Chapter – 1: Microsoft Power BI

Introduction to Power BI

- Microsoft Power BI is a data visualization and reporting platform that is used by businesses and professionals every day. While the platform is commonly used by business analysts, it is also designed to be easily accessible for those without any specialized data knowledge.

What is Microsoft Power BI?

- Microsoft Power BI is a data visualization platform used primarily for business intelligence purposes. Designed to be used by business professionals with varying levels of data knowledge.
- Power BI's dashboard is capable of reporting and visualizing data in a wide range of different styles, including graphs, maps, charts, scatter plots, and more.
- Power BI itself is composed of several interrelated applications: Power BI Desktop, Pro, Premium, Mobile, and Report Server. While some of these applications are free-to-use, paid subscriptions to the pro and premium versions provide greater analytics capabilities.

What is Power BI used for?

Whether you're a data pro or are just entering the business world, Power BI is designed to empower you with data-driven insights. Some of the most common uses for the platform include:

1. Creating reports and dashboards that present data sets in multiple ways using visuals.
2. Connecting various data sources, such as Excel sheets, onsite data warehouses, and cloud-based data storage, and then transforming them into business insights.
3. Turning data into a wide range of different visuals, including pie charts, decomposition trees, gauge charts, KPIs, combo charts, bar and column charts, and ribbon charts – among many other options.
4. Providing company-wide access to data, data visualization tools, and insights in order to create a data-driven work culture.

Who uses Power BI?

- Power BI users aren't limited to data professionals, such as data scientists or data engineers, and can include a wide range of different business users. In fact, the platform is intentionally designed so non-technical users can easily create reports, manipulate data, and perform in-depth data analysis operations.
- Nonetheless, some of the most common analyst positions that use the platform on a daily basis include the following:

i. Business analysts
ii. Business intelligence analysts
iii. Supply chain analysts
iv. Data analyst

Power BI in the real world

- As data becomes more and more important to the daily functioning of the goods and services that businesses provide, so too do business intelligence platforms capable of turning that data into insights, reports, and interactive visualizations.
- For example, a university attempting to optimize the efficiency of their buildings might set up a system to collect real-time data on critical building systems. Afterward, they might connect these data sources to Power BI and identify areas for improvement.
- An advertising company, meanwhile, running a digital marketing campaign might monitor its effectiveness by connecting various data sources to Power Bi and generating a dashboard that highlights key figures. Here, marketers would be able to better understand what marketing channels are best for reaching their target market.

How Power BI Solves Data Management

- Assimilates data from diverse sources to create a coherent format data.
- Data source connectors use a single website service to connect users with multiple data sources.
- Power BI data flows help users instantly connect with a variety of data from multiple sources. The data management gateway helps in arranging, classifying, storing, and managing data in an enterprise's database.

Data Management Challenges Addressed by Power BI

- No Single Data Source
- Unavailability of Useful Data
- Modelling Non-Uniform Data
- Acquiring Useful Insights from Data
- Real-Time Data Analysis

Power BI Data Warehouse

Benefits of using a data warehouse.

- Provides insight into an organization's operations and processes.
- It helps optimize resource allocation by providing better insights.
- Data warehouses provide faster access to information.
- A data warehouse allows you to access information quickly, making better decisions before receiving it from other sources.
- A well-designed data warehouse can be used for benchmarking against industry standards.
- A key benefit of using a data warehouse is that it combines all of your organization's data into one location so that everyone who needs access to it can see the same.

ETL (Extract, Transform, Load):

- ETL is a data integration process that combines, cleans and organizes data from multiple sources into a single, consistent data set for storage in a data warehouse, data lake or other target system.
- ETL pipelines are often used by organizations to:
  - Extract data from legacy systems
  - Cleanse the data to improve data quality and establish consistency
  - Load data into a target database

ETL tools

- **Comprehensive automation and ease of use.**
- **A visual, drag-and-drop interface.**
- **Support for complex data management.**
- **Security and compliance.**

Power BI Key Components

- Power Query
- Power Pivot
- Power View
- Power Map
- Power Q&A

Power Query

- Power Query is one of the important components of Power BI. This can be included in your Excel or can be used as a component of the Power BI Desktop. Using Power Query, you can delete data from numerous data sources and extract data from a wide range of different databases like Oracle, SQL Server, MySQL, and other different databases. You can also fetch data from records like text files, CSV files, or Excel files.
- Power BI gives you a strong GUI so that you can transform and use the data as you need, such as the date and time changes, adding columns, changing the types and content, and many different options. It uses a simple language, Power Query M Formula Language, as a behind code which is more vigorous than a GUI.

