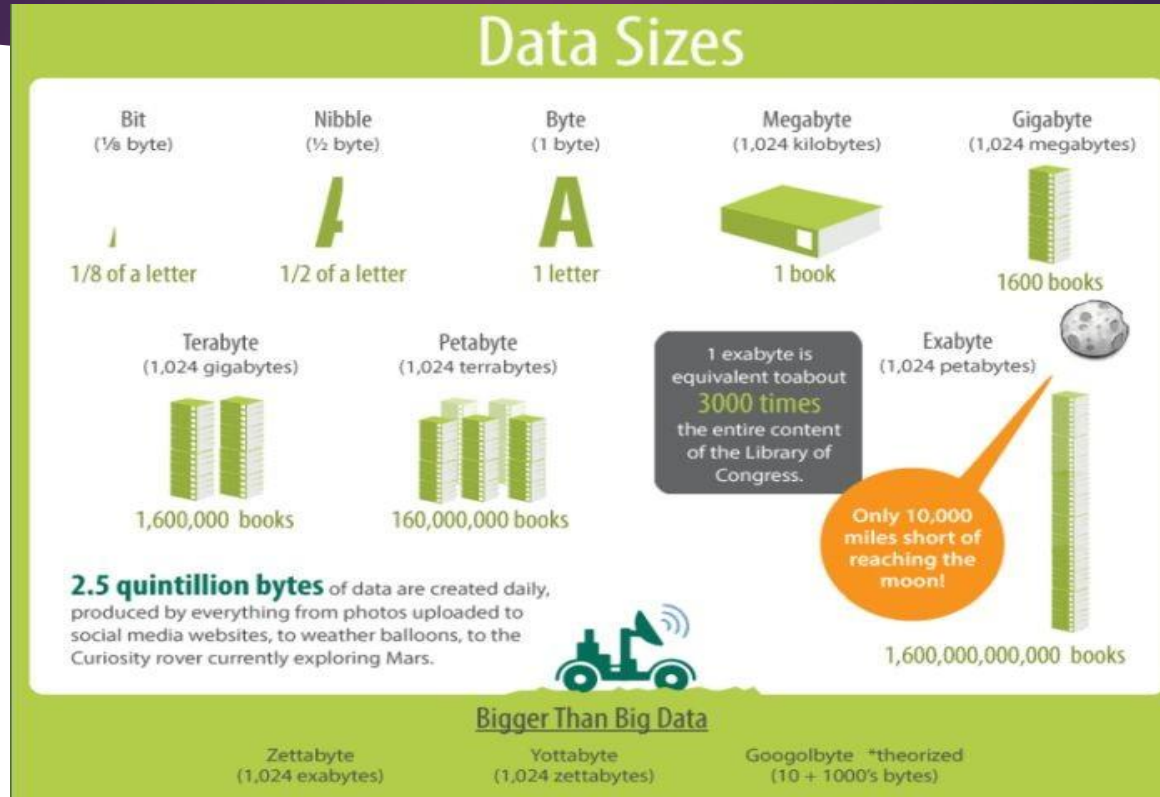# BUSINESS INTELLIGENCE

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Why Are Business Intelligence Concepts And BI Solutions So Important Today?

BI Functionalities:

- **Analysis**: Business Intelligence solution analyze the raw data with seasonal, trend analysis , what if scenarios, modeling using different data modeling techniques and similar functionalities.

- **Reports**: The solution provides very comprehensive functionalities for creating reports for better understanding of the business data. Business users can create, view, modify report and visualizations online and offline and with other office products.

BI Functionalities:

- **Real time monitoring**: Business Intelligence solution provides tools to analyze the real time up to the second operational data to enable the business to take quick and informed decisions.

- **Dashboards**: The solution provides dashboards which helps the business to monitor, measure and manage business performance in a very quick manageable way.

- **Scorecards**: Business Intelligence solutions provides industry standard scorecards to enable the business to measure the key performance indicators.

BI Functionalities:

- **Collaborative Business Intelligence**: Business Intelligence Solution provides capabilities to collaboratively share the information with different stakeholders with in the organization and outside.

