



**NATIONAL  
UNIVERSITY**

# **BUSINESS INTELLIGENCE & DATA WAREHOUSE**

## Business Intelligence (BI):

- BI is the process of collecting, analyzing, and interpreting data to gain insights that can inform business decisions. It's about turning raw data into actionable knowledge.

## Data Warehousing:

- A data warehouse is a central repository that stores historical data from various sources within an organization. It's designed for analysis and reporting, not for day-to-day transactions.



# WHAT IS BUSINESS INTELLIGENCE (BI)?

- Imagine a vast ocean of information – that's the data landscape most businesses face.
- BI acts like a sophisticated lighthouse, guiding us through this data sea to find valuable insights.
- It's a collection of tools and techniques that help us:
  - **Gather data** from various sources like sales figures, customer interactions, and social media.
  - **Analyze** this data to identify patterns and trends hidden within.
  - **Interpret** the results, transforming data into actionable knowledge.
  - **Visualize** the data through reports, charts, and dashboards for clear understanding.

# WHY IS BI IMPORTANT?

In today's data-driven world, BI is essential for businesses of all sizes.

Here's why:


- **Informed Decisions:** BI empowers you to make decisions based on facts and insights, not just gut feelings.
- **Improved Performance:** Identify areas for improvement and streamline processes for better efficiency.
- **Enhanced Customer Experience:** Understand customer behavior and tailor offerings for increased satisfaction.
- **Competitive Advantage:** Gain valuable insights into market trends and competitor strategies for a leading edge.



# WHAT IS DATA WAREHOUSE?

- A Data Warehouse is a centralized repository designed specifically for storing and analyzing historical data from various sources within an organization.
- It's like a giant, organized library for your company's information, but instead of books, it holds historical data from different departments and systems.

Here's a breakdown of what makes a Data Warehouse unique:

- **Centralized:** Data from various sources (sales figures, customer info, website traffic) is brought together in one place, making it easier to analyze.
  - **Historical Focus:** Unlike operational databases used for daily transactions, a data warehouse stores historical data for trend analysis.
  - **Optimized for Analysis:** The data is structured and formatted consistently to facilitate fast and efficient analysis using BI tools.
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# **BENEFITS OF A DATA WAREHOUSE:**


- **Improved decision-making:** Analyze historical trends to make informed decisions about future strategies.
- **Enhanced reporting and analytics:** Easier access to historical data allows for deeper analysis and creation of insightful reports.
- **Increased efficiency:** Saves time and resources by eliminating the need to query multiple data sources for analysis.
- **Data consistency:** Ensures consistent data formats across different departments, improving data quality for analysis.



# HOW DATA GETS INTO A WAREHOUSE:

The data journey to the warehouse involves a process called ETL (Extract, Transform, Load):

ETL is the process of extracting data from various sources, transforming it into a consistent format, and loading it into the data warehouse. This ensures the data is clean and ready for analysis.

1. **Extract:** Data is pulled from various sources like sales databases, customer relationship management systems, and marketing platforms.
  2. **Transform:** The data is cleaned, formatted consistently, and integrated to ensure all information speaks the same language.
  3. **Load:** The transformed data is loaded into the data warehouse, ready for analysis.
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# REPORTING, ANALYTICS, AND VISUALIZATION

- Reporting, Analytics, and Visualization are essential tools for businesses of all sizes who want to gain valuable insights from their data. By leveraging these techniques, organizations can transform data into knowledge, fostering better decision-making and driving success.
- These are tools used in BI to present data in a clear and concise way. Reports summarize data, analytics uncover patterns and trends, and visualizations use charts and graphs to make data easier to understand.





# REPORTING:

- Imagine a detailed document summarizing key data points and trends. Reports present information in a structured format, often including tables, charts, and text explanations.
- They act like a snapshot in time, providing a clear picture of a specific situation or performance metric.
- Examples: Sales reports, marketing campaign performance reports, financial reports.



# ANALYTICS:

- This goes beyond just reporting the data. It's the process of uncovering hidden patterns, trends, and relationships within the data.
- Analysts use various techniques like statistical analysis, machine learning, and data mining to extract meaning from the data.
- Key Skills: Asking the right questions, data interpretation, identifying cause-and-effect relationships.



