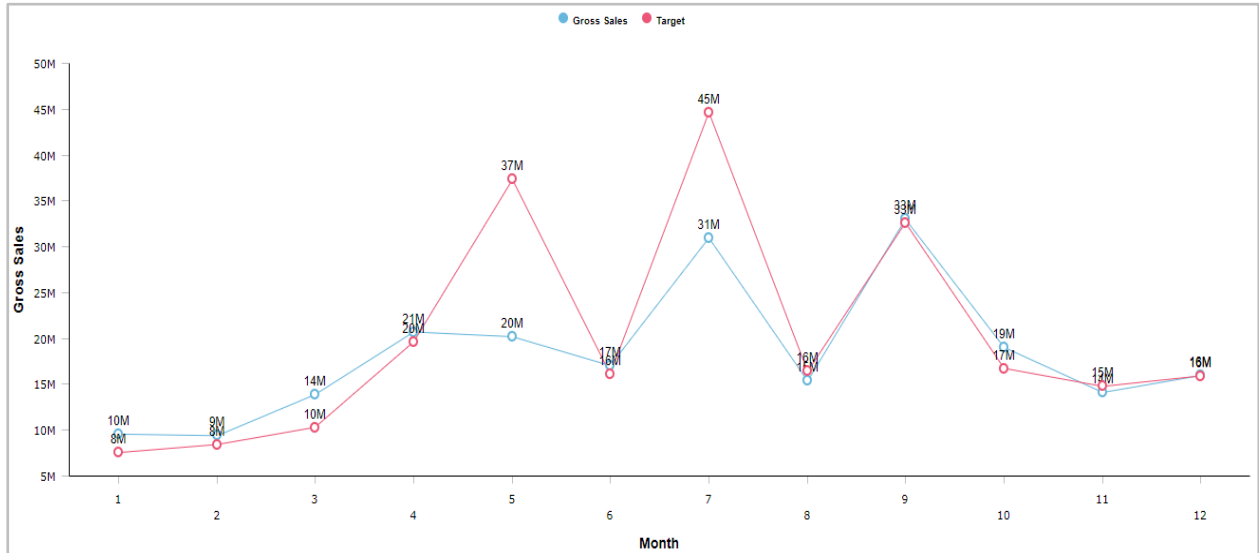
21) **Schema Combination:** 1 Dimension 2 Measure

   Types of Dimension(s): Any Dimension

   Types of Measure(s): Comparative Measures

   Example: Product wise Sales vs Target

   Preferred Chart Type: Bar Graph

Pros:

- Simple and easy to understand representation.
- Allows pagination and so easy navigation.

Cons:

- May need more space in case of many category axis values.
- Data values may result in cluttered display in case of many bars.

22) **Schema Combination:** 1 Dimension 2 Measure

Types of Dimension(s): Any Dimension

Types of Measure(s): Comparative Measures

Example: Monthly Sales vs Target

Preferred Chart Type: Line Graph

Pros:

- Effective for showing the trend and growth of a variable across timelines or in case of showing a trend across a sequence of dimension values.

Cons:

- Can be misleading if the axis values are not interlinked or if the values don't follow a particular sequence.
- May need more space in case of many category axis values.
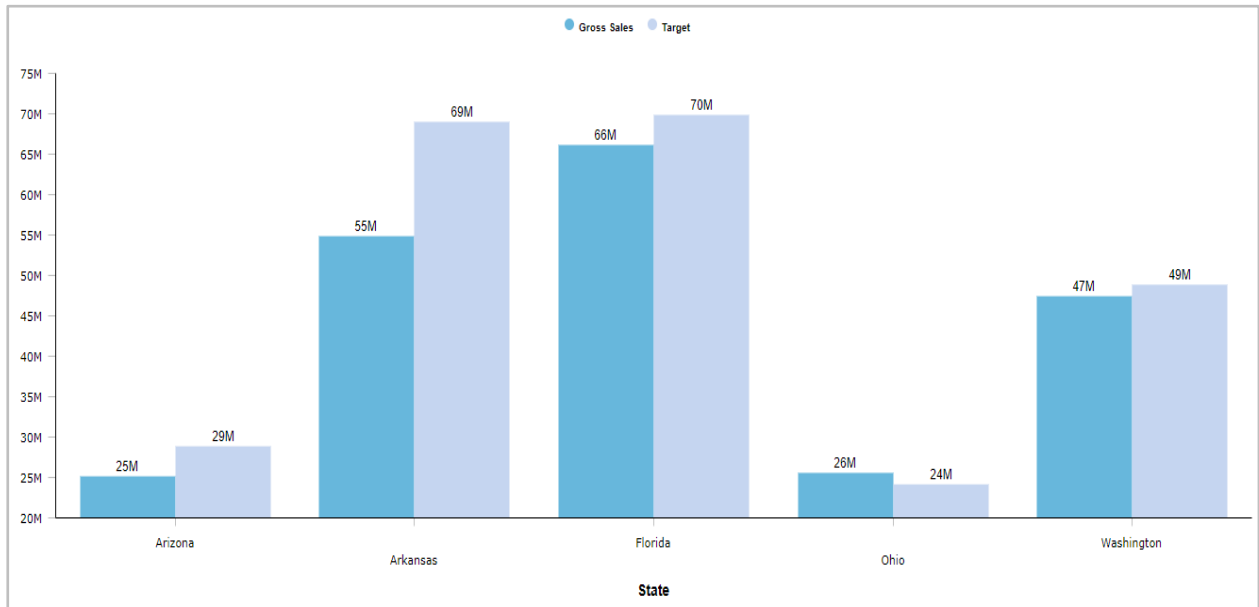- Data values may result in cluttered display in case of many bars.

23) **Schema Combination:** 1 Dimension 2 Measure

   Types of Dimension(s): Any Dimension

   Types of Measure(s): Comparative Measures

   Example: Region wise Sales vs Target

   Preferred Chart Type: Bar Graph

Pros:

- Simple and easy to understand representation.
- Allows pagination and so easy navigation.