- **Mobile Business Intelligence**: Business Intelligence solution provides functionalities to make the same information such as reports, dashboards, monitoring available in mobile device.

- **Advanced Analytics and visualization**: Some of the business intelligence solutions provide advanced analytics and visualisation capabilities enabling real time visualisation in different forms and methods and to augment additional functionalities.

STEP 1

Analysis

Analyze the raw data with seasonal, trend analysis, what if scenarios, modeling using different data modeling techniques and similar functionalities.

STEP 2

Reports

Functionalities for creating reports for better understanding of the business data.

STEP 3

Real time monitoring

Provides tools to analyze the real time up to the second operational data to enable the business to take quick and informed decisions.

STEP 4

Dashboards

Provides dashboards which helps the business to monitor, measure and manage business performance in a very quick manageable way.

STEP 5

Scorecards

Provides industry standard scorecards to enable the business to measure the key performance indicators.

STEP 6

Collaborative Business Intelligence

Capabilities to collaboratively share the information.

STEP 7

Advanced Analytics

Advanced analytics and visualization capabilities.

STEP 8

Mobile Business Intelligence

Available in mobile device.

Importance of BI:

▶ Business intelligence is used to improve all parts of a company by improving access to the firm's data and then using that data to increase profitability.

▶ Companies that practice BI can translate their collected data into insights from their business processors.

▶ Then the insights can be used to create strategic business decisions that improve productivity and accelerate growth.

Benefits:

- Driving new revenues.

- It increases operational efficiency.

- It optimizes internal business processes.

- It improves decision-making.

- It is gaining a competitive advantage over business rivals.

- It is used in spotting business problems that need to be addressed.

- It can be used in assisting companies in the identification of market trends.

How business intelligence works:

THE MODERN ANALYTICS WORKFLOW

Access & View

Interact

Analyze & Discover

Share

Promote & Govern

IT/BI Professional

Information Consumer

Content Creator

How Business Intelligence Works:

▶ Businesses have Goals.

▶ Goals demand Gathering the necessary data

▶ After Data analysis, determine what actions to take to reach the goals.

▶ On the technical side, raw data is collected from business systems. Data is processed and then stored in data warehouses, the cloud, applications, and files.

▶ Once it's stored, users can access the data, starting the analysis process to answer business questions.

BI Methods:

▶ **Data mining:** Using databases, statistics, and machine learning (ML) to uncover trends in large datasets

▶ **Reporting:** Sharing data analysis to stakeholders so they can draw conclusions and make decisions

▶ **Performance metrics and benchmarking:** Comparing current performance data to historical data to track performance against goals, typically using customized dashboards

BI Methods:

▶ **Descriptive analytics:** Using preliminary data analysis to find out what happened

▶ **Querying:** Asking the data-specific questions, BI pulling the answers from the data sets

▶ **Statistical analysis:** Taking the results from descriptive analytics and further exploring the data using statistics such as how this trend happened and why

▶ **Data visualization:** Turning data analysis into visual representations such as charts, graphs, and histograms to more easily consume data

BI Methods:

▶ **Visual analysis:** Exploring data through visual storytelling to communicate insights on the fly and stay in the flow of analysis

▶ **Data preparation:** Compiling multiple data sources, identifying the dimensions and measurements, and preparing it for data analysis

How do BI, data analytics, and business analytics work together?

▶ Business intelligence includes data analytics and business analytics but uses them only as parts of the whole process.

▶ BI helps users draw conclusions from data analysis.

▶ Data scientists dig into the specifics of data, using advanced statistics and predictive analytics to discover patterns and forecast future patterns.

▶ BI is designed to answer specific queries and provide at-a-glance analysis for decisions or planning. However, companies can use the processes of analytics to continually improve follow-up questions and iteration.

Categories of BI analysis:

Predictive Analysis :

Predictive analytics is the process of using data to forecast future outcomes. The process uses data analysis, machine learning, artificial intelligence, and statistical models to find patterns that might predict future behavior.