# VISUALIZATION:

- Data visualization is the art of transforming data into visually compelling formats like charts, graphs, and dashboards.
- Visualizations make complex data easier to understand by leveraging human visual perception.
- Examples: Bar charts, pie charts, line graphs, heatmaps, interactive dashboards.




# The Power of the Trio:

These three components work together to create a comprehensive understanding of data:

1. **Reporting:** Provides the foundation by summarizing key data points.
2. **Analytics:** Uncovers deeper insights and reveals hidden relationships.
3. **Visualization:** Makes the insights clear and easily digestible through visual representations.

## Benefits:

- **Improved decision-making:** By clearly understanding the data, businesses can make informed decisions backed by evidence.
  - **Enhanced communication:** Visualizations help communicate complex information to a wider audience more effectively.
  - **Increased efficiency:** Identify trends and patterns quickly, leading to faster problem-solving and improved resource allocation.
  - **Data-driven storytelling:** Use data visualizations to tell compelling stories about business performance and customer behavior.
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# EXAMPLES:

- A marketing team might use analytics to identify which social media campaigns resonate best with their target audience. Then, they can visualize this data in a chart to present the insights to stakeholders.
- A sales team might analyze customer purchase history to identify buying patterns. These insights can be presented in a report with relevant visualizations to guide future sales strategies.
- Reporting, Analytics, and Visualization are essential tools for businesses of all sizes who want to gain valuable insights from their data. By leveraging these techniques, organizations can transform data into knowledge, fostering better decision-making and driving success.



# WHAT IS OLAP?

- While traditional databases allow you to query data in a straightforward way, OLAP empowers you to analyze data multi-dimensionally. Think of data as a giant cube with various dimensions, like product category, customer location, and time. OLAP allows you to:
  - **Drill Down:** Explore deeper into specific data points. For example, if you see a spike in sales, you can drill down by region or product category to understand the reason behind the increase.
  - **Roll Up:** Move to a higher level of aggregation. For example, you can analyze total sales by year, then roll up to see overall sales trends across several years.
  - **Slice and Dice:** Analyze specific subsets of data. Imagine slicing the data cube by product category, then dicing it further by customer location to see how specific products perform in different regions.

# BENEFITS OF OLAP:

- **Deeper Insights:** Uncover hidden trends and patterns that might not be evident in traditional analysis.
- **Improved Decision-Making:** Gain a more comprehensive understanding of your data to inform better business decisions.
- **Faster Analysis:** OLAP tools allow for quick manipulation of data through multi-dimensional analysis.
- **Flexibility:** Analyze data from various perspectives without needing complex queries.



# HOW DOES OLAP WORK?

- OLAP tools rely on multidimensional data structures, typically OLAP cubes. These cubes store data along various dimensions, allowing for fast and efficient analysis.
- Here's a breakdown:
  - **Dimensions:** Categories used to categorize data (e.g., product, customer, time, region).
  - **Measures:** Quantitative values associated with the data (e.g., sales figures, customer count, profit margin).
  - **Cells:** The intersection of a dimension and a measure in the cube holds the specific data value (e.g., sales of a specific product in a particular region during a specific time period).



# REAL-WORLD APPLICATIONS OF OLAP:

- **Retail:** Analyze sales trends by product category, location, and season to optimize inventory management and targeted promotions.
- **Finance:** Investigate financial performance across different departments and projects to identify areas for cost reduction or revenue growth.
- **Marketing:** Evaluate the effectiveness of marketing campaigns across channels and demographics to optimize marketing strategies.



# WHAT IS BIG DATA?

Big data refers to massive and complex datasets that are difficult to manage, store, and analyze using traditional tools and techniques.

We're talking about volumes of data that grow exponentially, often encompassing:

- **High Volume:** Terabytes, petabytes, and even exabytes of data generated from various sources, like social media, sensor networks, and financial transactions.
- **High Velocity:** Data is constantly being created and streamed in real-time, requiring agile processing and analysis methods.
- **High Variety:** The data comes in various formats – structured (databases), semi-structured (logs, emails), and unstructured (text, images, videos) – posing challenges for traditional data analysis tools.



# WHY IS BIG DATA IMPORTANT?

While big data might sound overwhelming, it holds immense potential for organizations that can leverage it effectively.

Here's why it's important:

- **Uncover Hidden Insights:** Big data analysis can reveal hidden patterns and trends that might not be evident in smaller datasets, leading to better decision-making.
- **Improved Customer Experience:** Analyze customer behavior across various touchpoints to personalize experiences and offerings.
- **Real-time Analytics:** Make data-driven decisions faster with the ability to analyze real-time data streams.
- **Innovation:** Big data can fuel innovation by providing insights for developing new products, services, and strategies.




