

Tech Saksham

Case Study Report

Data Analytics with Power BI

“Real-Time Analysis of Bank Customers”

**“Government Arts and Science College,
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ABSTRACT

In the digital age, data has become an invaluable asset for businesses, particularly in the banking sector. The proposed project, “Real-Time Analysis of Bank Customers,” aims to leverage PowerBI, a leading business intelligence tool, to analyze and visualize real-time customer data. This project will enable banks to gain deep insights into customer behavior, preferences, and trends, thereby facilitating data-driven decision-making and enhancing customer satisfaction. The real-time analysis will allow banks to respond promptly to changes in customer behavior or preferences, identify opportunities for cross-selling and up-selling, and tailor their products and services to meet customer needs. The project will also contribute to the broader goal of digital transformation in the banking sector, promoting efficiency, innovation, and customer-centricity.

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INTRODUCTION

1.1 Problem Statement

In today's competitive banking landscape, understanding customer behavior and preferences is crucial for customer retention and revenue generation. However, banks often face challenges in analyzing customer data due to the sheer volume and velocity of data generated. Traditional data analysis methods are time-consuming and often fail to provide real-time insights. This lack of real-time analysis can lead to missed opportunities for customer engagement, cross-selling, and up-selling, impacting the bank's revenue generation and customer satisfaction. Furthermore, the complexity and diversity of customer data, which includes transaction history, customer feedback, and demographic data, pose additional challenges for data analysis.

1.2 Proposed Solution

The proposed solution is to develop a PowerBI dashboard that can analyze and visualize real-time customer data. The dashboard will integrate data from various sources such as transaction history, customer feedback, and demographic data. It will provide a comprehensive view of customer behavior, preferences, and trends, enabling banks to make informed decisions. The dashboard will be interactive, user-friendly, and customizable, allowing banks to tailor it to their specific needs. The real-time analysis capability of the dashboard will enable banks to respond promptly to changes in customer behavior or preferences, identify opportunities for cross-selling and up-selling, and tailor their products and services to meet customer needs.

1.3 Feature

- **Real-Time Analysis:** The dashboard will provide real-time analysis of customer data.
- **Customer Segmentation:** It will segment customers based on various parameters like age, income, transaction behavior, etc.
- **Trend Analysis:** The dashboard will identify and display trends in customer behavior.
- **Predictive Analysis:** It will use historical data to predict future customer behavior.

1.4 Advantages

- **Data-Driven Decisions:** Banks can make informed decisions based on real-time data analysis.
- **Improved Customer Engagement:** Understanding customer behavior and trends can help banks engage with their customers more effectively.
- **Increased Revenue:** By identifying opportunities for cross-selling and up-selling, banks can increase their revenue.

1.5 Scope

The scope of this project extends to all banking institutions that aim to leverage data for decision-making and customer engagement. The project can be further extended to incorporate more data sources and advanced analytics techniques, such as machine learning and artificial intelligence, to provide more sophisticated insights into customer behavior. The project also has the potential to be adapted for other sectors, such as retail, healthcare, and telecommunications, where understanding customer behavior is crucial. Furthermore, the project contributes to the broader goal of digital transformation in the banking sector, promoting efficiency, innovation, and customer-centricity.

POWER BI

Power BI is a Data Visualization and Business Intelligence tool by Microsoft that converts data from different data sources to create various business intelligence reports. Microsoft Power BI makes it easy for businesses to spot trends, track performance, and make data-driven decisions.

Here, This Power BI tutorial is your one-stop guide for learning Power BI from Scratch. It covers all the basic and advanced concepts of Power BI like, filter Power BI, Power BI desktop, functions in Power BI, Power BI services, etc.

- **Data Collection and Storage Services:** Banks need to collect and store customer data in real-time. This could be achieved through services like Azure Data Factory, Azure Event Hubs, or AWS Kinesis for real-time data collection, and Azure SQL Database or AWS RDS for data storage.

- **Data Processing Services:** Services like Azure Stream Analytics or AWS Kinesis Data Analytics can be used to process the real-time data.
- **Machine Learning Services:** Azure Machine Learning or AWS SageMaker can be used to build predictive models based on historical data.

Tools:

- **PowerBI:** The main tool for this project is PowerBI, which will be used to create interactive dashboards for real-time data visualization.

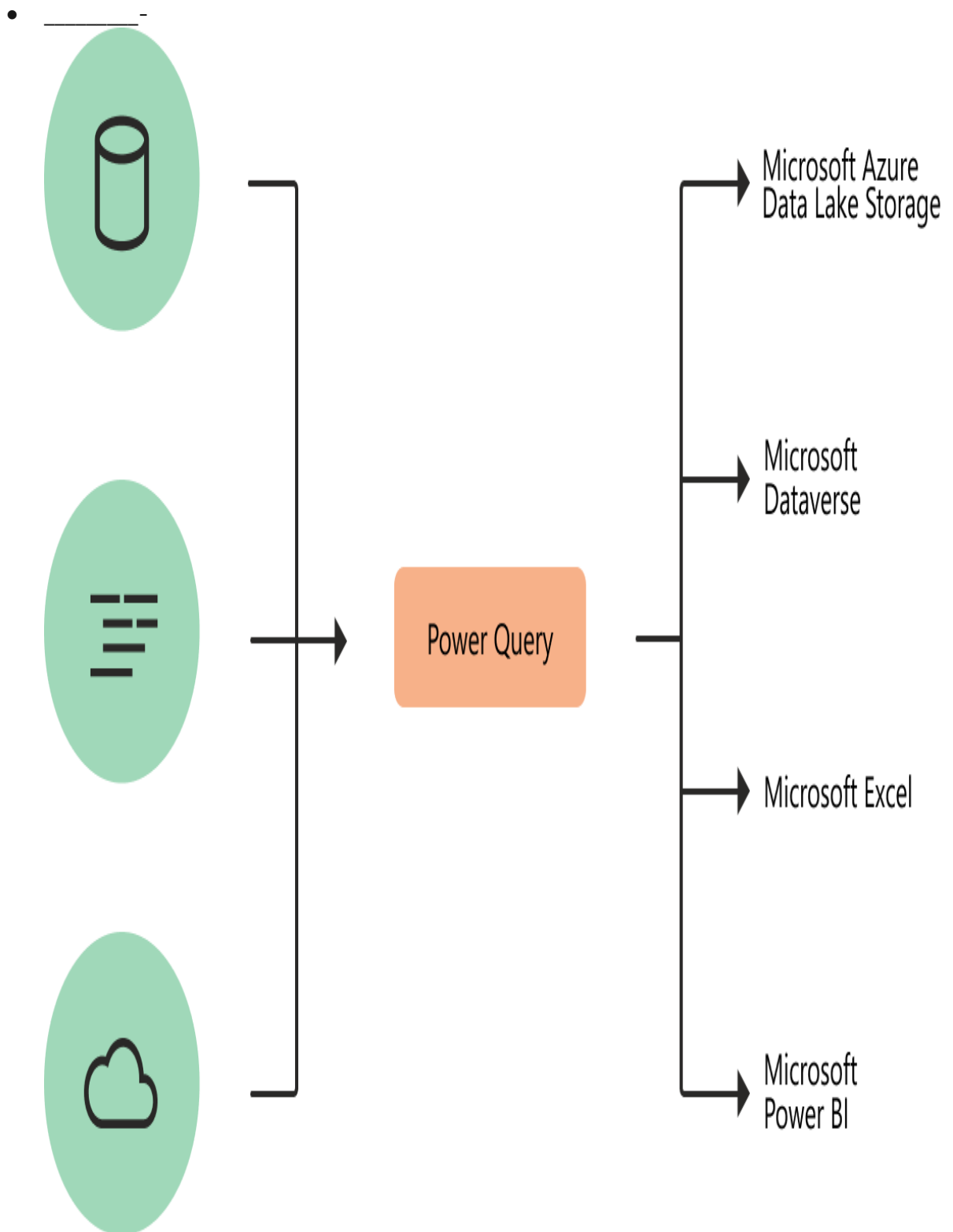
POWER QUERY EDITOR

- **Power Query:** This is a data connection technology that enables you to discover, connect, combine, and refine data across a wide variety of sources.

Software Requirements:

- **PowerBI Desktop:** This is a Windows application that you can use to create reports and publish them to PowerBI.
- **PowerBI Service:** This is an online SaaS (Software as a Service) service that you use to publish reports, create new dashboards, and share insights.
- **PowerBI Mobile:** This is a mobile application that you can use to access your reports and dashboards on the go.
- **Power Query:** Power Query is a data transformation and data preparation engine. Power Query comes with a graphical interface for getting data from sources and a Power Query Editor for applying transformations. Because the engine is available in many products and services, the destination where the data will

be stored depends on where Power Query was used. Using Power Query, you can perform the extract, transform, and load (ETL) processing of data.



The Power Query Editor is the primary data preparation experience, where you can connect to a wide range of data sources and apply hundreds of different data transformations by previewing data and selecting transformations from the UI. These data transformation capabilities are common across all data sources, whatever the underlying data source limitations.

When you create a new transformation step by interacting with the components of the Power Query interface, Power Query automatically creates the M code required to do the transformation so you don't need to write any code.

Currently, two Power Query experiences are available:

- **Power Query Online**—Found in integrations such as Power BI dataflows, Microsoft Power Platform dataflows, Azure Data Factory wrangling dataflows, and many more that provide the experience through an online webpage.
- **Power Query for Desktop**—Found in integrations such as Power Query for Excel and Power BI Desktop.