Cons:

- May need more space in case of many category axis values.
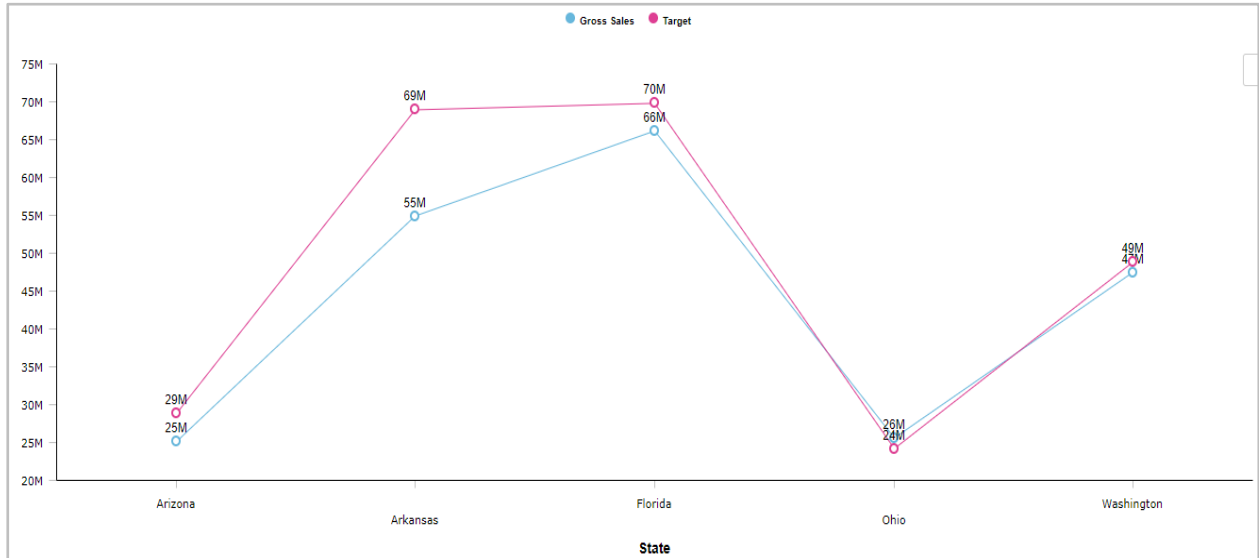- Data values may result in cluttered display in case of many bars.

24) **Schema Combination:** 1 Dimension 2 Measure

   Types of Dimension(s): Any Dimension

   Types of Measure(s): Comparative Measures

   Example: Region wise Sales vs Target

   Preferred Chart Type: Line Graph

Pros:

- Effective for showing the trend and growth of a variable across timelines or in case of showing a trend across a sequence of dimension values.

Cons:

- Can be misleading if the axis values are not interlinked or if the values don't follow a particular sequence.
- May need more space in case of many category axis values.
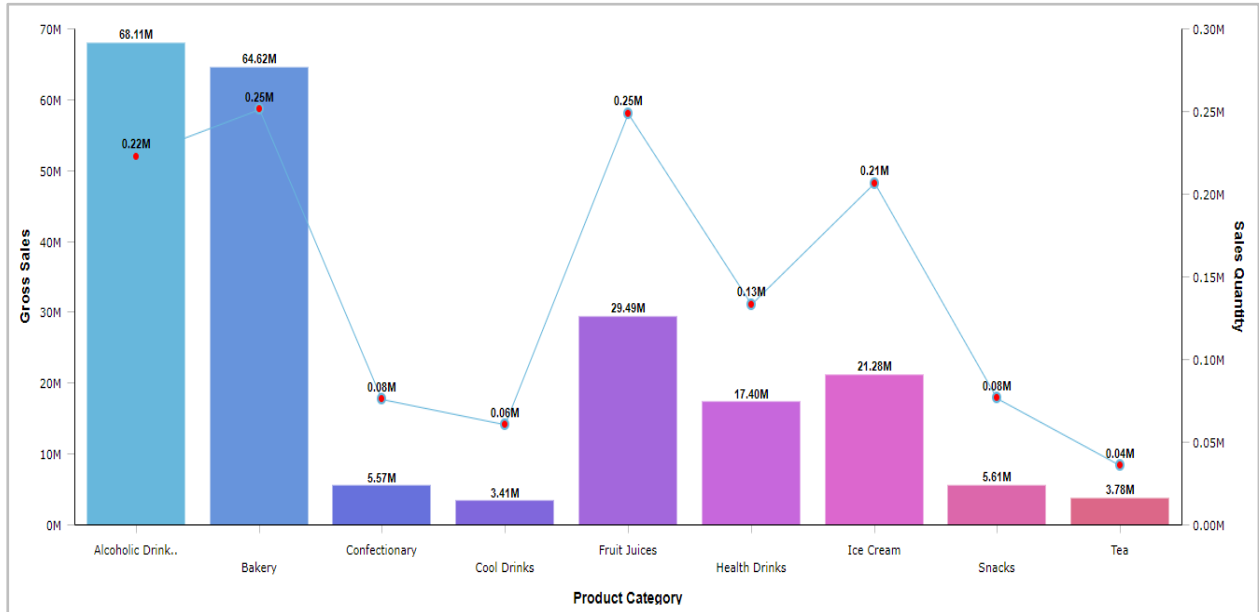- Data values may result in cluttered display in case of many bars.

25) **Schema Combination:** 1 Dimension 2 Measure

Types of Dimension(s): Any Dimension

Types of Measure(s): Different Scale Measures

Example: Product wise Quantity & Sales

Preferred Chart Type: Combined Chart

Pros:

- It is best used to show relationships and pattern between the measures.
- It allows to show outliers.

Cons:

- It cannot be used for 2 or more dimensions.
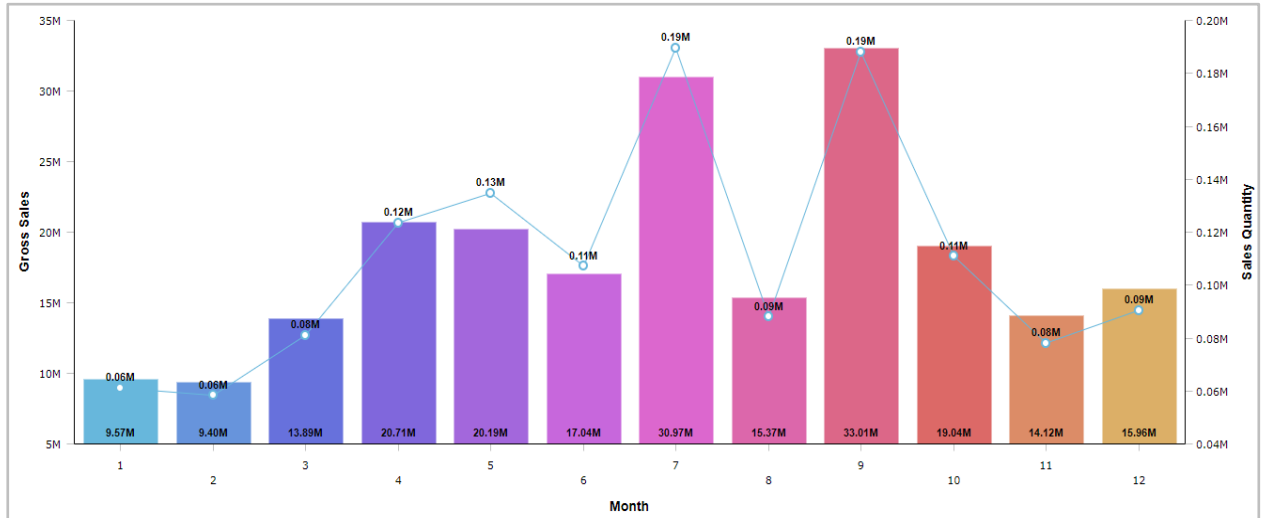- It becomes difficult to choose a suitable scale when values of matrix differ by greater magnitude.