Categories of BI analysis:

Descriptive Analysis :

Descriptive analytics is the process of using current and historical data to identify trends and relationships. It's sometimes called the simplest form of data analysis because it describes trends and relationships but doesn't dig deeper.

Categories of BI analysis:

Prescriptive Analysis :

Prescriptive analytics is the use of advanced processes and tools to analyze data and content to recommend the optimal course of action or strategy moving forward. Simply put, it seeks to answer the question, "What should we do?"

Categories of BI analysis:

Business Assessment :

- A business assessment ensures your business is well equipped with what it needs to deliver on your goals. It provides a guideline to help you scale your business in a way that is smart and strategic. The secret to conducting useful business assessments that provide actionable insights is to analyze appropriate Key Performance Indicators (KPIs).

- KPIs keep business objectives at the forefront. They are the metrics that provide answers to the right questions or monitor the health of the areas of your business in consideration. With the right selection of KPIs you evaluate how a BI solution needs to address pain points experienced in the past, how should it deliver on the current needs, and finally how will it scale to cover future wants.

- Since KPIs also play a pivotal role in keeping your business intelligence projects on track, we have created a KPIs for BI Template that will assist you in the exercise of choosing the right ones

Data Assessment:

- The truthfulness of the analysis is directly proportional to the integrity of the data.
- A data assessment report can identify data quantity, complexity, and active versus inactive data – critical for project scoping.
- It includes various quality checks which provide information on data relevancy, business data readiness, target readiness, and gap analysis.
- Data Assessment must also confirm that the data is applicable to the KPIs.
- You may have the right KPIs defined in the Business Assessment Report but if there's a mismatch between your data and KPIs, you need to relook at your data.
- Finally, a thorough data assessment will also reduce unnecessary infrastructure costs and the complexity of your new system - ensuring better operational efficiencies.

User Group Assessment:

- Business intelligence is a process that sees many users participate at various stages starting with data transformation performed by technical users and ending with reports or dashboards consumed by business users.

- Each group has specific requirements from the BI solution.

- Profiling them helps in understanding their consumption and usage patterns which comes in handy while selecting and designing dashboards

Security Assessment:

▶ When there are multiple users and datasets involved in the project, it's crucial to know in advance---
    1) how the interactivity will take place,
    2) how will users be authenticated,
    3) what is the back-end architecture,
    4) and where is the solution going to be integrated?

▶ Finally, if there are any security checkpoints already in place that needs to be considered, or if any extra security checks need to be put in place.

CHOOSING APPROPRIATE VISUALS

▶ **<u>Understand your data and objective:</u>** Before selecting visuals, make sure you understand your data and the key insights you want to convey. Consider the type of data you have (numeric, categorical, temporal, etc.) and the story you want to tell with it.

▶ **<u>Use colors wisely:</u>** Choose a color scheme that complements your data and enhances readability. Stick to a limited color palette and avoid using colors that may convey unintended meanings. For example, using red for positive values may confuse your audience.

CHOOSING APPROPRIATE VISUALS

▶ **Use the right chart types:** Different chart types are suitable for different types of data.

1. **Bar/column charts:** For comparing categorical data or showing data over time.

2. **Line charts:** For showing trends over time or continuous data.

3. **Pie/doughnut charts:** For displaying parts of a whole (make sure not to use too many categories).

4. **Scatter plots:** For showing relationships between two numeric variables.

5. **Area charts:** For visualizing trends and comparing proportions over time.

6. **Heatmaps:** For displaying matrix-like data and identifying patterns.

7. **Treemaps:** For showing hierarchical data and part-to-whole relationships.

CHOOSING APPROPRIATE VISUALS

▶ **Utilize interactivity:** Power BI allows for interactive visuals. Use slicers, filters, and drill-through actions to enable users to explore the data and draw their own insights.

▶ **Consider data granularity:** Depending on your data's granularity (e.g., daily, monthly, yearly), you might need different visualizations to reveal patterns and trends effectively.