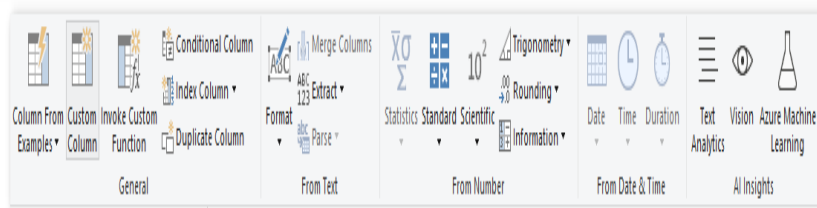
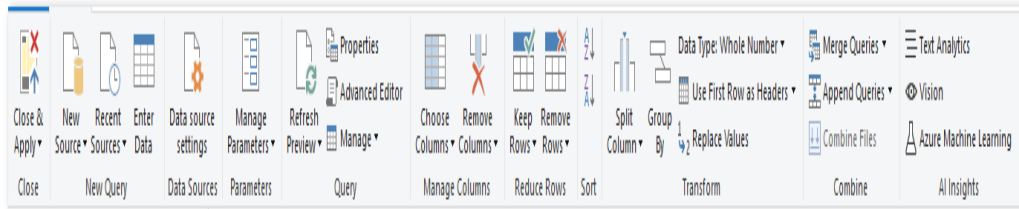
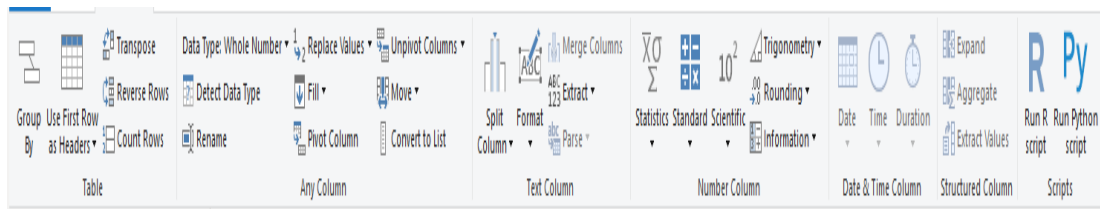
Note

Although two Power Query experiences exist, they both provide almost the same user experience in every scenario.

Transformations

The transformation engine in Power Query includes many prebuilt transformation functions that can be used through the graphical interface of the Power Query Editor. These transformations can be as simple as removing a column or filtering rows, or as common as using the first row as a table header. There are also advanced transformation options such as merge, append, group by, pivot, and unpivot.

All these transformations are made possible by choosing the transformation option in the menu, and then applying the options required for that transformation. The following illustration shows a few of the transformations available in Power Query Editor.



USER INTERFACE

THE RIBBON:

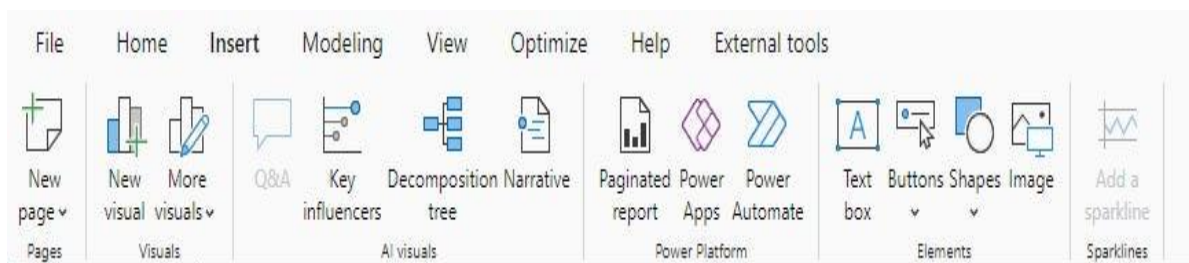
At the top we have the familiar Microsoft Ribbon. Just like the ribbons in Microsoft Excel and Word and Powerpoint, the Power BI ribbon is filled with tools split up into different tabs.

RIBBON TABS:

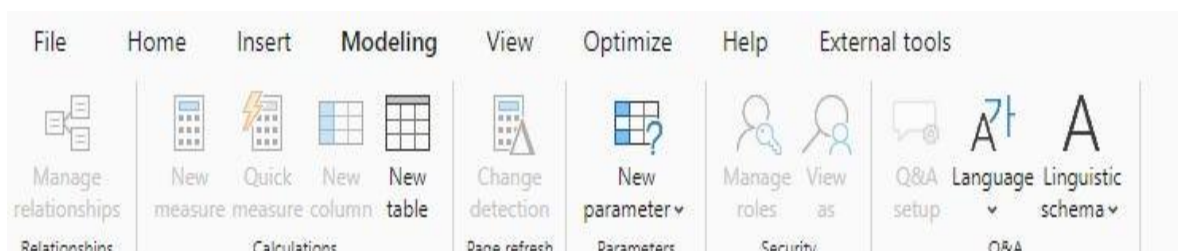
The **HOME** tab has tools for adding data sources, accessing Power Query Editor (used for cleaning and transforming data) via the “Transform data” buttons, and adding in visuals and more.



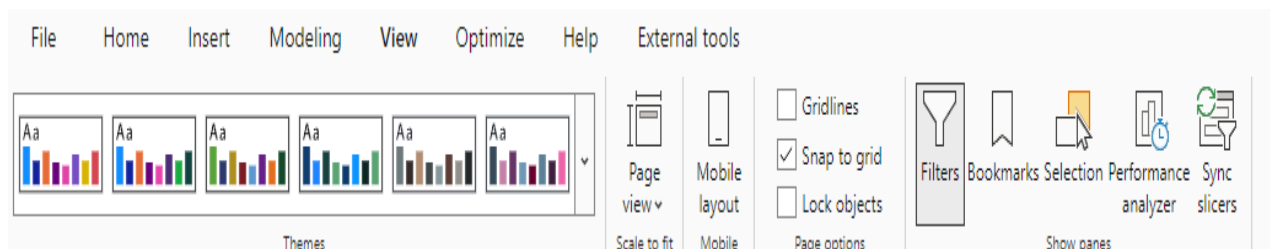
The **INSERT** tab lets us insert different visuals, text boxes, buttons, shapes, and images.



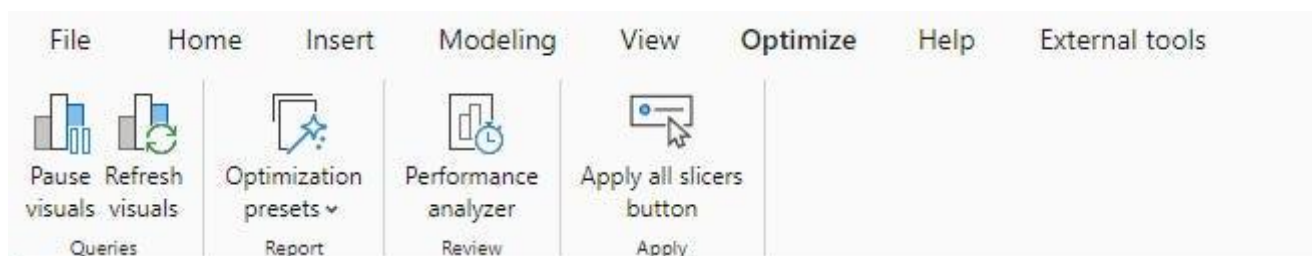
The **MODELING** tab lets us create DAX measures, or even new columns and tables, and also lets us set up a security model if we need some users to only see some data.



The **VIEW** tab lets us set a theme for our reports, set up mobile layouts, and access other panes that don't show up by default.



The **OPTIMIZE** tab has tools to check the efficiency of our reports... as in if they are loading really slow, we can analyze what parts of the report are loading really slowly.



The **HELP** tab has links to things like Microsoft forums and the Power BI blog which has news about new features.



The **EXTERNAL TOOLS** tab is where 3rd-party tools live. There are only a few of these okay'd by Microsoft, and if you haven't downloaded one, this tab doesn't show up.

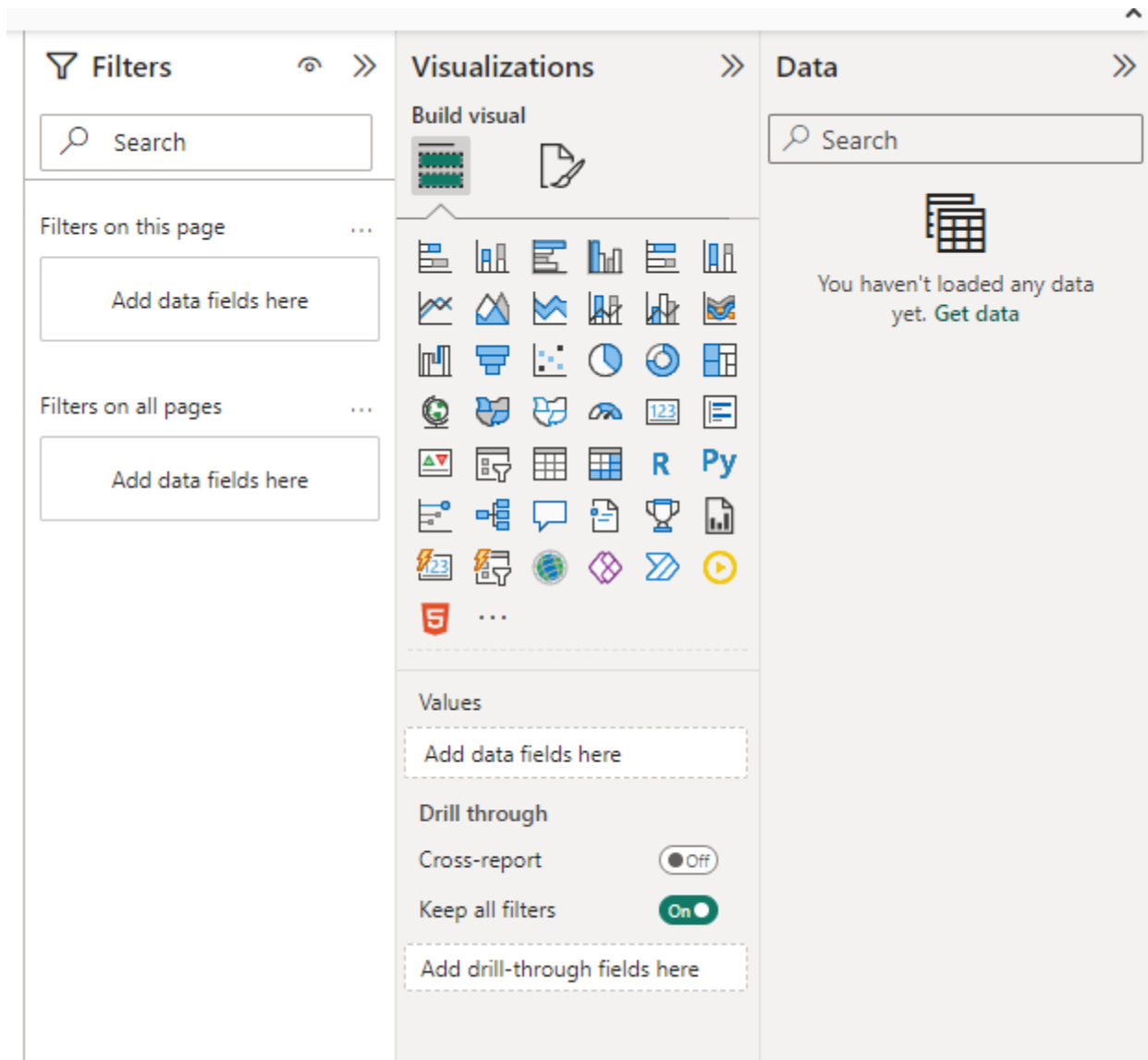
PANES:

On the right side of the Power BI interface are 3 panes that appear by default.

The **DATA** Pane is where we see the tables and columns of data we've added.

The **VISUALIZATION** Pane is where we can choose what visual we want to make, and it also has formatting tools.

The **FILTERS** Pane is where we can create filters and control what data is making it from our data to the visuals on our Canvas.



ABOUT MY PROJECT

Project: Analyze customer data to segment customers based on their behavior and demographics. Investigate factors contributing to customer churn and develop strategies for retention.

I hope to help the bank to increase their profits from issuing new loans and credit cards to new customers. Using the bank accounts and demographics data provided from the bank to create an

Analytics Dashboard in Power BI. There are 2 matters that can be explored.

First, its marketing strategy, which group/area of potential customers should the bank be focusing on? We can look at the population and average income of the people in the region to decide where we can target our advertising/promotions on for their loan and credit card products.

Second, it is to identify the traits of bad credit customers, assuming customers who have defaulted on their loan or have late payments so we can avoid or set stricter conditions for loans to these people to avoid losses when in the event of default.

Note that the data have been divided into 8 regions within Czech Republic including its capital, Prague. Its currency is the Czech koruna (sign: **Kč**).

From loan dataset, we could assume that the year 1999, given that a 12 months loan issued in Jan 1998 is still in service.

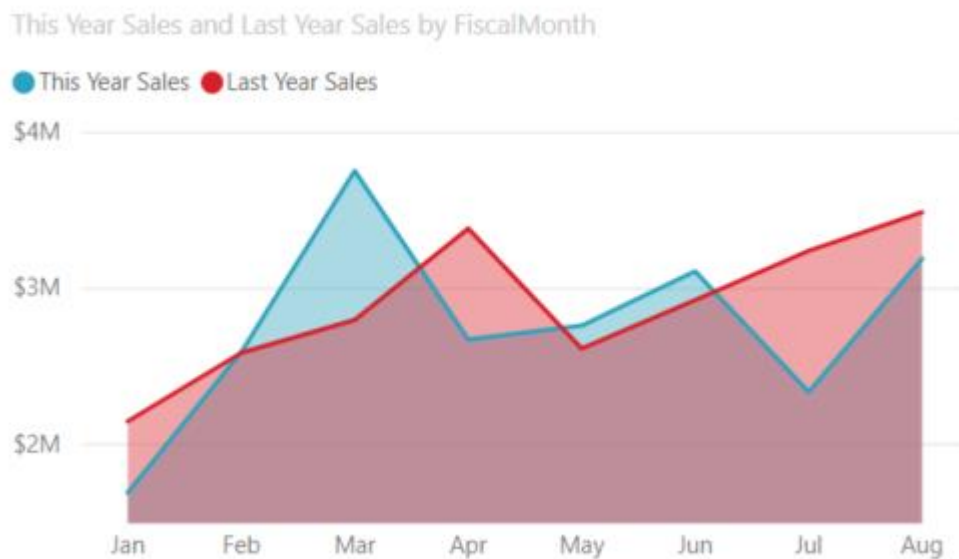
Report	account_id	date	Loan Amt	duration	payments	status	Credit Rating	Loan Status	Count of all loan	
	5782	3953	980104	63,576 Kč	12	5298	C	GOOD	Timely payment	682
	7110	10345	980121	31,260 Kč	12	2605	C	GOOD	Timely payment	682
	7126	10445	980122	33,412 Kč	12	1951	C	GOOD	Timely payment	682

And a 12 months loan issued in Dec 1997 has been repaid in full.

loan_id	account_id	date	Loan Amt	duration	payments	status	Credit Rating	Loan Status	Count of all loan
6059	5196	971228	79,824 Kč	12	6652	A	GOOD	Repaid Full	682
6727	8505	971210	42,840 Kč	12	3570	A	GOOD	Repaid Full	682

VISUALIZATION IN POWER BI

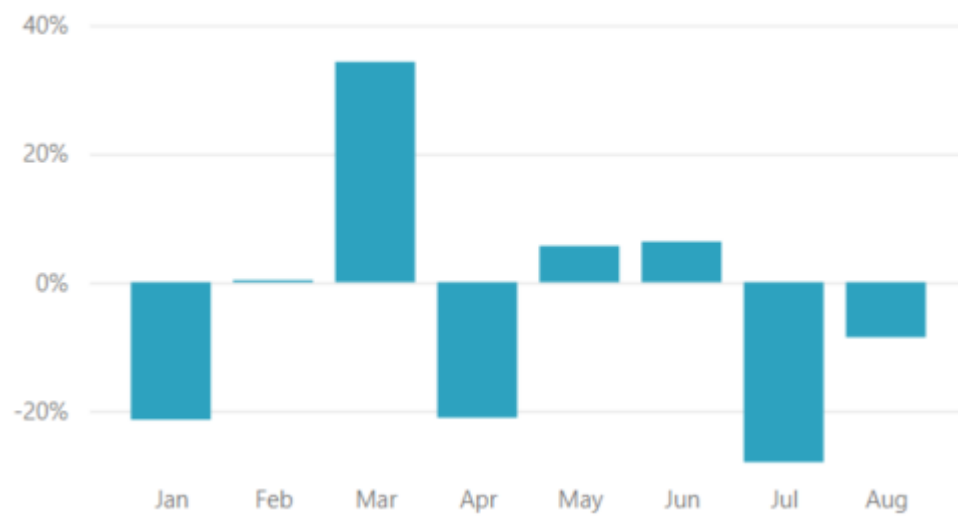
Area charts: Basic (Layered) and Stacked



The basic area chart is based on the line chart with the area between the axis and line filled in. Area charts emphasize the magnitude of change over time, and can be used to draw attention to the total value across a trend. For example, data that represents profit over time can be plotted in an area chart to emphasize the total profit.

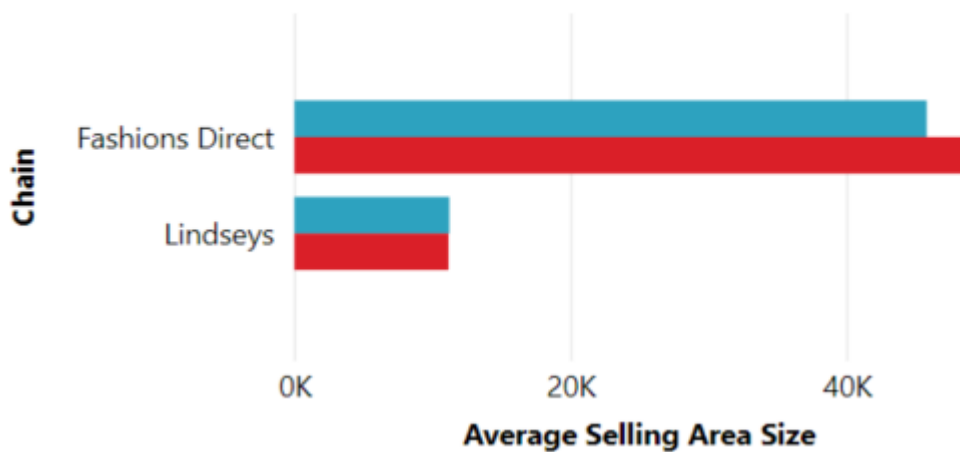
Bar and column charts

Total Sales Variance % by FiscalMonth



Average Selling Area Size by Store Type, Chain

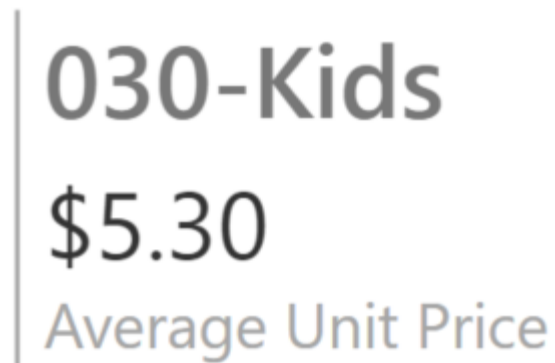
Store Type ● New Store ● Same Store



Bar charts are the standard for looking at a specific value across different categories.