26) **Schema Combination:** 1 Dimension 2 Measure

   Types of Dimension(s): Any Dimension

   Types of Measure(s): Different Scale Measures

   Example: Monthly Quantity & Sales

   Preferred Chart Type: Combined

Pros:

- It is best used to show relationships and pattern between the measures.
- It allows to show outliers.

Cons:

- It cannot be used for 2 or more dimensions.
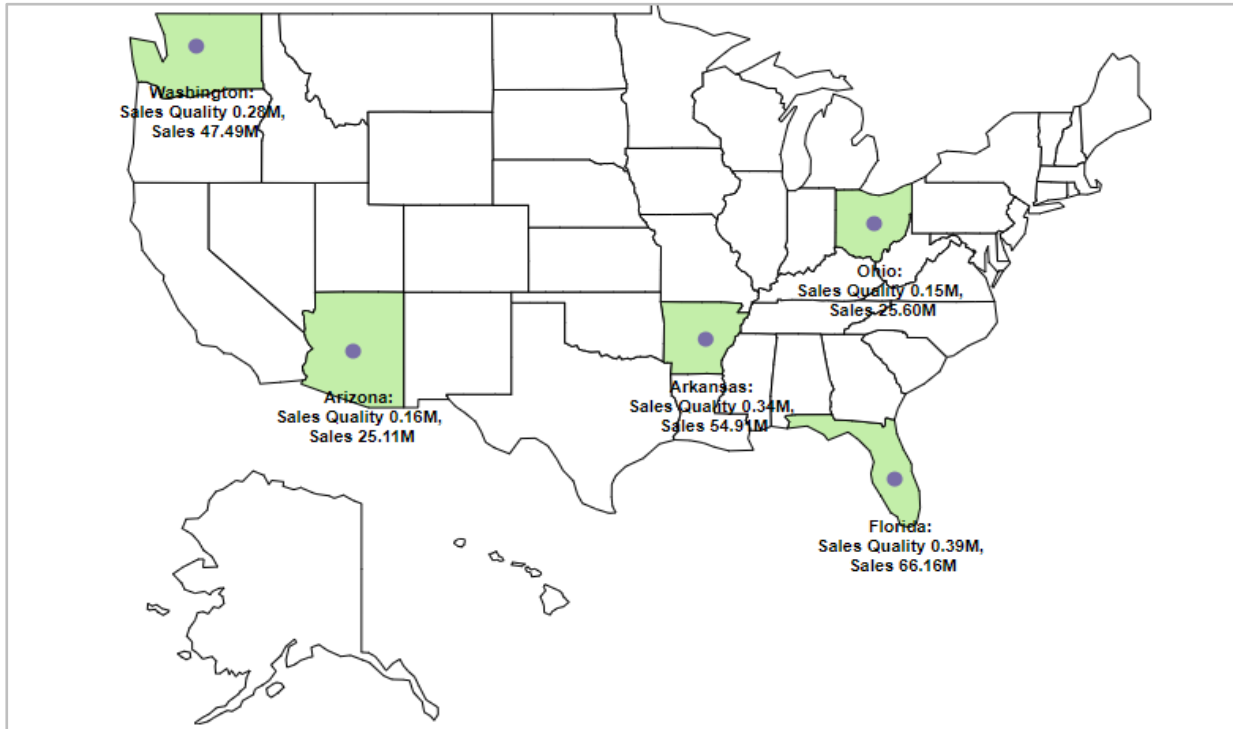- It becomes difficult to choose a suitable scale when values of matrix differ by greater magnitude.

27) **Schema Combination:** 1 Dimension 2 Measure

Types of Dimension(s): Any Dimension

Types of Measure(s): Different Scale Measures

Example: Region wise Quantity & Sales

Preferred Chart Type: Geomap

Pros:

- Best option when the dimension is a geo column.
- Allows to show data on a map along with spot lighters highlighting the affected and impacted areas as per the values.
- Wraps values of multiple sub-categories in a table to be displayed on a single marker.

Cons:

- Only plausible in case of geographic columns.
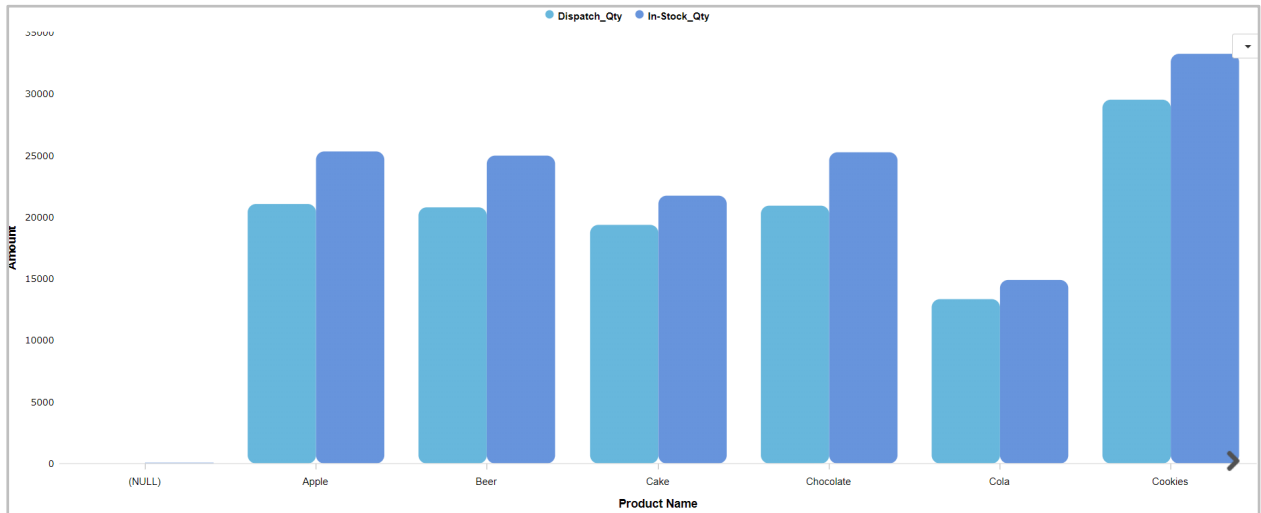- May look cluttered if the geo coordinates are too many or are too closely plotted on the map.