Power Pivot

- Power Pivot is a data modeling and calculation engine. It is used for modeling simple and complex data. In Power Pivot, you can set or create relationships between different tables and calculate values that can be viewed in Pivot tables. It provides you with a huge space to create your design.
- The language used by Power BI Pivot is Data Analysis Expression (DAX), which is a strongly functional language, and all your calculations are done here.

Power View

- Power View is the fundamental data visualization component of Power BI. It is an interactive component that connects to data sources and retrieves metadata that can be utilized for data analysis. There are many blueprints for visualization in the Power View lists. With Power View, you can filter data for each visualization component or even for the entire report. Slicers can be used for better slicing and dicing of data.
- Reports in Power View are interactive; the user can highlight some part of the data or different components in Power View to interact with each other.

Power Map

- Power Map is used to visualize geospatial data in 3D mode. As soon as the visualization renders in 3D mode, it provides another dimension to it. In Power Map, you can assume one attribute as the length of a column in 3D and another attribute as a heatmap view. Based on a geographical location, the data can be highlighted. Geographical locations can be a country, state, city, or street address.
- To get the best visualization, Power Map works with the Bing Maps based on the geographical latitude or longitude or a country, state, city, or street address data.

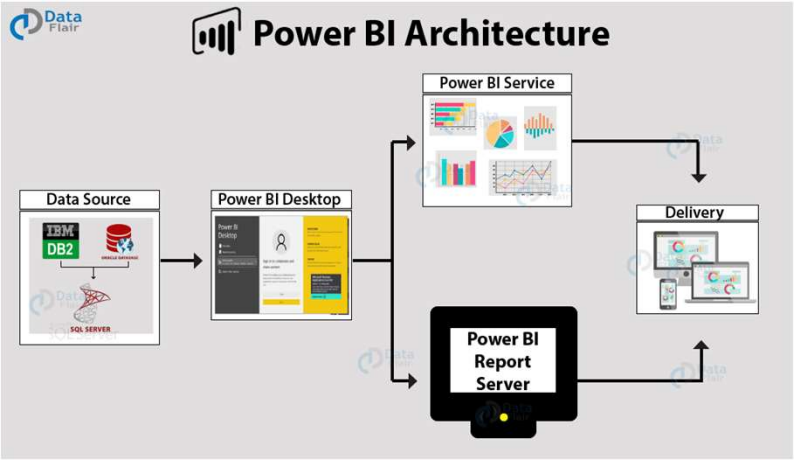
Power Q & A

- Power BI Q&A is an ordinary language motor for your data model's questions and answers. After assembling your data model and updating it on Power BI Website, you or your users can ask questions, if any, and get solutions to those questions. There are some shortcuts and hints for the construction of your model so that it can answer questions in the best possible way.
- For data visualizations, Power Q&A works with Power View so that users can ask questions, like the number of customers by state, and the question is answered in the form of a map view with numbers represented as bubbles by Power Q&A.

Power BI Architecture

- *Power BI is a business suite that includes several technologies that work together.* To deliver outstanding business intelligence solutions, Microsoft Power BI technology consists of a group of components such as:
  - Power Query (for data mash-up and transformation)
  - Power BI Desktop (a companion development tool)
  - Power BI Mobile (for Android, iOS, Windows phones)
  - Power Pivot (for in-memory tabular data modeling)
  - Power View (for viewing data visualizations)
  - Power Map (for visualizing 3D geo-spatial data)
  - Power Q&A (for natural language Q&A)

Power BI Architecture



Data Sources

An important component of Power BI is its vast range of data sources. You can import data from files in your system, cloud-based online data sources or connect directly to live connections. If you import from data on-premise or online services there is a limit of 1 GB. Some commonly used data sources in Power BI are:

- Excel
- Text/CSV
- XML
- JSON
- Oracle Database
- IBM DB2 Database
- MySQL Database
- PostgreSQL Database
- Sybase Database
- Teradata Database
- SAP HANA Database
- SAP Business Warehouse server
- Amazon Redshift
- Impala
- Google BigQuery (Beta)
- Azure SQL Database
- Salesforce Reports
- Google Analytics
- Facebook
- GitHub

Power BI Desktop

- Power BI Desktop is a client-side tool known as a companion development and authoring tool.
- This desktop-based software is loaded with tools and functionalities to *connect to data sources, transform data, data modeling and creating reports.*
- You can download and install Power BI Desktop in your system for free. Using Power BI Desktop features, one can do *data cleansing, create business metrics and data models, define the relationship between data, define hierarchies, create visuals and publish reports.*

Power BI Service

- Power BI Service is a web-based platform from where you can *share reports made on Power BI Desktop, collaborate with other users, and create dashboards.*
- It is available in three versions:
  - Free version
  - Pro version
  - Premium version
- Power BI Service is also known as, **"Power BI.com"**, **"Power BI Workspace", "Power BI Site"** and **"Power BI Web Portal"**. This component also offers advanced features like *natural language Q&A* and *alerts*.