Cards

Multi row



Multi row cards display one or more data points, one per row.

Single number



Single number cards display a single fact, a single data point. Sometimes a single number is the most important thing you want to track in your Power BI dashboard or report, such as total sales, market share year over year, or total opportunities.

Combo charts

This Year Sales, Last Year Sales and Total Sales Variance % by Month



A combo chart combines a column chart and a line chart. Combining the two charts into one lets you make a quicker comparison of the data. Combo charts can have one or two Y axes, so be sure to look closely.

Combo charts are a great choice:

- When you have a line chart and a column chart with the same X axis.
- To compare multiple measures with different value ranges.
- To illustrate the correlation between two measures in one visual.
- To check whether one measure meets the target which is defined by another measure.
- To conserve canvas space.

Decomposition tree

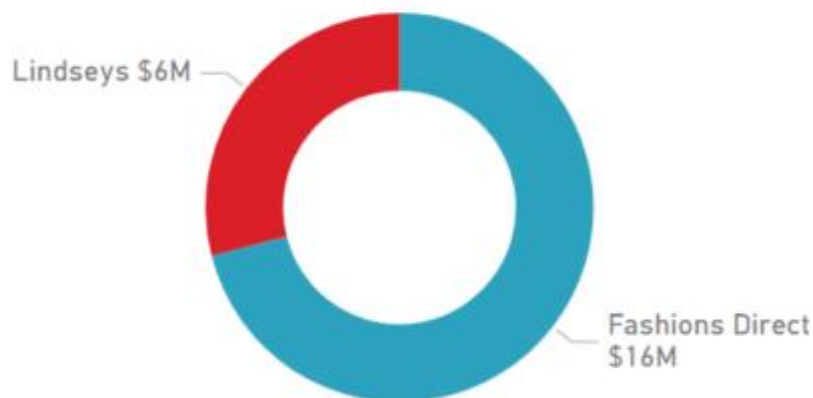


The decomposition tree visual lets you visualize data across multiple dimensions. It automatically aggregates data and enables drilling down into your dimensions

in any order. It is also an artificial intelligence (AI) visualization, so you can ask it to find the next dimension to drill down into based on certain criteria. This makes it a valuable tool for ad hoc exploration and conducting root cause analysis.

Doughnut charts

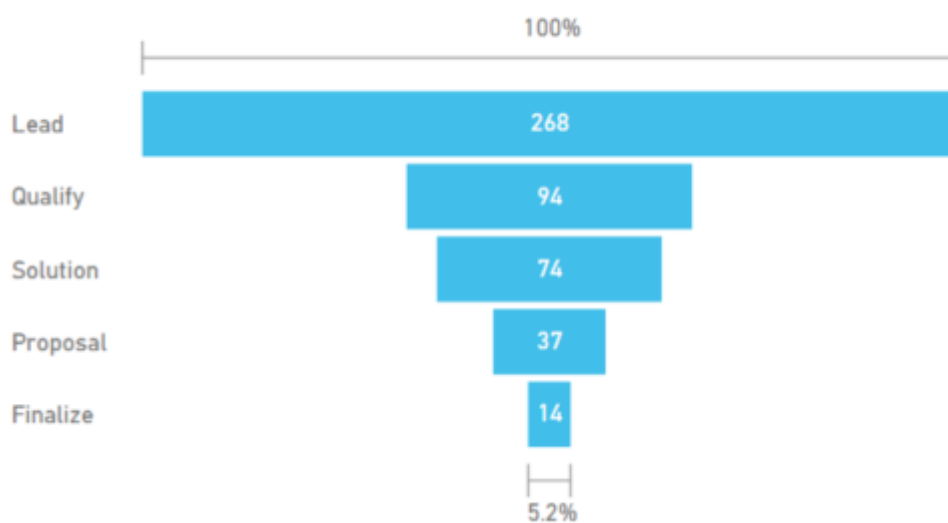
This Year Sales by Chain



Doughnut charts are similar to pie charts. They show the relationship of parts to a whole. The only difference is that the center is blank and allows space for a label or icon.

Funnel charts

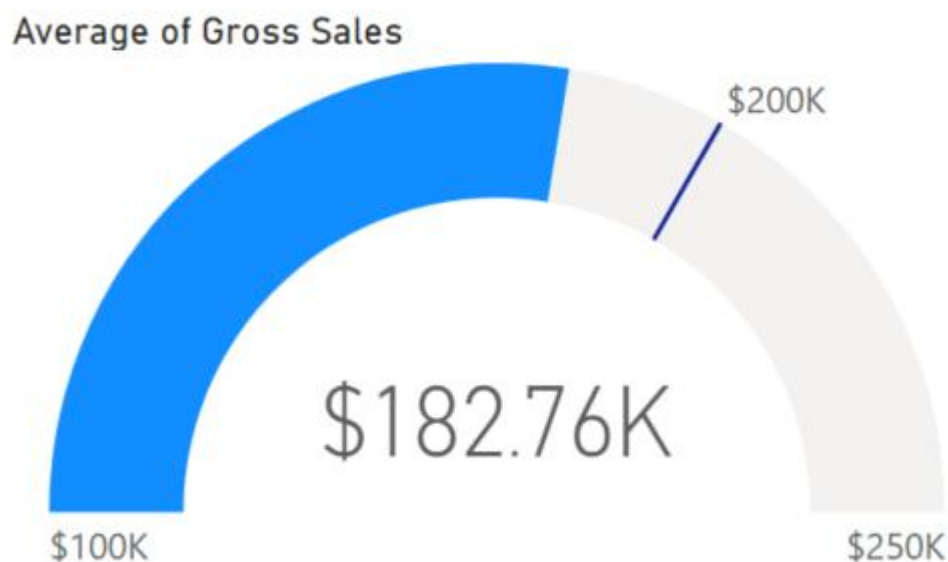
Opportunity Count by Sales Stage



Funnels help visualize a process that has stages, and items flow sequentially from one stage to the next. One example is a sales process that starts with leads and ends with purchase fulfillment.

For example, a sales funnel that tracks customers through stages: Lead > Qualified Lead > Prospect > Contract > Close. At a glance, the shape of the funnel conveys the health of the process you're tracking. Each funnel stage represents a percentage of the total. So, in most cases, a funnel chart is shaped like a funnel -- with the first stage being the largest, and each subsequent stage smaller than its predecessor. A pear-shaped funnel is also useful -- it can identify a problem in the process. But typically, the first stage, the "intake" stage, is the largest.

Gauge charts



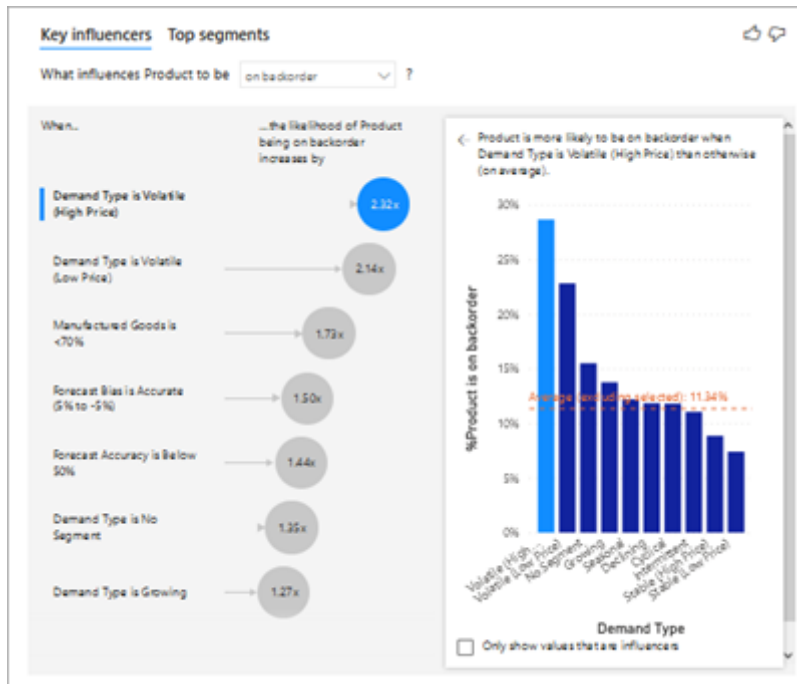
A radial gauge chart has a circular arc and displays a single value that measures progress toward a goal. The goal, or target value, is represented by the line (needle). Progress toward that goal is represented by the shading. And the value that represents that progress is shown in bold inside the arc. All possible values are spread evenly along the arc, from the minimum (left-most value) to the maximum (right-most value).

In the example above, we are a car retailer, tracking our Sales team's average sales per month. Our goal is 200,000 and represented by the location of the needle. The minimum possible average sales is 100,000 and we've set the maximum as 250,000. The blue shading shows that we're currently averaging approximately \$180,000 this month. Luckily, we still have another week to reach our goal.

Radial gauges are a great choice to:

- Show progress toward a goal.
- Represent a percentile measure, like a KPI.
- Show the health of a single measure.
- Display information that can be quickly scanned and understood.

Key influencers chart



A key influencer chart displays the major contributors to a selected result or value.

Key influencers are a great choice to help you understand the factors that influence a key metric. For example, ***what influences customers to place a second order*** or ***why were sales so high last June***.