28) **Schema Combination:** 1 Dimension 2 Measure

   Types of Dimension(s): Any Dimension

   Types of Measure(s): Non-Comparative & Same Scale Measures

   Example: Product wise In-stock Quantity & Dispatch Quantity

   Preferred Chart Type: Bar Graph

Pros:

- Simple and easy to understand representation.
- Allows pagination and so easy navigation.

Cons:

- May need more space in case of many category axis values.
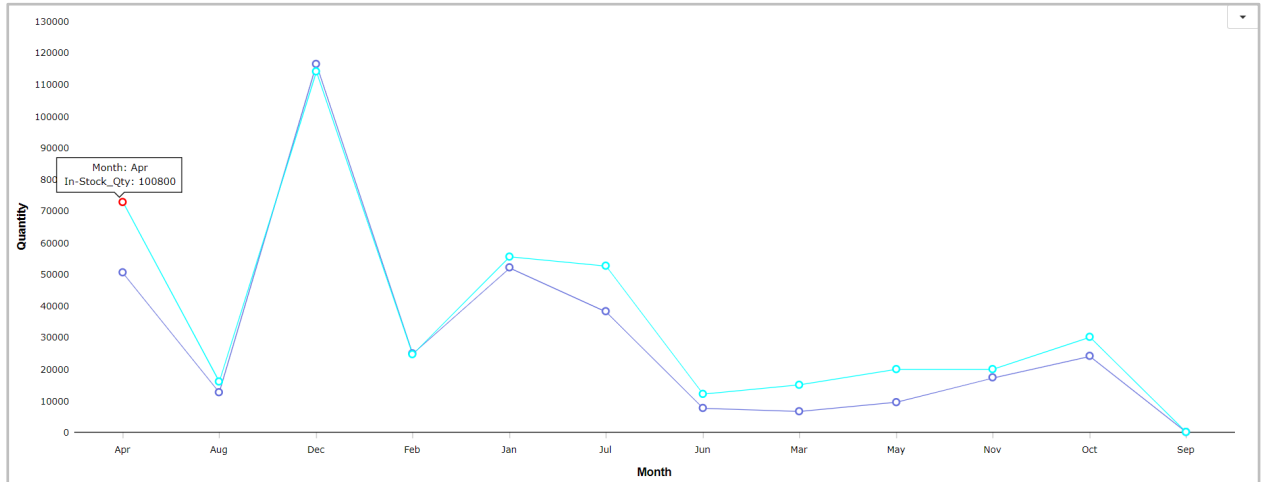- Data values may result in cluttered display in case of many bars.

29) **Schema Combination:** 1 Dimension 2 Measure

   Types of Dimension(s): Any Dimension

   Types of Measure(s): Non-Comparative & Same Scale Measures

   Example: Monthly In-stock Quantity & Dispatch Quantity

   Preferred Chart Type: Line Graph

Pros:

- Effective for showing the trend and growth of a variable across timelines or in case of showing a trend across a sequence of dimension values.

Cons:

- Can be misleading if the axis values are not interlinked or if the values don't follow a particular sequence.
- May need more space **in** case of many category axis values.
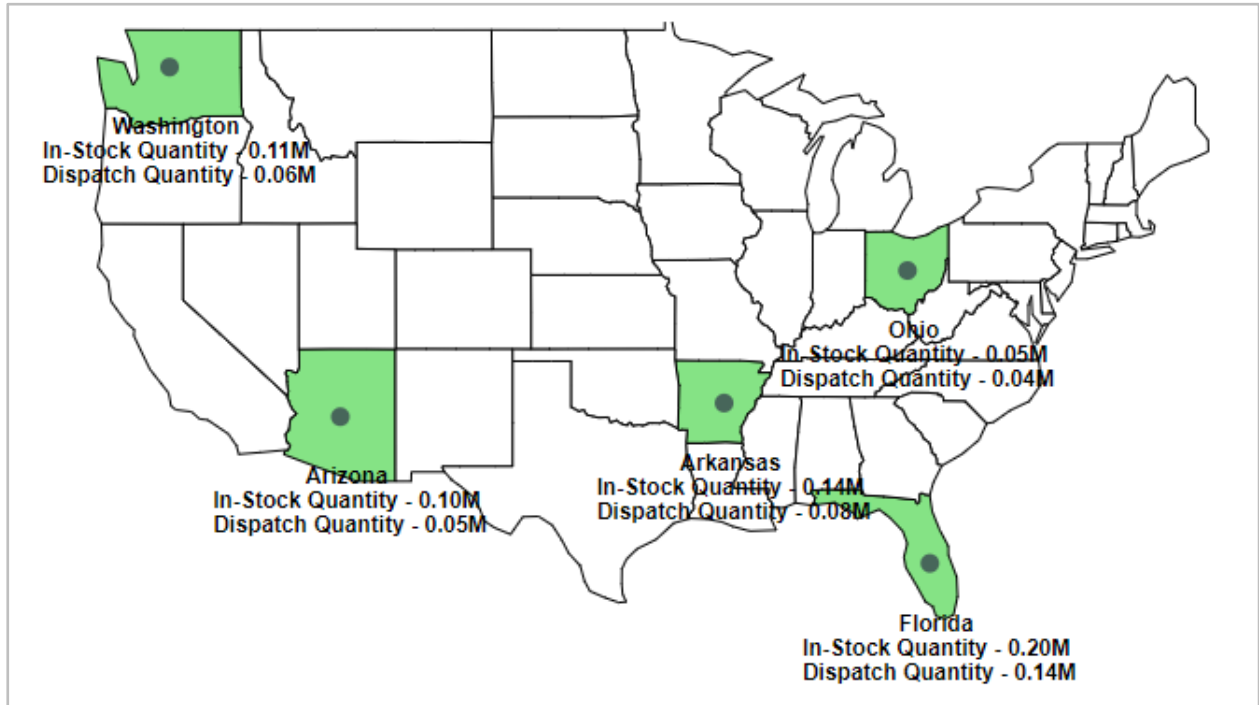- Data values may result in cluttered display in case of many bars.

30) **Schema Combination:** 1 Dimension 2 Measure

Types of Dimension(s): Any Dimension

Types of Measure(s): Non-Comparative & Same Scale Measures

Example: Region wise In-stock Quantity & Dispatch Quantity

Preferred Chart Type: Geomap

Pros:

- Best option when the dimension is a geo column.
- Allows to show data on a map along with spot lighters highlighting the affected and impacted areas as per the values.
- Wraps values of multiple sub-categories in a table to be displayed on a single marker.