▶ **Be mindful of your audience:** Consider the level of data literacy and familiarity with the subject matter of your audience. Choose visuals that resonate with them and make the data more accessible.

CHOOSING APPROPRIATE VISUALS

▶ **<u>Keep it simple and uncluttered:</u>** Avoid using too many visuals on a single report page. Focus on the most critical insights and make sure your visuals are easy to interpret. Cluttered visuals can confuse and distract your audience.

▶ **<u>Leverage Power BI's custom visuals:</u>** Power BI has a marketplace with custom visuals created by the community. If you can't find the right visual among the built-in options, explore the custom visuals gallery for additional choices.

▶ **<u>Test and iterate:</u>** Don't be afraid to experiment with different visualizations and layouts. Gather feedback from your audience and make improvements based on their input.

APPLYING CALCULATIONS & STATISTICS

▶ **DAX (Data Analysis Expressions)**:

DAX is the formula language used in Power BI to create custom calculations and perform aggregations. You can create DAX measures and calculated columns using the "New Measure" or "New Column" options in the Power BI Field or Modeling tabs.

It is similar to Excel formulas but designed for working with relational data and creating complex calculations. Some common DAX functions include SUM, AVERAGE, COUNT, IF, RELATED, CALCULATE, etc.

▶ **Quick Measures**:

Power BI provides a feature called "Quick Measures" that allows you to create common calculations using a graphical user interface. You can find this feature in the "Home" tab under "Quick Measures.

APPLYING CALCULATIONS & STATISTICS

▶ **Grouping and Binning**: You can group data based on specific attributes or create bins to summarize continuous data into discrete groups. For example, you can group sales data by product categories or bin customer ages into age ranges.

▶ **Time Intelligence**: Power BI has built-in time intelligence functions that allow you to perform calculations related to dates and time periods. You can calculate year-to-date, quarter-to-date, and compare data from previous periods.

▶ **Statistical Functions**: Power BI includes various statistical functions that can be used to analyze your data. For instance, you can use AVERAGE, MEDIAN, MIN, MAX, STDEV.P, STDEV.S, etc., to calculate basic statistics. Additionally, you can use the Analytics pane to add trend lines, forecasting, and clustering to your visuals.

APPLYING CALCULATIONS & STATISTICS

▶ **Custom Functions**: If the built-in DAX functions don't meet your needs, you can create custom functions using DAX. These functions can be reused in multiple measures or calculated columns.

▶ **Python/R Integration**: Power BI allows you to integrate Python or R scripts into your data transformation and analysis processes. This enables you to leverage the power of these programming languages for advanced statistical calculations and machine-learning models.

APPLYING CALCULATIONS & STATISTICS

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DATA SORTING:

▶ **Table Visualization:** If you are using a table visualization, you can sort the data by clicking on the column header. Clicking once will sort in ascending order, and clicking again will sort in descending order.

▶ **Matrix Visualization:** For a matrix visualization, you can sort the data by clicking on the "Column headers" and using the sorting options that appear.

▶ **Charts:** For visualizations like bar/column charts and line charts, you can sort the data by the associated data fields. In the visualizations' "Visualizations" pane, you can go to the "Sort" section and choose the desired sorting option.

▶ **Sorting Options:** Power BI allows you to sort by a single column or by multiple columns. You can also apply custom sorting based on other measures or columns.

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DATA FILTERING:

▶ **Visual Level Filters:** Each visualization has its own filters. Click on a data point within a visual to select it, and you can use the funnel icon that appears to apply a filter based on that selection.

▶ **Page Level Filters:** You can set filters that apply to the entire report page. Go to the "View" tab, click on "Page Level Filters," and add the desired filters.

▶ **Report Level Filters:** Report level filters apply across all pages of the report. You can set them up by clicking on the "Report" tab and then selecting "Report Level Filters.

DATA FILTERING:

▶ **Filter Panes:** In the "Filter" pane on the right side of the Power BI window, you can add filters by dragging and dropping fields from your dataset.

▶ **Visual Interactions:** You can control how filters in one visual interact with other visuals on the same page. In the "Visualizations" pane, go to the "Edit interactions" option and adjust the filter interactions.