KPIs

Total Units This Year and Total Units Last Year by Month



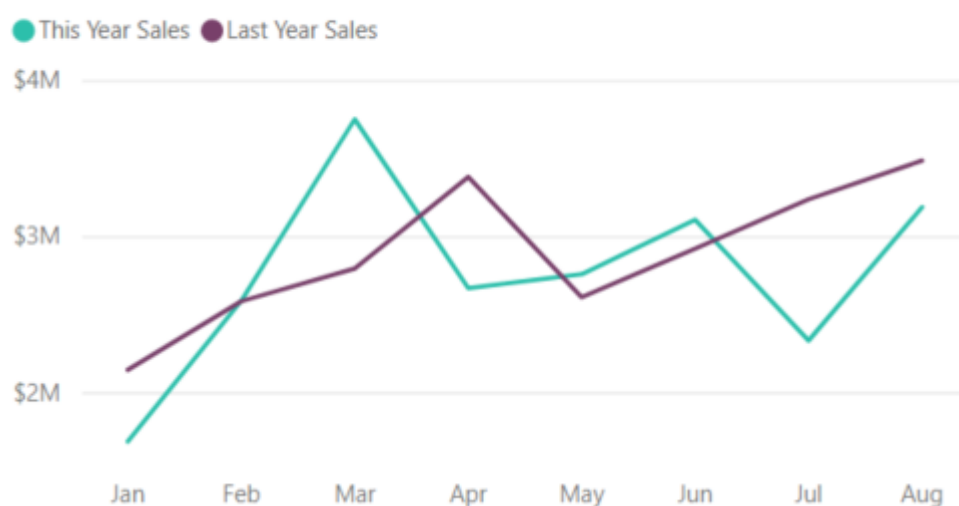
A Key Performance Indicator (KPI) is a visual cue that communicates the amount of progress made toward a measurable goal.

KPIs are a great choice:

- To measure progress (what am I ahead or behind on?).
- To measure distance to a metric (how far ahead or behind am I?).

Line charts

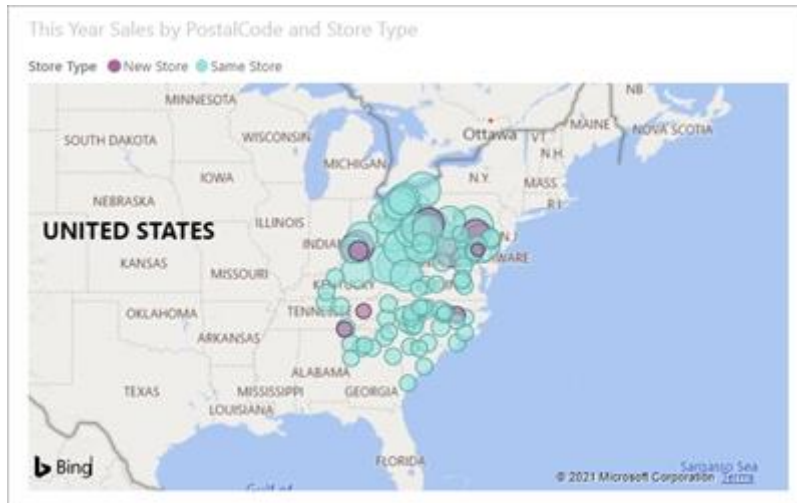
This Year Sales and Last Year Sales by FiscalMonth



Line charts emphasize the overall shape of an entire series of values, usually over time.

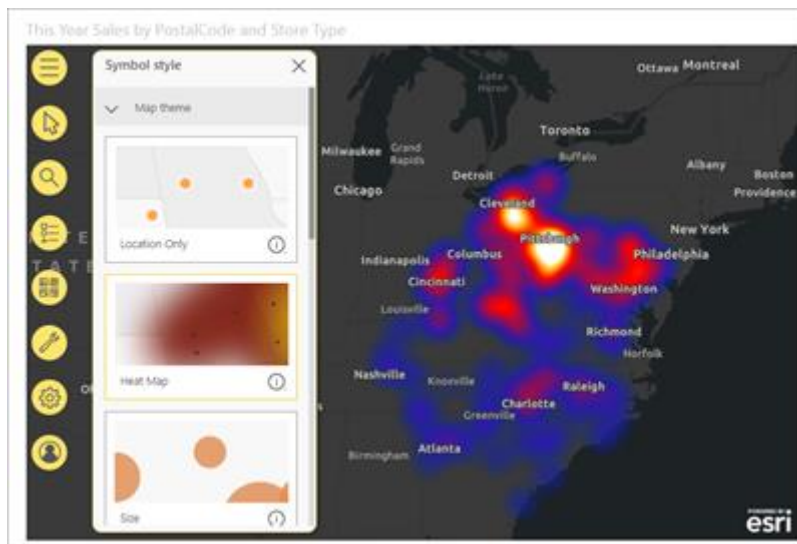
Maps

Basic map



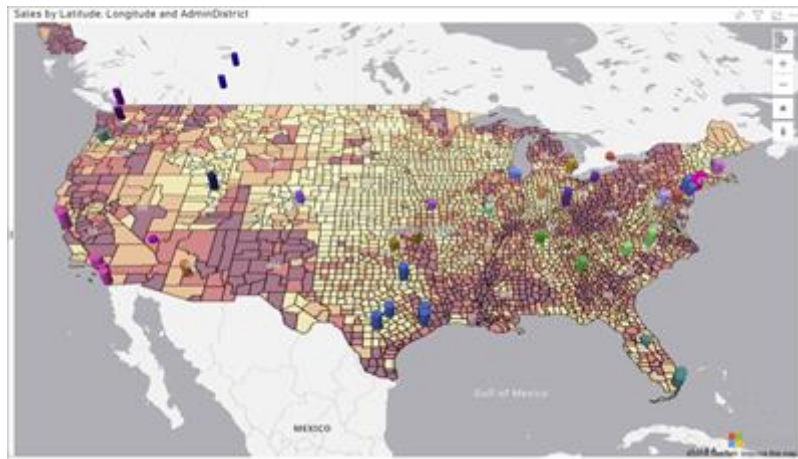
Use a basic map to associate both categorical and quantitative information with spatial locations.

ArcGIS map



The combination of ArcGIS maps and Power BI takes mapping beyond the presentation of points on a map to a whole new level. The available options for base maps, location types, themes, symbol styles, and reference layers creates gorgeous informative map visuals. The combination of authoritative data layers (such as census data) on a map with spatial analysis conveys a deeper understanding of the data in your visual.

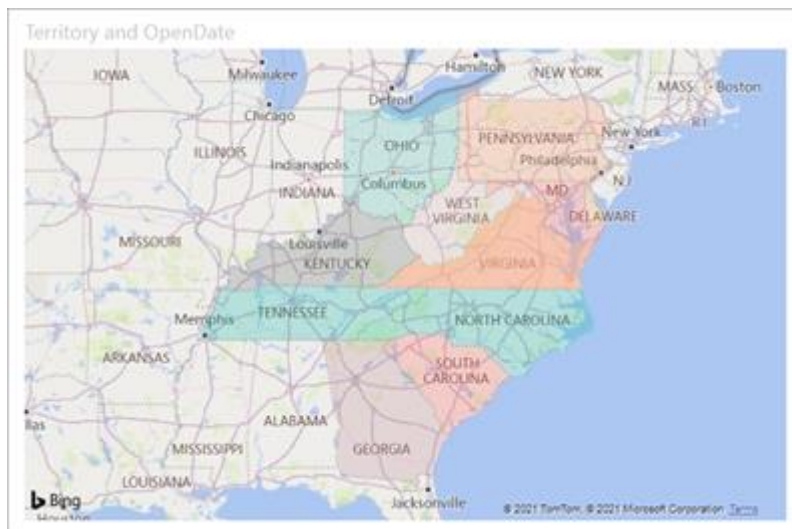
Azure map



Tip

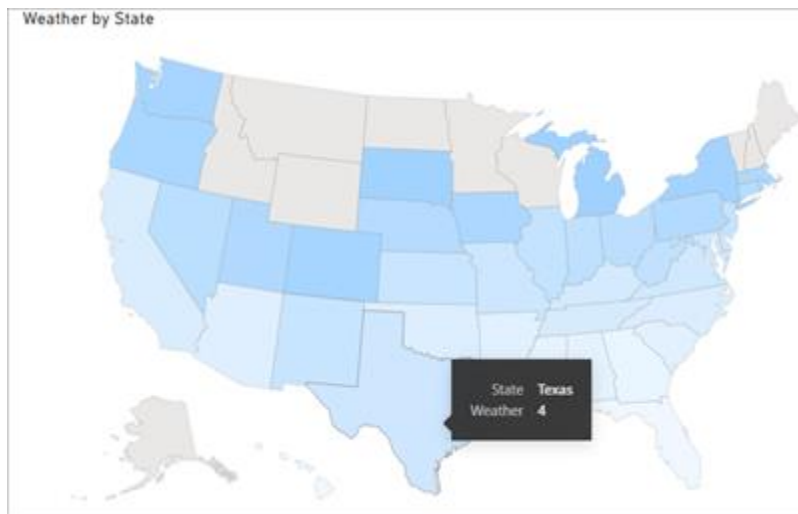
Used to associate both categorical and quantitative information with spatial locations.

Filled map (Choropleth)



A filled map uses shading or tinting or patterns to display how a value differs in proportion across a geography or region. Quickly display these relative differences with shading that ranges from light (less-frequent/lower) to dark (more-frequent/more).

Shape map



Shape maps compare regions on a map using color. A shape map can't show precise geographical locations of data points on a map. Instead, its main purpose is to show relative comparisons of regions on a map by coloring them differently..