Cons:

- Only plausible in case of geographic columns.
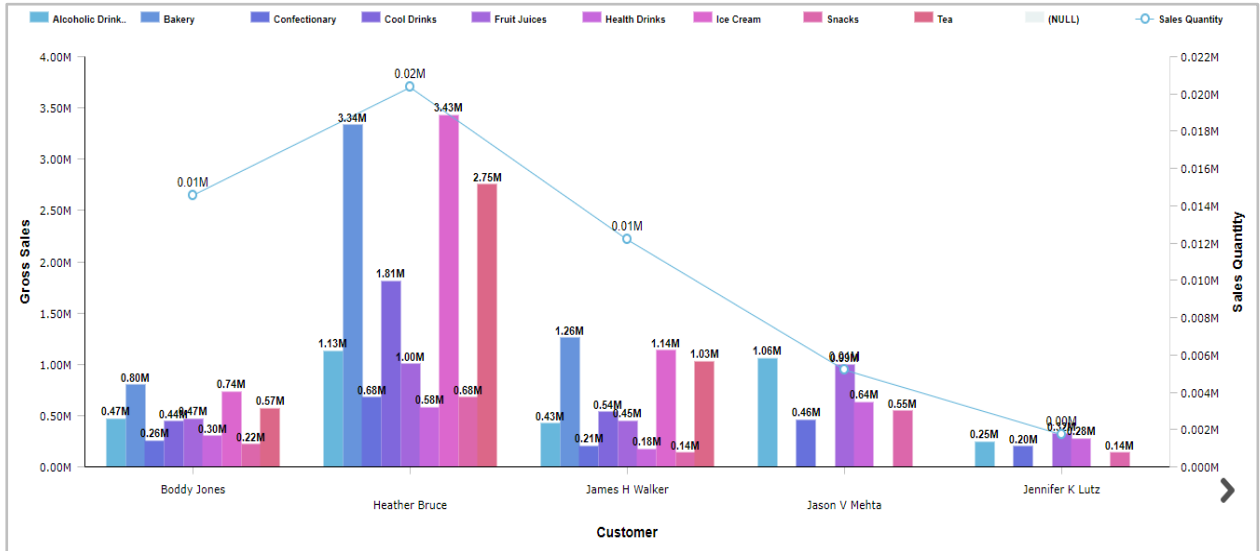- May look clutter if the geo coordinates are too many or are too closely plotted on the map.

31) **Schema Combination:** 2 Dimension 2 Measure

   Types of Dimension(s): Any Dimensions

   Types of Measure(s): Comparative Measures

   Example: Customer wise Product Wise Sales & Quantity

   Preferred Chart Type: Combined (Change Graph type)

Pros:

- Best option to show pictorial representation of percentage distribution of sub-category values within a range of category values.

Cons:

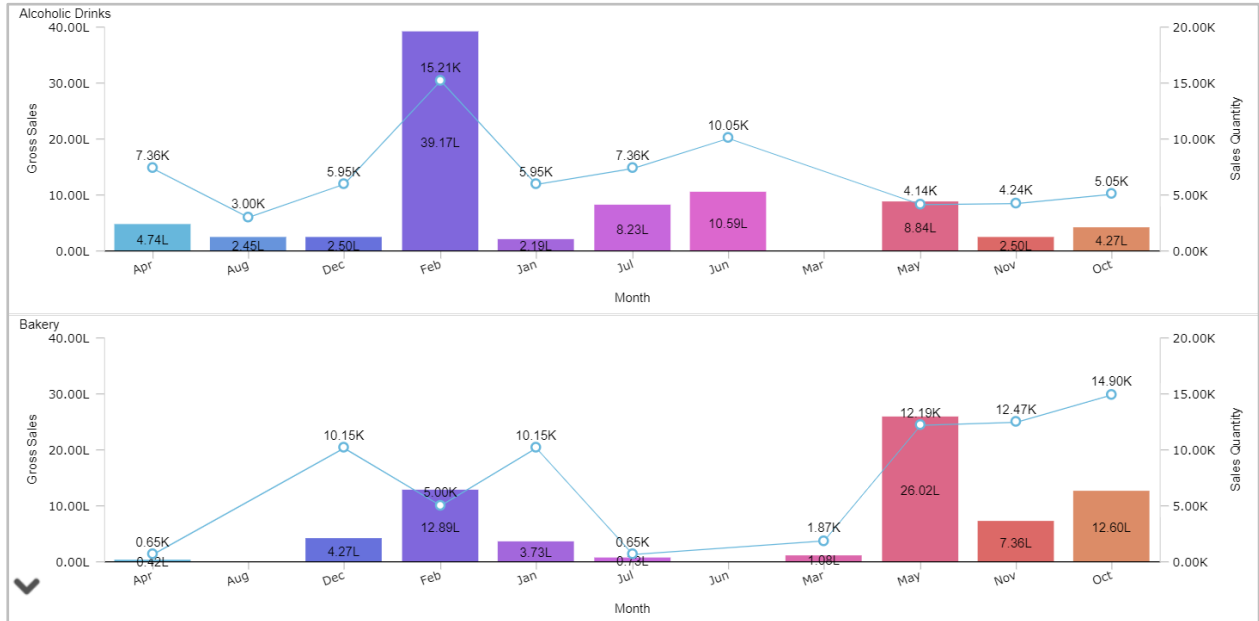- Hard to depict smaller values between the larger values.

32) **Schema Combination:** 2 Dimension 2 Measure

Types of Dimension(s): Descriptive & Time Series Dimensions

Types of Measure(s): Different Scale Measures

Example: Product wise Monthly Sales & Quantity

Preferred Chart Type: Distributed Bar Graph

Pros:

- Simple and easy to understand representation.
- Allows pagination and so easy navigation.