Power BI Report Server

- The Power BI Report Server is similar to the Power BI Service. The only difference between these two is that Power BI Report Server is an on-premise platform. It is used by organizations who do not want to publish their reports on the cloud and are concerned about the security of their data.
- Power BI Report Server enables you to create dashboards and share your reports with other users following proper security protocols. To use this service, you need to have a Power BI Premium license.

Power BI Gateway

- This component is used to connect and access on-premise data in secured networks. Power BI Gateways are generally used in organizations where data is kept in security and watch. Gateways help to extract out such data through secure channels to Power BI platforms for analysis and reporting.

- **Power BI Mobile**
- Power BI Mobile is a native Power BI application that runs on iOS, Android, and Windows mobile devices. For viewing reports and dashboards, these applications are used.

- **Power BI Embedded**
- Power BI Embedded offers APIs which are used to embed visuals into custom applications.

Power BI data integration

- Power BI data integration is a strategic advantage for firms, not merely a technical need. It seamlessly combines data from several sources—such as on-premises databases, cloud-based services, or real-time data streams—into a cohesive, analytical model within Power BI.
- This procedure provides a comprehensive understanding of the business environment and democratizes departmental data access. It is impossible to exaggerate the significance of this convergence. It enables businesses to swiftly change course in response to thorough insights, creating a climate where data-driven choices are the rule rather than the exception.

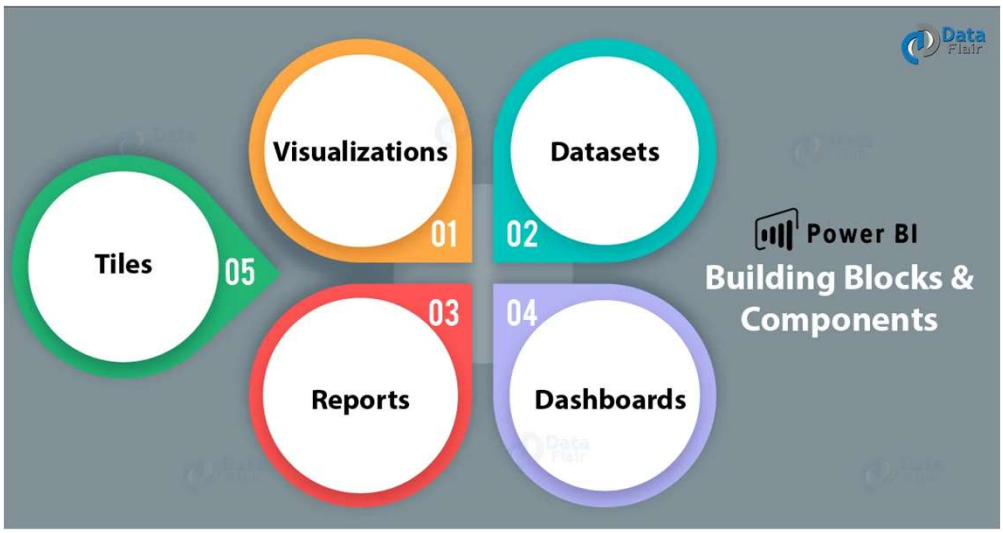
Power BI Data Integration Techniques

- **Direct Query**
- The data technique involves copying the data from the source into Power BI. This is the most popular technique when integrating datasets that change infrequently or extend beyond Power BI's data capacity constraints.
- **Data Size:**
- Power BI's data model size restrictions apply to imported datasets, which may be a drawback for larger datasets.
- **Hybrid Approach:**
- To maximize functionality, performance, and data freshness, a combination of the techniques above is used. Direct Query, for instance, may be used for vital real-time data while previous data is loaded.

Data Updating Management

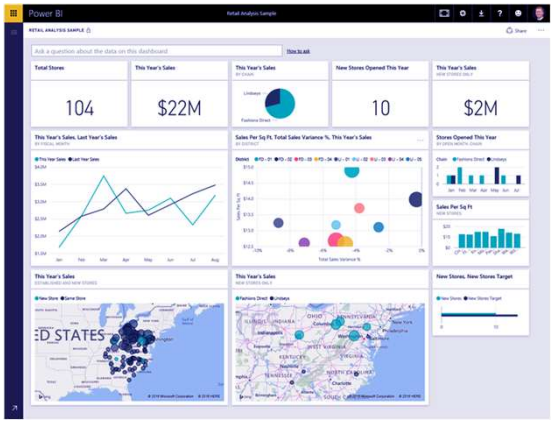
- Maintaining current data in Power BI is essential for precise analysis and decision-making. Mechanisms for updating data, such as manual and scheduled refreshes, are essential to this procedure.
- With scheduled refresh, users may program Power BI to refresh data in reports and dashboards at scheduled intervals. This guarantees that users never have to update their dashboards or reports manually.
- This is especially helpful for datasets that are updated often. This gives users access to updated insights at any crucial moment they choose, such as the beginning of their workday.
- However, when updated data is required immediately, the user initiates a manual refresh. Although this approach is flexible, it is less practical for frequent upgrades since it requires human effort.