Matrix

Drill on Rows								
Region	Central		East		West		Total	
Sales Stage	Opportunity Count	Revenue	Opportunity Count	Revenue	Opportunity Count	Revenue	Opportunity Count	Revenue
Lead	102	\$107,574,417	114	\$473,687,837	52	\$294,198,114	268	\$1,237,621,368
Qualify	28	\$111,715,661	30	\$195,692,194	19	\$52,442,343	94	\$359,849,978
Solution	29	\$100,743,798	30	\$134,347,170	19	\$33,441,901	74	\$268,532,469
Proposal	14	\$48,722,868	13	\$58,970,824	10	\$43,032,669	37	\$149,726,462
Finalize	5	\$13,302,248	5	\$30,696,428	4	\$21,176,183	14	\$75,174,859
Total	179	\$790,058,792	212	\$894,594,513	96	\$426,251,832	487	\$2,110,905,127

The matrix visual is a type of table visual (see [Tables](#) in this article) that supports a stepped layout. A table supports two dimensions, but a matrix makes it easier to display data meaningfully across multiple dimensions. Often, report designers include matrixes in reports and dashboards to allow users to select one or more element (rows, columns, cells) in the matrix to cross-highlight other visuals on a report page

Pie charts

This Year Sales by Chain



Pie charts show the relationship of parts to a whole.

Power Apps visual

Customer
Fusion Tomo

Account Manager
Elisabeth Iversen

Sales Region
Northwest

Estimated Value
\$ 458,707

In FastTrack Program
☒

Contact Sales Team
Request call with customer

Submit

Report designers can create a Power App and embed it into a Power BI report as a visual. Consumers can interact with that visual within the Power BI report.

Q&A visual

Help Q&A understand people's questions better by adding synon...

Add synonyms now

Ask a question about your data

Try one of these to get started

what is the total store
by city

what is the total sales
by category

what is the total sales LY
by category

Show all suggestions

R script visuals

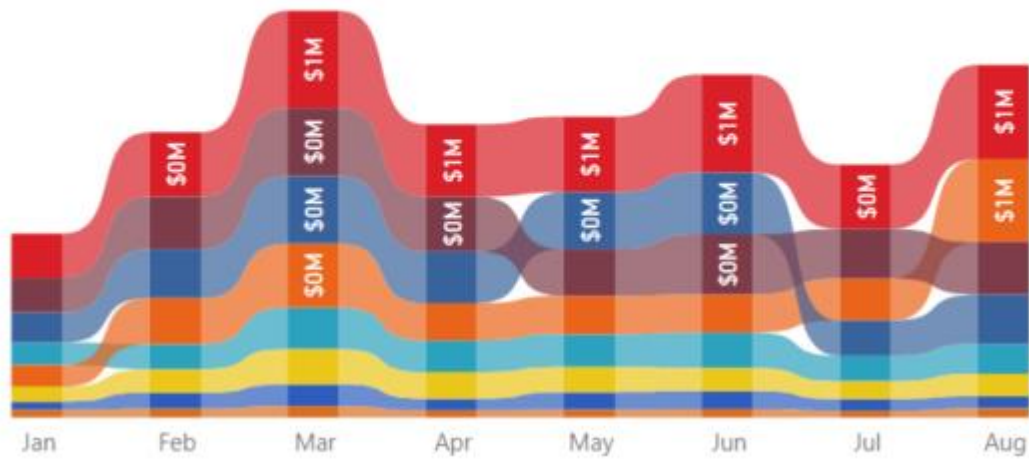
Car Attributes Correlation

	Num of Cyl	displacement	Horse Power	mileage	sec for 0-100	Weight
Num of Cyl	1.0	-0.8	-0.7	0.9	0.7	-0.6
displacement		1.0	-0.6	0.8	0.6	-0.7
Horse Power			1.0	0.7	0.8	-0.5
mileage				1.0	-0.3	0.9
sec for 0-100					1.0	-0.1
Weight						1.0

Ribbon chart

This Year Sales by FiscalMonth and Category

Category ● 010-Womens ● 020-Mens ● 030-Kids ● 040-Juniors ● 060-Intimate ● 070-Hosiery

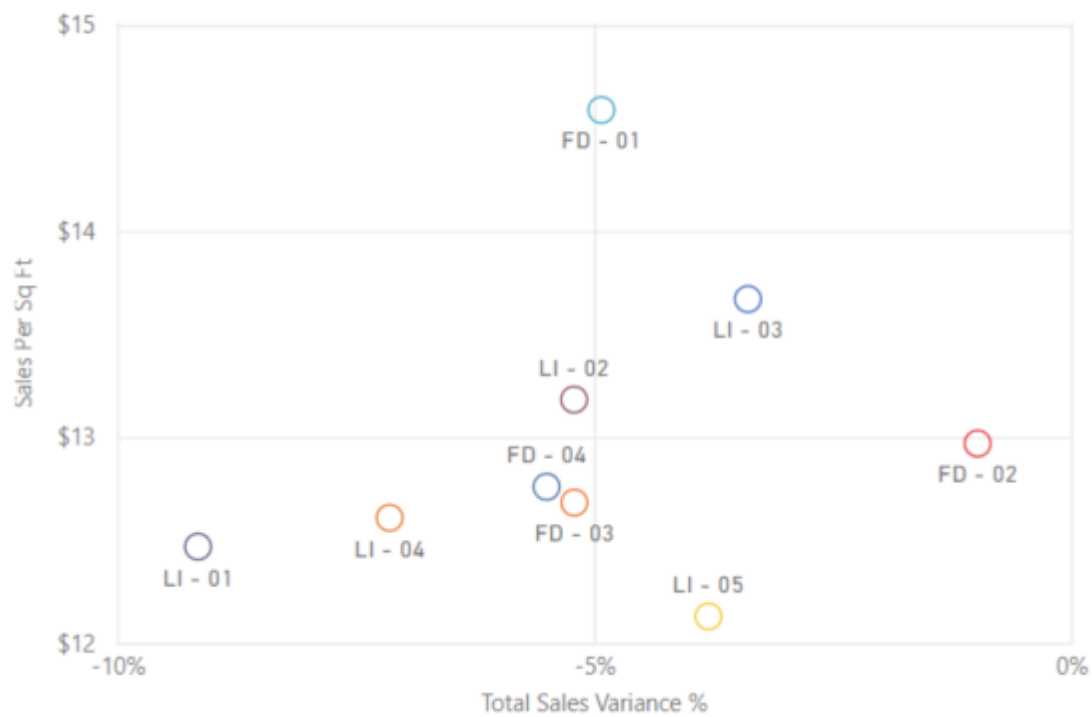


Scatter

Scatter, bubble, and dot plot chart

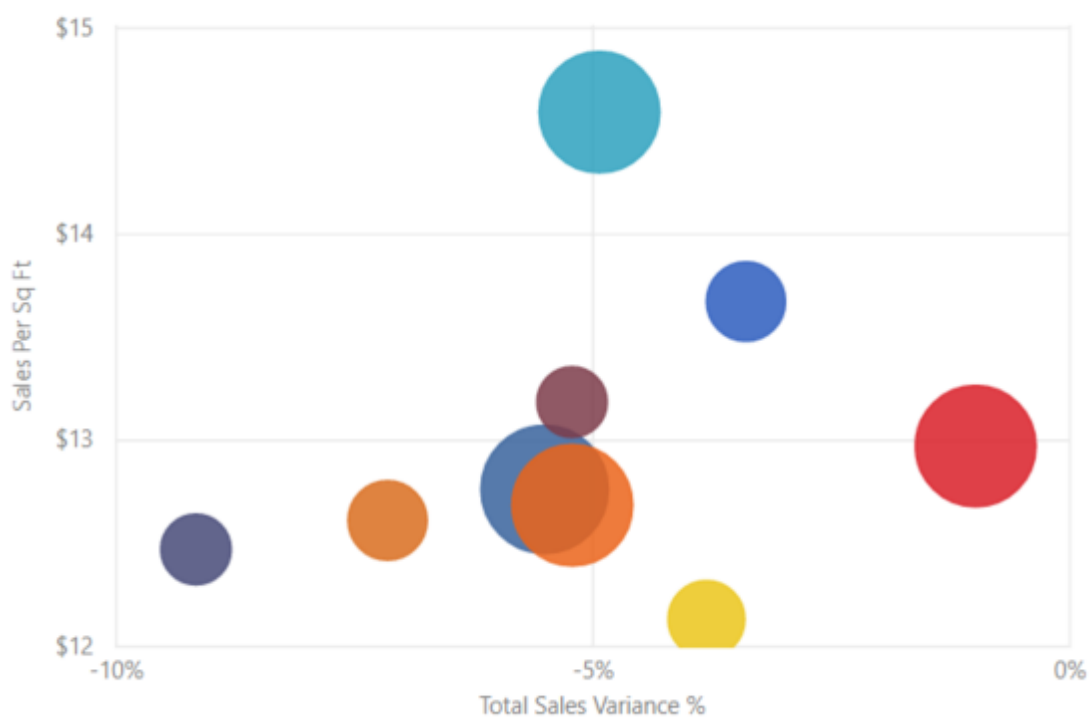
A scatter chart always has two value axes to show one set of numerical data along a horizontal axis and another set of numerical values along a vertical axis. The chart displays points at the intersection of an x and y numerical value, combining these values into single data points. These data points might be distributed evenly or unevenly across the horizontal axis, depending on the data.