▶ **Advanced Filtering:** Power BI supports various types of filters, including basic filtering, relative date filtering, top N filtering, advanced filtering with DAX expressions, and more.

AN INTERACTIVE VISUALIZATION

▶ An interactive visualization, also known as an interactive visual, is a graphical representation of data that allows users to engage and interact with the visual to explore and analyze the underlying information.

▶ In an interactive visual, users can manipulate the data, change the view, apply filters, and drill down to specific details, providing a more dynamic and engaging data analysis experience.

AN INTERACTIVE VISUALIZATION KEY FEATURES

▶ **Filtering and Slicing:** Users can apply filters or slicers to focus on specific data subsets. For example, in a bar chart showing sales data for different regions, users can select a particular region to view sales for that region only.

▶ **Drill-Down and Drill-Up:** Interactive visuals often support drill-down and drill-up capabilities. Users can drill down to see more detailed data or drill up to view higher-level summaries. For instance, in a hierarchical chart, users can drill down from yearly data to quarterly or monthly data.

▶ **Tooltip Information:** Hovering over data points or elements in the visualization can trigger tooltips that display additional information related to that data point, helping users gain insights without cluttering the main view.

AN INTERACTIVE VISUALIZATION KEY FEATURES

▶ **Highlighting and Selection:**

Users can highlight specific data points or categories to emphasize their significance in the visual. Selection can trigger interactions with other visuals on the same page, allowing users to cross-filter and cross-highlight data.

▶ **Animations and Transitions:**

Animations and smooth transitions can be applied to visual changes, enhancing the user experience when filtering, sorting, or changing views.

▶ **Responsive Design:**

Interactive visuals should be responsive and adapt to different screen sizes and orientations, ensuring a consistent experience across various devices.

EVENT LISTENER – CALLBACK FUNCTION

▶ Event listeners are a programming concept used in various programming languages and frameworks to handle events or actions that occur during the execution of a program.

▶ An event listener, also known as an event handler or callback function, is a piece of code that waits for and responds to specific events, such as user interactions, system events, or custom events.

EVENT LISTENER – CALLBACK FUNCTION

▶ **Event Registration:** When an event occurs, such as a user clicking a button, pressing a key, or submitting a form, the corresponding event is triggered.

▶ **Event Listener Setup:** Before the event occurs, developers can set up event listeners to "listen" to specific events. They register these listeners on elements or objects that are expected to generate the events.

▶ **Event Handling:** When the event occurs, the registered event listener (callback function) is automatically executed in response to the event. It processes the event and performs any actions or tasks associated with that event.

▶ **Event Removal:** Event listeners can also be removed or deactivated when they are no longer needed, freeing up resources and preventing unintended behavior.

DATA UPDATING

▶ **Direct Query:** Power BI offers various data connectivity options, such as Direct Query, where the data remains in the data source (e.g., a database), and Power BI sends queries to fetch the latest data on demand. This allows for real-time or near-real-time data updates as the data source changes.

▶ **Import Data:** When you import data into Power BI, it creates a dataset in the Power BI service. You can set up scheduled refreshes to update the dataset regularly (daily, hourly, etc.) with the latest data from the original data source.

▶ **Streaming Data:** Power BI also supports streaming data scenarios, where you can push real-time data directly into a Power BI dataset using APIs or services like Power Automate (formerly Microsoft Flow).

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VISUAL UPDATING

- **Automatic Refresh:** Once the underlying data is updated, the visuals in your Power BI report or dashboard will automatically update to reflect the changes. This is true for visuals using Direct Query or scheduled data refresh.

- **Real-Time Visuals:** If you are using real-time streaming data, visuals can update in real-time to show the latest information as it is being generated.

- **Manual Interaction:** Users can manually update visuals by interacting with slicers, filters, and other data exploration elements. For example, using a slicer to select a specific time period will update all visuals based on the selected time range.

- **Bookmarks and Buttons:** Power BI allows you to create bookmarks and buttons to control visual interactions. This can be used to set up scenarios where users can click a button to update visuals to predefined states or views.