Power BI Building Blocks – 5 Major Parts



Visualization

- A perception is a visual portrayal of information. For example, a diagram, chart, shading coded outline, other intriguing things you can make to speak to your information outwardly. Power BI has a wide range of various perception writes, and additionally coming constantly. The accompanying picture demonstrates a gathering of various visualization that was made in the Power BI benefit.



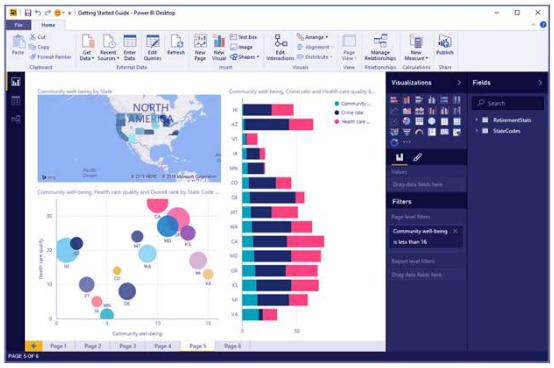
Datasets

- A dataset is an accumulation of information that Power BI uses to make its representations. You can have a basic dataset in light of a solitary table from Excel exercise manual, like what's appeared in the accompanying picture.
- Datasets can likewise a blend of a wide range of sources, which you can channel and consolidate to give an exceptional accumulation of information (a dataset) for use in Power BI.

	B	C	D	E	F	G	H
1	Year	Month	Month Name	Calendar Month	Births	Births Per Day	Births (Normalized)
2119	2004	1	January	1/1/2004	2,937	94.7	2842
2120	2004	2	February	2/1/2004	2,824	97.4	2921
2121	2004	3	March	3/1/2004	3,128	100.9	3027
2122	2004	4	April	4/1/2004	2,896	96.5	2896
2123	2004	5	May	5/1/2004	3,008	97.0	2911
2124	2004	6	June	6/1/2004	3,047	101.6	3047
2125	2004	7	July	7/1/2004	2,981	96.2	2885
2126	2004	8	August	8/1/2004	3,079	99.3	2980
2127	2004	9	September	9/1/2004	3,219	107.3	3219
2128	2004	10	October	10/1/2004	3,547	114.4	3433
2129	2004	11	November	11/1/2004	3,365	112.2	3365
2130	2004	12	December	12/1/2004	3,143	101.4	3042
2131	2005	1	January	1/1/2005	2,921	94.2	2827
2132	2005	2	February	2/1/2005	2,699	96.4	2892
2133	2005	3	March	3/1/2005	3,024	97.5	2926
2134	2005	4	April	4/1/2005	3,037	101.2	3037
2135	2005	5	May	5/1/2005	3,231	104.2	3127
2136	2005	6	June	6/1/2005	3,163	105.4	3163
2137	2005	7	July	7/1/2005	3,119	100.6	3018
2138	2005	8	August	8/1/2005	3,156	101.8	3054
2139	2005	9	September	9/1/2005	3,439	114.6	3439

Reports

- In Power BI, a report is a gathering of perceptions that seem together on at least one pages. Much the same as some other report you may make for a business introduction, or a report you would compose for a school task, in Power BI a report is an accumulation of things that identify with each other. The accompanying picture demonstrates a report in Power BI Desktop – for this situation, it's the fifth page in a six-page report. You can likewise make reports in the Power BI benefit.



Dashboards

- When you prepare to share a solitary page from a report or offer an accumulation of perceptions, you make a dashboard. Much like the dashboard in an auto. A Power BI dashboard is a gathering of visuals from a solitary page that you can impart to others. Frequently, it's a chosen gathering of visuals that give snappy understanding into the information or story you're attempting to exhibit.
- A dashboard needs to fit on a solitary page, frequently called a canvas. Consider it like the canvas that a craftsman or painter utilizes. A workspace where you make, consolidate, and adjust fascinating and convincing visuals. You can impart dashboards to different clients or gatherings, who would then able to communicate with your dashboard when they're in Power BI benefit, or on their cell phone.

Tiles

- In Power BI, a tile is a solitary representation found in a report or on a dashboard. It's the rectangular box that contains every individual visual. In the accompanying picture, you see one tile (featured by a splendid box) which additionally encompass by different tiles.