Total Sales Variance % and Sales Per Sq Ft by District



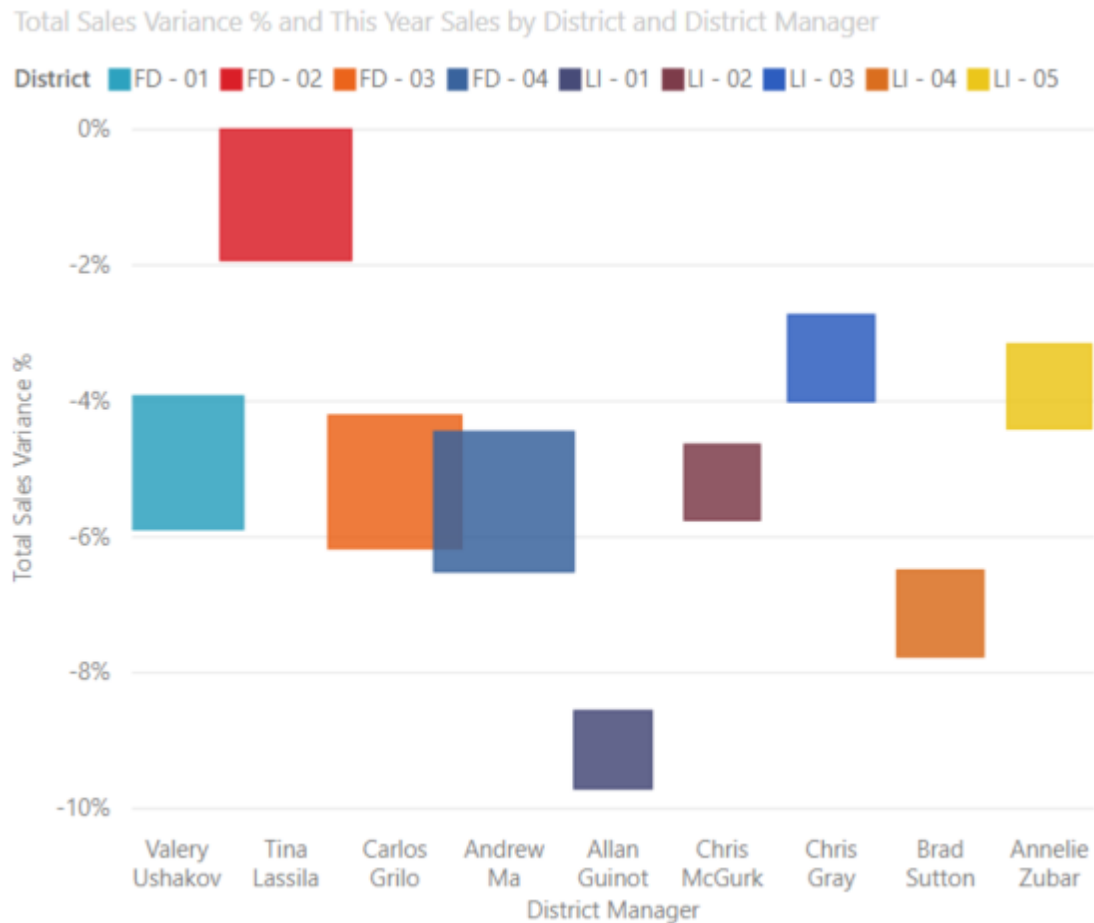
A bubble chart replaces data points with bubbles, with the bubble size representing an additional dimension of the data.

Total Sales Variance %, Sales Per Sq Ft and This Year Sales by District

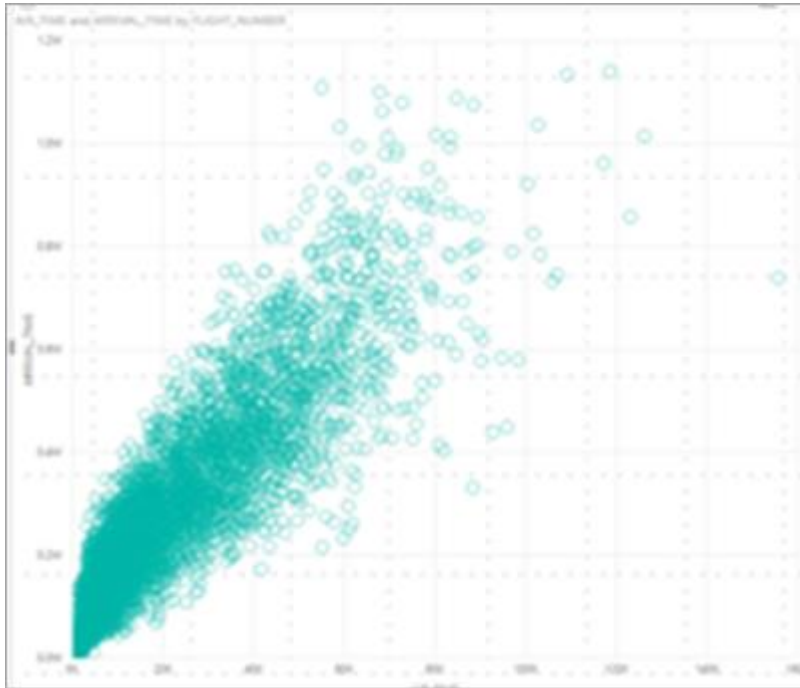


Both scatter and bubble charts can also have a play axis, which can show changes over time.

A dot plot chart is similar to a bubble chart and scatter chart except that it can plot numerical or categorical data along the X axis. This example happens to use squares instead of circles and plots sales along the X axis.



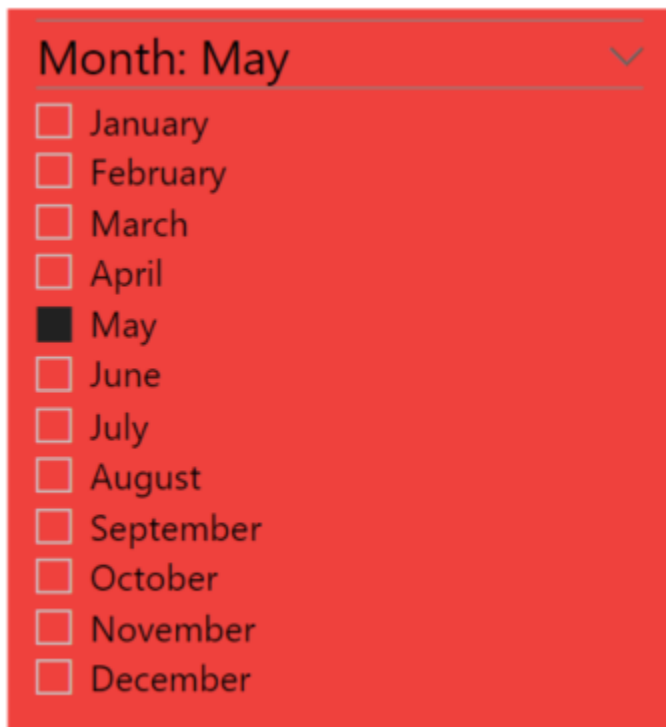
Scatter-high density



By definition, high-density data is sampled to create visuals reasonably quickly that are responsive to interactivity. High-density sampling uses an algorithm that eliminates overlapping points, and ensures that all points in the data set are represented in the visual. It doesn't just plot a representative sample of the data.

This ensures the best combination of responsiveness, representation, and clear preservation of important points in the overall data set.

Slicers

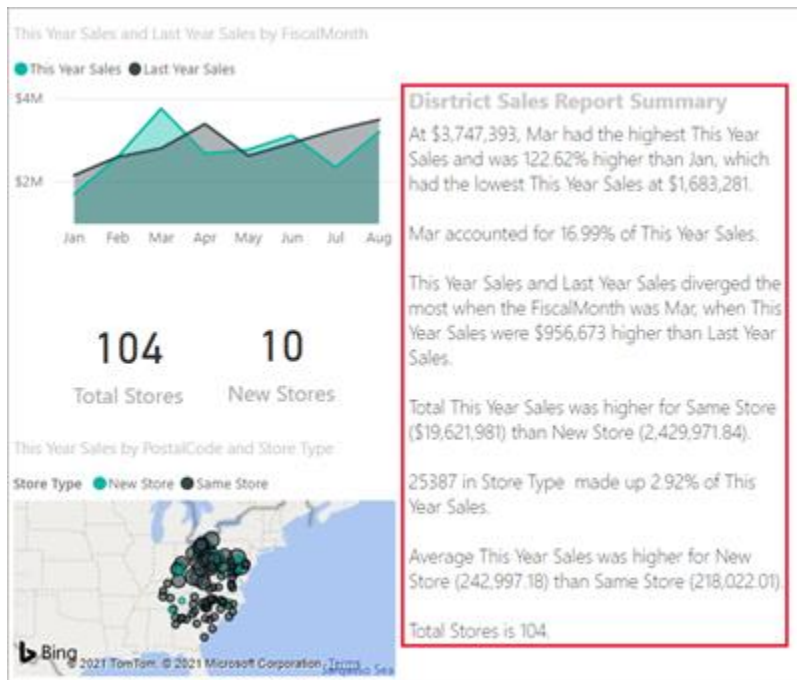


A slicer is a standalone chart that can be used to filter the other visuals on the page. Slicers come in many different formats (category, range, date, etc.) and can be formatted to allow selection of only one, many, or all of the available values.

Slicers are a great choice to:

- Display commonly used or important filters on the report canvas for easier access.
- Make it easier to see the current filtered state without having to open a drop-down list.
- Filter by columns that are unneeded and hidden in the data tables.
- Create more focused reports by putting slicers next to important visuals.

Smart narrative



The Smart narrative adds text to reports to point out trends, key takeaways, and add explanations and context. The text helps users to understand the data and identify the important findings quickly.

Standalone images



A standalone image is a graphic that has been added to a report or dashboard.