Cons:

- May need more space in case of many category axis values.
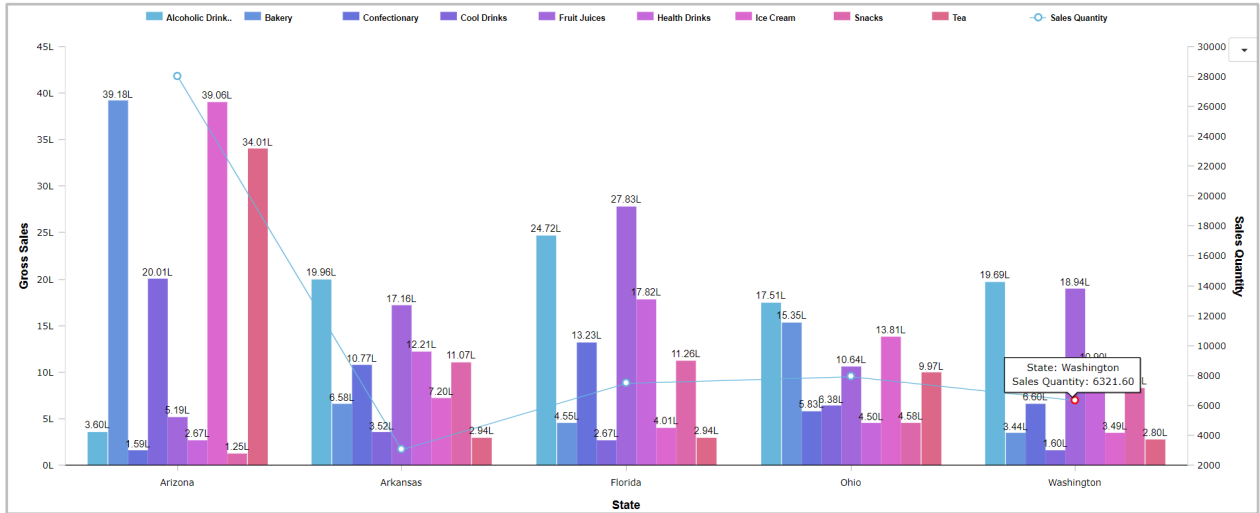- Data values may result in cluttered display in case of many bars.

33) **Schema Combination:** 2 Dimension 2 Measure

   Types of Dimension(s): Descriptive & Geographic Dimensions

   Types of Measure(s): Different Scale Measures

   Example: State wise Product Wise Sales & Quantity

   Preferred Chart Type: Combined Bar Graph (With Pagination)

Pros:

- Simple and easy to understand representation.
- Allows pagination and so easy navigation.

Cons:

- May need more space in case of many category axis values.
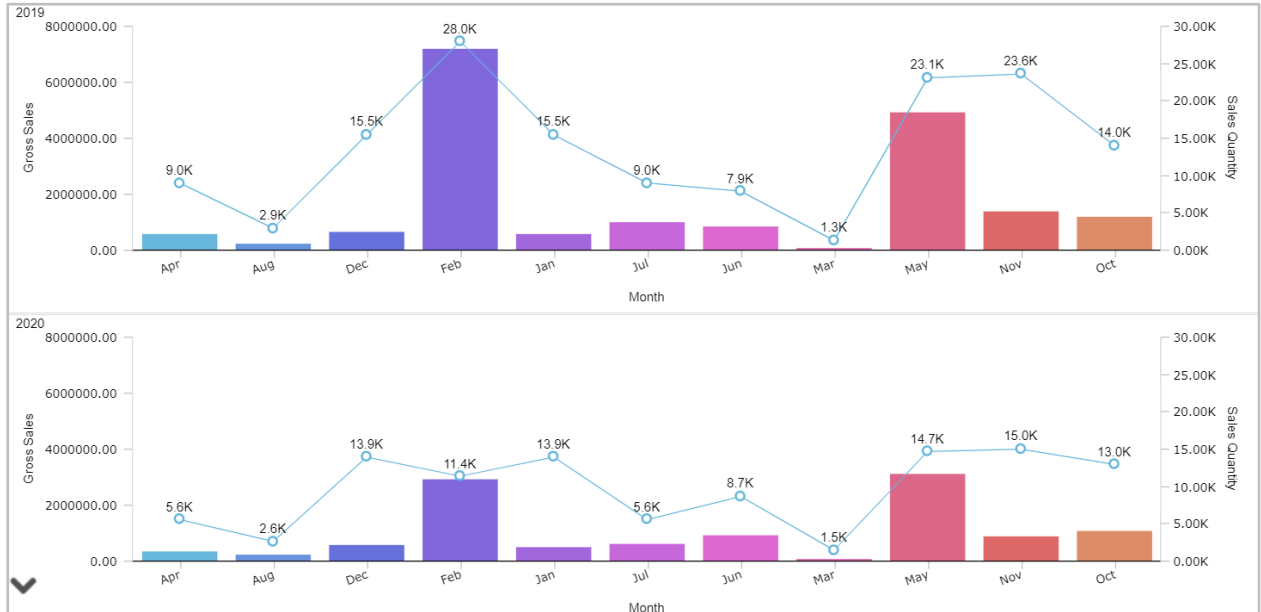- Data values may result in cluttered display in case of many bars.

34) **Schema Combination:** 2 Dimension 2 Measure

   Types of Dimension(s): Time Series Dimensions

   Types of Measure(s): Different Scale Measures

   Example: Year wise Monthly Sales & Quantity

   Preferred Chart Type: Distributed Combined Line Graphs

Pros:

- Simple and easy to understand representation.
- Allows pagination and so easy navigation.

Cons:

- May need more space in case of many category axis values.
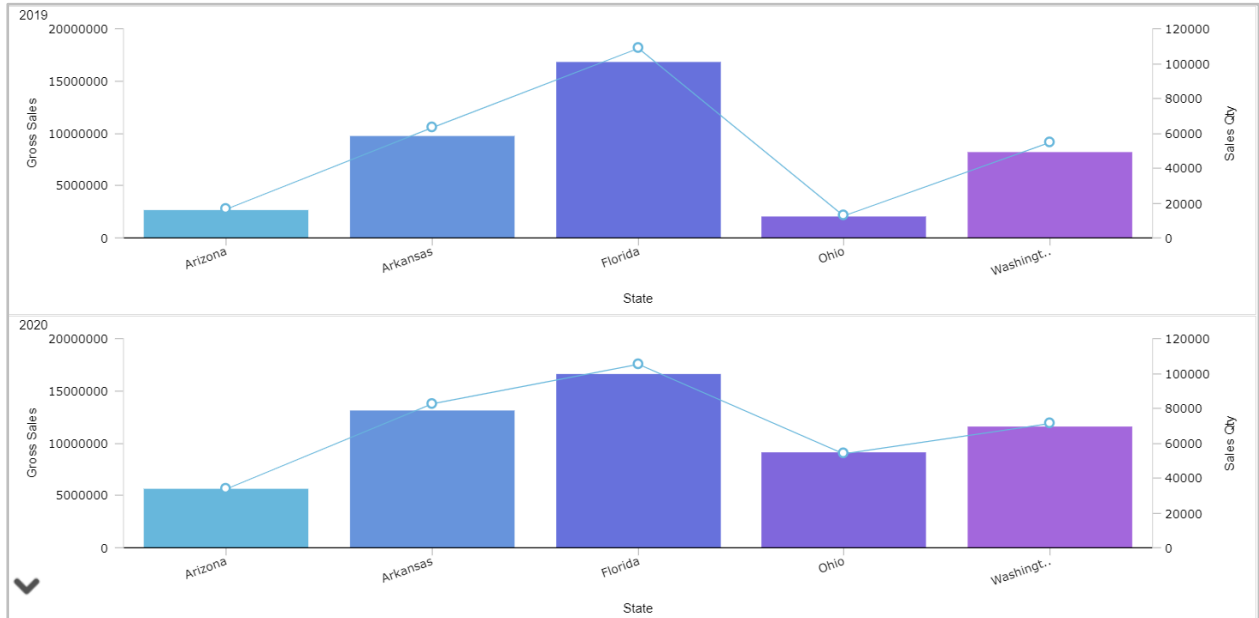- Data values may result in cluttered display in case of many bars.