DASHBOARD IN POWER BI

1. Define dashboard objectives: Understand the purpose of the dashboard and the key insights you want to convey. Identify the target audience and their specific data needs.

2. Keep it simple and focused: Avoid clutter and unnecessary visuals. Focus on the most critical data. Limit the number of visuals per page to maintain clarity.

3. Organize content logically: Arrange visuals in a logical flow to tell a coherent data story. Group related visuals together, such as sales-related charts or customer metrics.

DASHBOARD IN POWER BI

4. Use Appropriate Visualizations: Choose the right chart types for different data types and insights. Utilize color, size, and shape to highlight important data points.

5. Ensure Consistency: Maintain consistent color schemes, font styles, and visual layouts throughout the dashboard. Consistency enhances readability and reinforces branding.

6. Provide Interactivity: Use slicers, filters, and drill-through actions to enable users to explore the data on their own. Allow users to interact with visuals to understand the data better.

DASHBOARD IN POWER BI

7. Utilize White Space: White space (empty space) helps reduce visual clutter and improves focus on data. Use appropriate margins and spacing between visuals and text.

8. Incorporate KPIs and Key Metrics: Include key performance indicators (KPIs) and essential metrics that directly align with the dashboard objectives. Use visually impactful cards or gauges to showcase critical metrics.

9. Create Data Narratives: Use text boxes or explanatory notes to provide context and insights for data visualizations. Guide users through the dashboard with clear explanations.

DASHBOARD IN POWER BI

10. Responsiveness and Cross-Platform Compatibility:

Design the dashboard to be responsive and adapt to different screen sizes and devices.

Ensure compatibility with various web browsers and mobile devices.

11. Test and Iterate:

Test the dashboard with potential users and gather feedback for improvements.

Continuously refine and update the dashboard based on user input and changing data needs.

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TABLEAU vs POWER BI

CRITERIA	POWER BI	TABLEAU
SINCE	2011	2004
DATA SOURCES	114 Connectors	84 Connectors
USERS (IN YR 2022)	36% Market Share (Major in Europe & Asia)	20% Market Share (Major in North America)
VISUALIZATIONS	Better than MS Office	Better than Power BI
CONNECTION TO MS OFFICE	Direct (Native)	Adaptable to MS Office
COST	Nearly $100/yr	Nearly $800/yr
Usability	Easy	Moderate

DATA SOURCES IN TABLAEU

1. **<u>Files:</u>** Tableau can directly connect to various file formats, such as Excel (.xls and .xlsx), CSV, text files (.txt), JSON, PDF, and more.

    This is helpful for analyzing data stored in local files.

2. **<u>Databases:</u>** Tableau supports connections to a wide range of databases, Eg:
    1. SQL database
    2. NoSQL databases
    3. Cloud databases

DATA SOURCES IN TABLAEU

3. Cloud Services:

Tableau has connectors to popular cloud services, allowing you to directly access and visualize data from platforms like Google Analytics, Salesforce, Microsoft Azure, Amazon Web Services, and more.