Tables

Category	This Year Sales Status	Average Unit Price	Last Year Sales	This Year Sales	This Year Sales Goal
080-Accessories	●	\$4.84	\$1,273,096	\$1,379,259	\$1,273,096
090-Home	●	\$3.93	\$2,913,647	\$3,053,326	\$2,913,647
100-Groceries	●	\$1.47	\$810,176	\$829,776	\$810,176
020-Mens	●	\$7.12	\$4,453,133	\$4,452,421	\$4,453,133
030-Kids	●	\$5.30	\$2,726,892	\$2,705,490	\$2,726,892
050-Shoes	●	\$13.84	\$3,640,471	\$3,574,900	\$3,640,471
010-Womens	●	\$7.30	\$2,680,662	\$1,787,958	\$2,680,662
040-Juniors	●	\$7.00	\$3,105,550	\$2,930,385	\$3,105,550
060-Intimate	●	\$4.28	\$955,370	\$852,329	\$955,370
070-Hosiery	●	\$3.69	\$573,604	\$486,106	\$573,604
Total	●	\$5.49	\$23,132,601	\$22,051,952	\$23,132,601

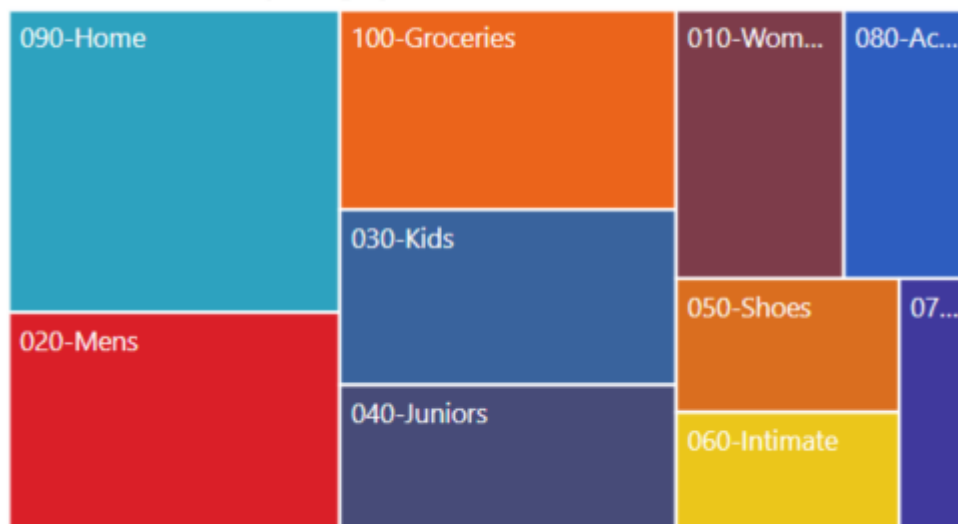
A table is a grid that contains related data in a logical series of rows and columns. It might also contain headers and a row for totals. Tables work well with quantitative comparisons where you are looking at many values for a single category. For example, this table displays five different measures for Category.

Tables are a great choice:

- To see and compare detailed data and exact values (instead of visual representations).
- To display data in a tabular format.
- To display numerical data by categories.

Treemaps

Total Units Last Year by Category



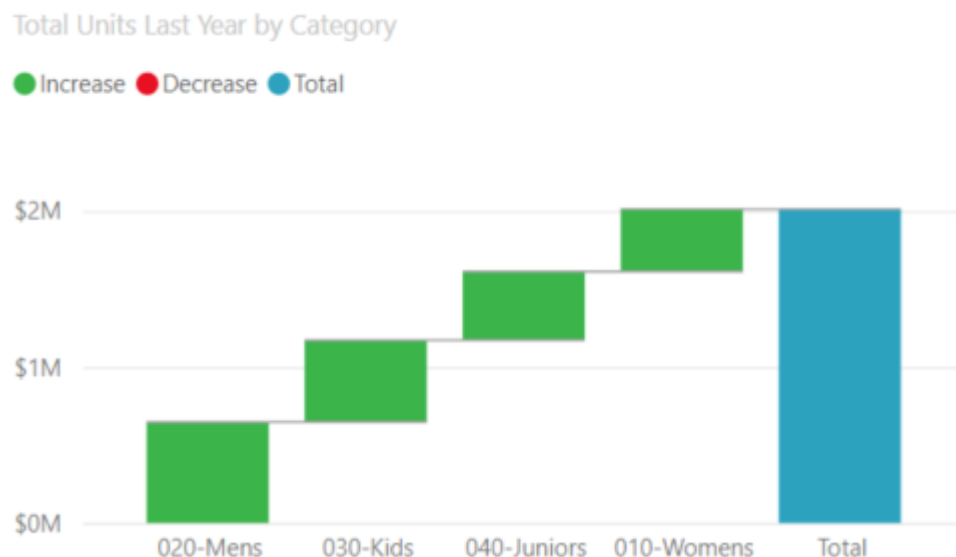
Treemaps are charts of colored rectangles, with size representing value. They can be hierarchical, with rectangles nested within the main rectangles. The space inside each rectangle is allocated based on the value being measured. And the rectangles are arranged in size from top left (largest) to bottom right (smallest).

Treemaps are a great choice:

- To display large amounts of hierarchical data.
- When a bar chart can't effectively handle the large number of values.
- To show the proportions between each part and the whole.
- To show the pattern of the distribution of the measure across each level of categories in the hierarchy.
- To show attributes using size and color coding.
- To spot patterns, outliers, most-important contributors, and exceptions.

For more information, see [Treemaps in Power BI](#).

Waterfall charts



A waterfall chart shows a running total as values are added or subtracted. It's useful for understanding how an initial value (for example, net income) is affected by a series of positive and negative changes.

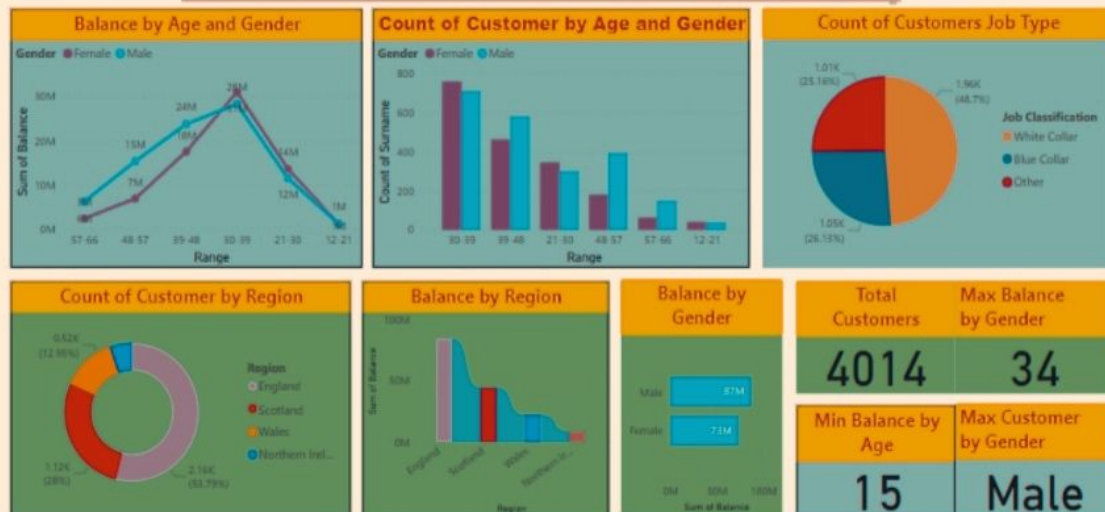
The columns are color coded so you can quickly tell increases and decreases. The initial and the final value columns often start on the horizontal axis, while the intermediate values are floating columns. Because of this "look", waterfall charts are also called bridge charts.

Waterfall charts are a great choice:

- When you have changes for the measure across time or across different categories.
- To audit the major changes contributing to the total value.
- To plot your company's annual profit by showing various sources of revenue and arrive at the total profit (or loss).
- To illustrate the beginning and the ending headcount for your company in a year.
- To visualize how much money you make and spend each month, and the running balance for your account.

DASHBOARD AND REPORT

Bank Customers Analysis



Reports:

Power BI offers numerous benefits for project tracking. One of the main advantages is its ability to consolidate data from multiple sources, such as project management tools, financial systems, and spreadsheets. This allows project managers to have a holistic view of the project, making it easier to identify trends, patterns, and anomalies. Power BI's advanced visualizations enable the creation of intuitive dashboards, making it effortless to track project progress at a glance. Furthermore, Power BI's interactive features allow users to explore and drill down into the data, gaining deeper insights into the project's performance.

Another benefit of using Power BI for project tracking is its ability to automate data refreshes. With Power BI, project managers can set up

scheduled refreshes to ensure that the data is always up to date. This eliminates the need for manual data updates and reduces the risk of using outdated information for decision-making.

In addition, Power BI offers a wide range of collaboration features that enhance team collaboration and communication. Project teams can easily share dashboards and reports with stakeholders, enabling real-time collaboration and feedback. Power BI also allows users to add comments and annotations to specific data points, facilitating discussions and improving the overall project tracking process.

CONCLUSION:

Microsoft Power BI is an indispensable tool in the realm of business intelligence. Its robust features, ease of use, and ability to transform raw data into actionable insights make it a top choice for organizations worldwide. As you wrap up your Power BI project, consider the following key points:

Data Connectivity: Power BI's extensive connector library allows seamless integration with various data sources, including Google Analytics, SQL databases, and more.

Custom Visualization: Leverage Power BI's pre-designed visualizations to create interactive reports tailored to your specific needs. Additionally, explore third-party solutions like FluentPro's report packs for enhanced intelligence and analytics.

Performance Optimization: The columnar database engine within Power BI significantly improves performance by compressing large datasets, making it an efficient choice for data modeling.

Result Finding:

Some common areas of analysis include customer transaction patterns, fraud detection, customer segmentation for targeted marketing, sentiment analysis of customer feedback, and predicting customer churn. The results could include insights such as unusual spending behavior indicating potential fraud, segmentation of customers into different categories based on their behavior or demographics, sentiment analysis of customer reviews to gauge satisfaction levels, and predictive models to forecast which customers are likely to leave the bank. These results help banks make data-driven decisions to improve customer experience, reduce risk, and enhance profitability.