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35) **Schema Combination:** 2 Dimension 2 Measure

Types of Dimension(s): Geographic & Time Series Dimensions

Types of Measure(s): Different Scale Measures

Example: State wise Yearly Sales & Quantity

Preferred Chart Type: Combined

Pros:

- Effective for showing the trend and growth of a variable across timelines or in case of showing a trend across a sequence of dimension values compared to other z-axis values.

Cons:

- Can be misleading if the axis values are not interlinked or if the values don't follow a particular sequence.
- May need more space in case of many category axis values.
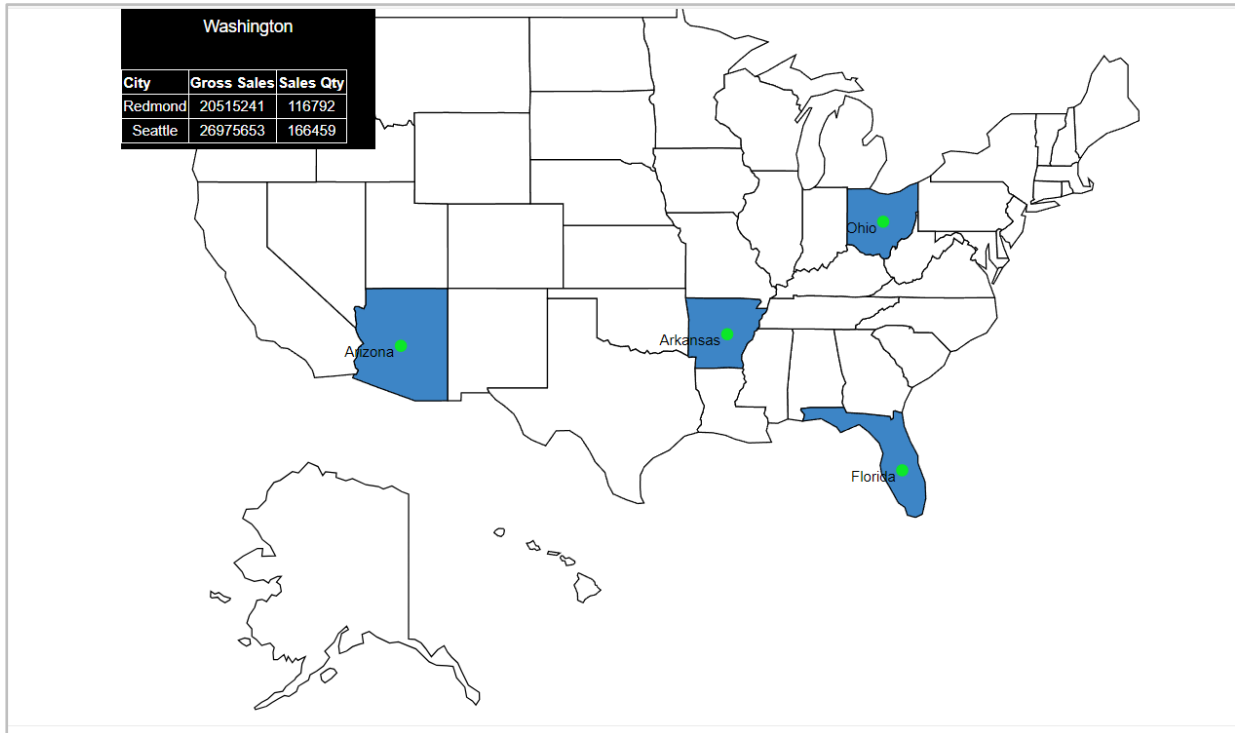- Data values may result in cluttered display in case of many bars.

36) **Schema Combination:** 2 Dimension 2 Measure

Types of Dimension(s): Geographic Dimensions

Types of Measure(s): Different Scale Measures

Example: State wise City Wise Sales & Quantity

Preferred Chart Type: Geomap

Pros:

- Best option when the dimension is a geo column.
- Allows to show data on a map along with spot lighters highlighting the affected and impacted areas as per the values.
- Wraps values of multiple sub-categories in a table to be displayed on a single marker.

Cons:

- Only plausible in case of geographic columns.
- May look cluttered if the geo coordinates are too many or are too closely plotted on the map.
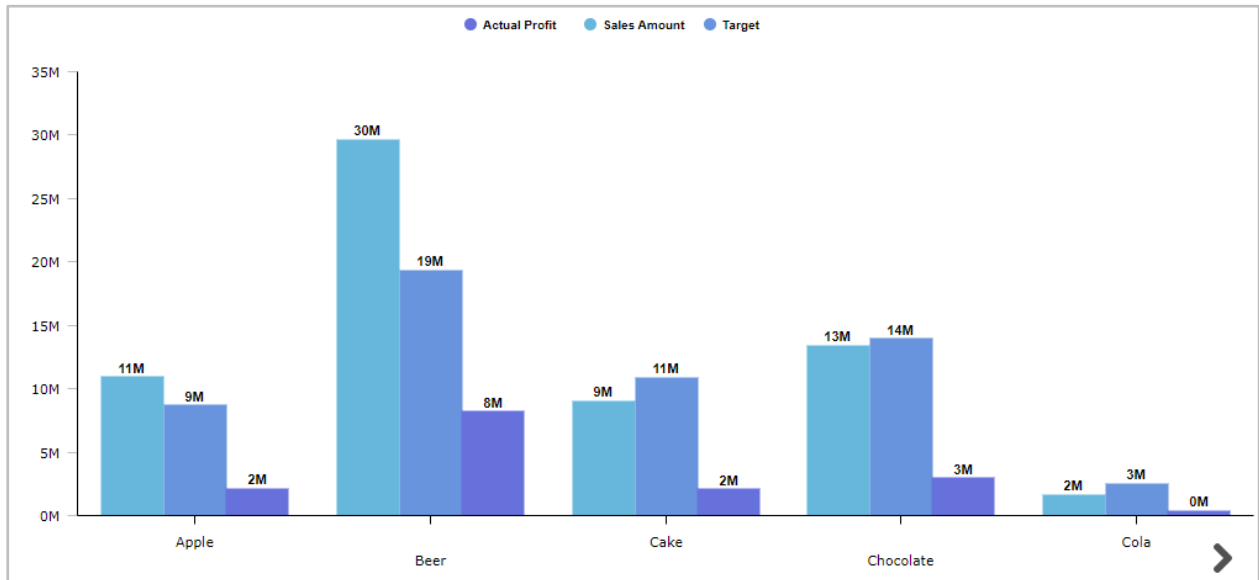
37) **Schema Combination:** 1 dimension 3 measure

Types of Dimension(s): Any Dimension

Types of Measure(s): Comparative Measures

Example: Product Wise Sales Amount, Target, Profit

Preferred Chart Type: Bar Graph

Pros:

- Simple and easy to understand representation.
- Allows pagination and so easy navigation.