4. Web Data Connectors:

Tableau allows you to create custom data connectors using web technologies (HTML, JavaScript) to access data from web sources that don't have native Tableau support.
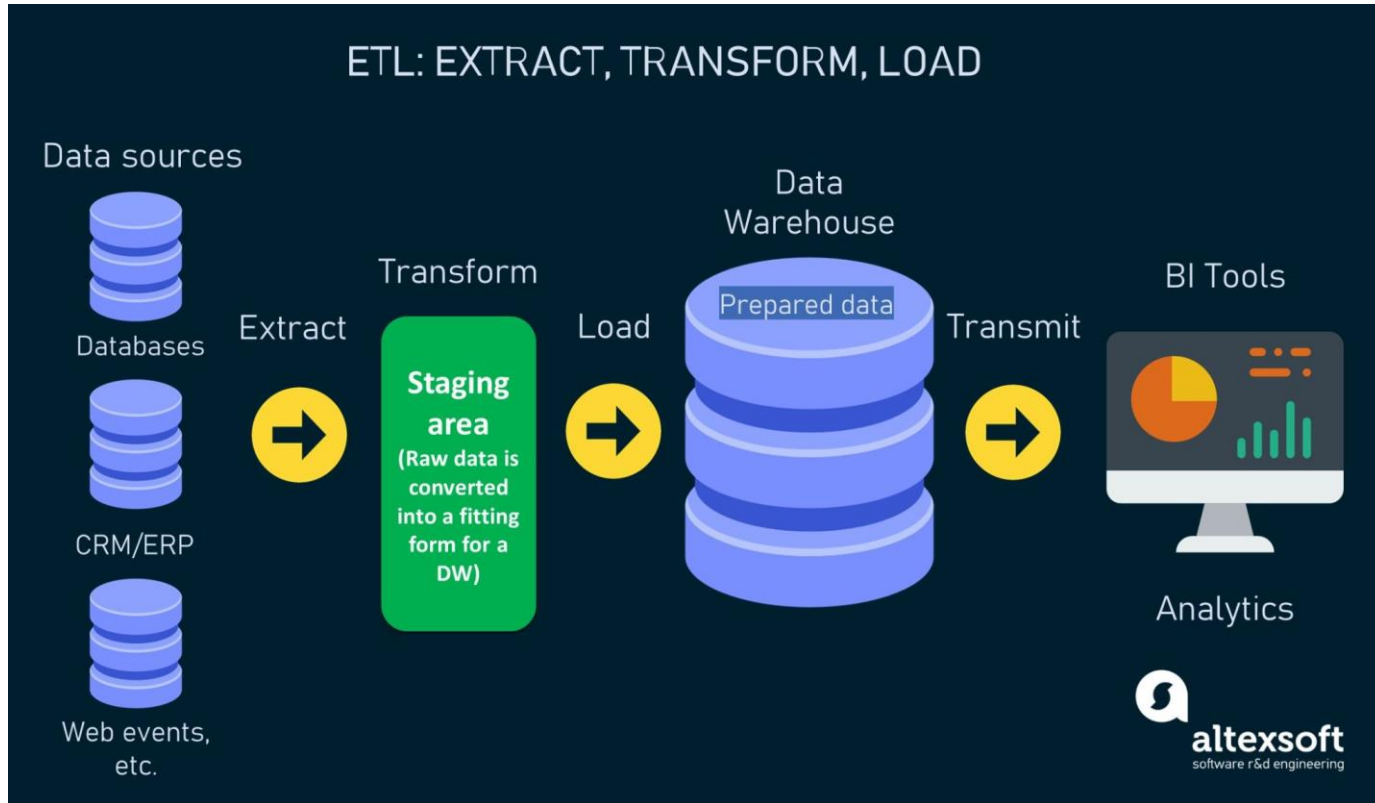
DATA SOURCES IN TABLAEU

Other Applications:

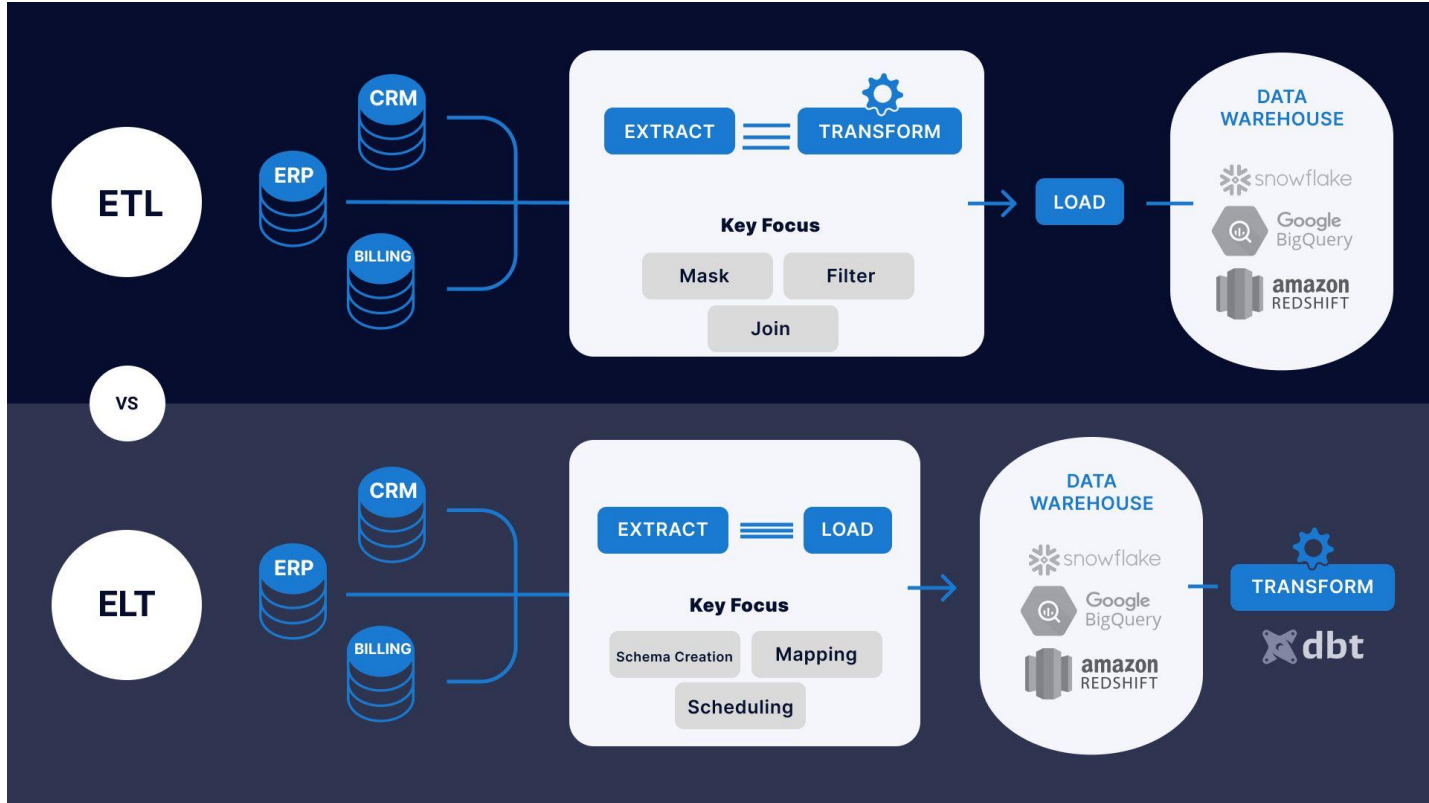Tableau can connect to various other applications like Google Sheets, SAP, SharePoint, etc.

OData:

Tableau supports the Open Data Protocol (OData) for connecting to RESTful APIs and consuming data.

ETL

VS

ETLT

It comprises two levels of data transformation, including ETL and ELT both.

1. **Extract** the raw, unprepared data from source applications and databases and load it into a staging area.
2. **Transform** data "lightly" while it's in the staging area (usually to remove/mask/encrypt PHI, PII, or other sensitive data). The first transformation stage only applies to one data source at a time. These transformations are fast and simple because they transform each source independently of other sources. There is no attempt to integrate two data sources into one until after loading. Transformations for this first stage relate to data formats, data cleansing, and masking/removing sensitive data for compliance purposes.

1. **Load** the prepared data into the data warehouse.
2. **Transform** and integrate data more completely within the data warehouse using the data warehouse to process those transactions. The second transformation stage relates to integrating multiple data sources and other transformations that apply to data from multiple sources at the same time.

ETLT allows you to ingest data from diverse sources faster because the pre-load transformation stage only performs light-duty transformations. These light-duty transformations are quick to set up and fast to process, and they overcome the risks of ELT by satisfying essential data compliance requirements and preserving data quality. Meanwhile, you can leave the complex, multi-source transformations for the data warehouse to process later.

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THANK YOU

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