# CHALLENGES OF BIG DATA:

- **Storage and Processing:** Traditional data storage and processing systems might struggle with the sheer volume and complexity of big data.
- **Data Quality:** Ensuring the accuracy and consistency of big data from diverse sources can be challenging.
- **Security and Privacy:** Protecting sensitive information within massive datasets requires robust security measures.
- **Skilled Workforce:** There's a growing demand for data scientists and analysts who can handle big data analysis.




# BIG DATA AND BUSINESS INTELLIGENCE:

- While big data offers vast amounts of information, BI tools help transform it into actionable insights.
  - BI tools can connect to big data sources and provide reports, visualizations, and dashboards to make sense of the data and support informed decision-making.
  - Big data presents both challenges and opportunities.
  - By understanding its characteristics and utilizing specialized tools and BI techniques, organizations can unlock the power of big data to gain valuable insights, improve operations, and achieve a competitive edge.
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# THE POWER OF PREDICTION: USING BI TOOLS FOR FORECASTING

- In today's data-driven world, the ability to predict future trends is critical for business success. BI tools can be powerful assets in this endeavor, leveraging historical data to forecast what might lie ahead.

## What is Forecasting?

- The process of making predictions about the future based on past data and trends.
  - Helps businesses anticipate future demand, plan resources effectively, and make informed decisions.
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# TYPES OF FORECASTING TECHNIQUES

- There are various forecasting techniques used with BI tools, each with its strengths and weaknesses.
- Here are some common examples:
  - **Time Series Forecasting:** Analyzes past data points over time to predict future values. This is often used for sales forecasting, website traffic prediction, and financial projections.
  - **Regression Analysis:** Identifies the relationship between variables and uses that relationship to predict future values of a dependent variable based on changes in the independent variable. This can be helpful for predicting customer churn or the impact of marketing campaigns on sales.
  - **Exponential Smoothing:** Assigns weights to past data points, with more recent data points having higher weights. This technique is useful for situations where trends are constantly changing, such as forecasting online advertising clicks.

# BENEFITS OF FORECASTING WITH BI TOOLS:

- **Improved decision-making:** By anticipating future trends, businesses can make more informed decisions about resource allocation, staffing, and product development.
- **Increased efficiency:** Forecasting can help businesses optimize inventory levels, streamline operations, and reduce costs.
- **Reduced risk:** By identifying potential risks early on, businesses can take steps to mitigate them and protect their bottom line.
- **Improved customer satisfaction:** By anticipating customer demand, businesses can ensure they have the right products and services in stock to meet customer needs.





# CONSIDERATIONS FOR USING FORECASTING:

- **Data quality:** The accuracy of your forecasts is directly tied to the quality of your data. Ensure your data is clean, consistent, and free of errors.
- **Model selection:** Choosing the right forecasting technique is crucial for accurate predictions. Consider the nature of your data and the type of prediction you want to make when selecting a forecasting model.
- **External factors:** Real-world events and economic conditions can significantly impact your forecasts. Consider how external factors might influence the future and adjust your forecasts accordingly.
- **Limitations of forecasting:** Forecasting is not an exact science. There will always be some degree of uncertainty associated with predictions.



# USING BI TOOLS FOR EFFECTIVE FORECASTING

- BI tools provide a user-friendly platform for data analysis and forecasting.
- Here are some key steps for effective forecasting with BI tools:
  1. **Data Preparation:** Clean, organize, and format your data to ensure accuracy and consistency.
  2. **Exploratory Data Analysis (EDA):** Use BI tools to visualize and explore your data to identify trends, patterns, and potential outliers.
  3. **Model Selection:** Choose the appropriate forecasting technique based on your data and prediction goals. BI tools often offer pre-built forecasting models or allow you to create your own.
  4. **Model Training:** Train the forecasting model using your historical data.
  5. **Model Evaluation:** Evaluate the accuracy of the model using metrics like mean squared error (MSE) or mean absolute error (MAE). BI tools can help visualize these metrics.
  6. **Refine and Forecast:** Based on the evaluation, you might need to refine your model or choose a different technique. Once satisfied, use the model to generate forecasts for the future.

Thank You