Cons:

- May need more space in case of many category axis values.
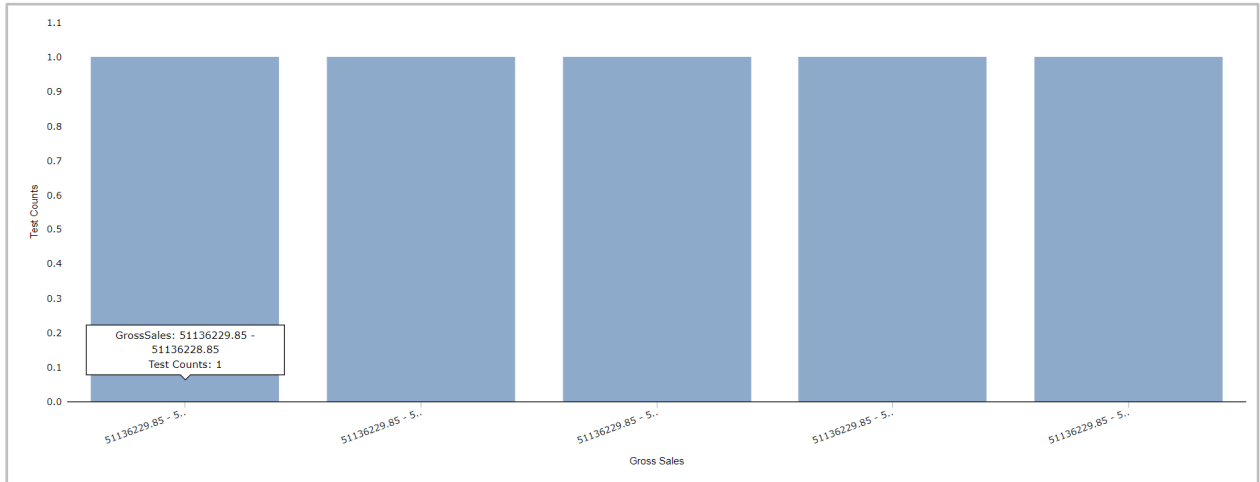- Data values may result in cluttered display in case of many bars.

38) **Schema Combination:** 0-dimension 1 measure

Types of Dimension(s): NA

Types of Measure(s): Any Measure

Example: Sales

Preferred Chart Type: Histogram

Pros:

- Huge amount of data can be represented very easily without the need of having a dimension
- Skewness of the data can be understood.
- Histograms are consistent in appearance as their intervals are evenly spaced.

Cons:

- It cannot be used to represent discrete frequency distributions.
- While the mode can be calculated using a histogram, the mean and the median cannot be calculated using a histogram.
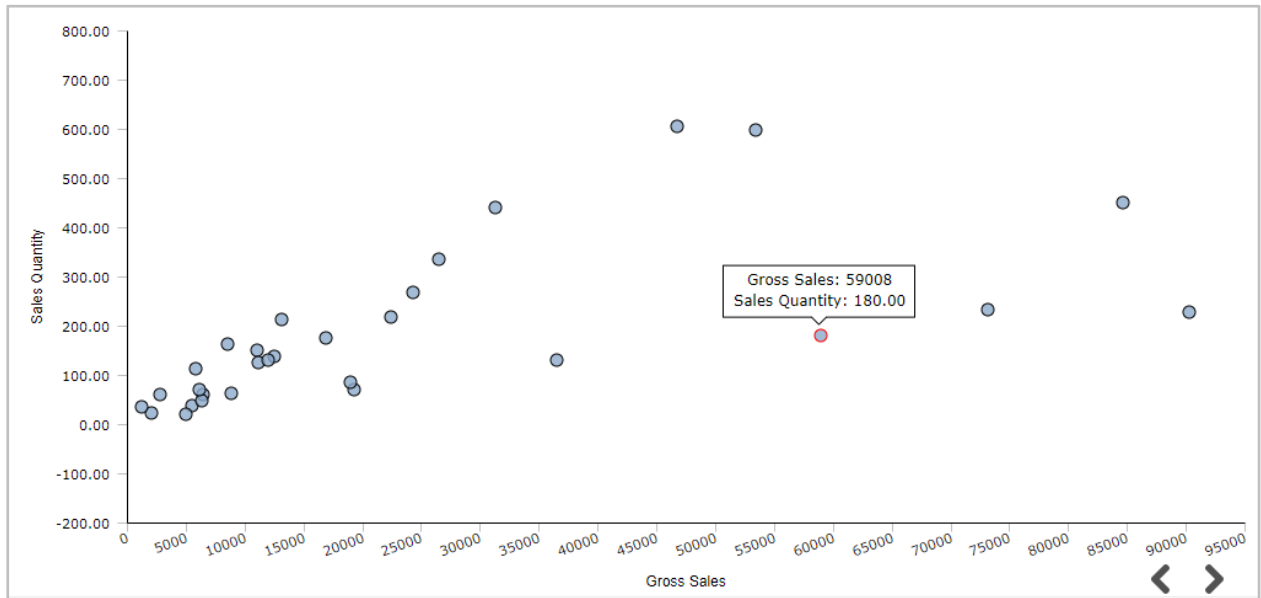
39) **Schema Combination:** 0-dimension 2 measure

Types of Dimension(s): NA

Types of Measure(s): Comparative Measures

Example: Sales & Quantity

Preferred Chart Type: XY Scatter

Pros:

- It helps in seeing correlation between two metrics.
- It can be easily understood and interpreted.

Cons:

- It does not show the relationship for more than two measures.
- It doesn't show the quantitative relationship between the two measures.

Product and Support Information

Find more information about Smarten and its features at www.smarten.com
Support: support@smarten.com
Sales: sales@smarten.com
Feedback & Suggestions: support@smarten.com
Support & Knowledgebase Portal: support.smarten.com