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Business Intelligence & Organizational Competitiveness

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Lecture 01: Introduction to Business Intelligence

1. The Concept of Business Intelligence:

Business Intelligence is not merely a set of software tools; it is a **strategic process** designed to transform raw data into actionable insights.

Definition:

BI is the organization's ability to leverage **past data** (historical records) and analyze it to understand "what happened." The goal is to influence the **present** by making smarter decisions that provide continuous **feedback loops** to correct paths and anticipate the future.

Business Intelligence is the bridge connecting **what happened yesterday** with **what must be done today** to ensure **success tomorrow**. It is a circular process that starts with data and ends with a decision that feeds the system with new information.

2. The Knowledge Hierarchy (DIKW Pyramid):

To master BI, one must understand how value evolves within an organization from the base to the peak:

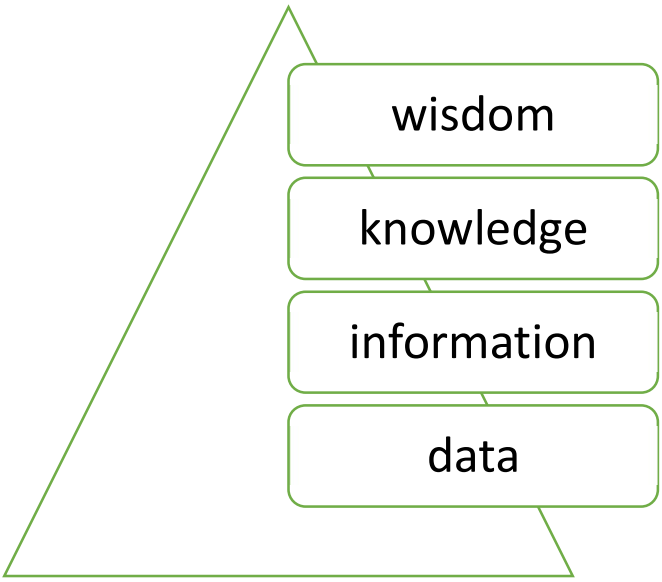
Data: Raw facts and symbols.

Information: Processed data that has been given context.

Knowledge: Understanding "why" something happened based on experience and context.

Wisdom: The ability to make the optimal strategic decision.

Figure 01: DIKW Pyramid



3. The Importance of BI:

The significance of this field lies in three fundamental pillars:

Informed Decision Making: Moving from **gut-feeling** or guesswork to **fact-based** decisions.

Competitive Advantage: The ability to respond to market changes faster than competitors.

Operational Efficiency: Identifying resource waste and optimizing internal workflows.

4. Objectives of Business Intelligence:

Objective	Description
Transparency	- Making organizational performance visible to management at any given moment.
Forecasting	- Using past trends to predict future consumer behavior or market shifts.
Feedback Loop	- Measuring the results of current decisions and adjusting strategies based on outcomes.

Data Integration	- Linking various departments (Finance, Marketing, HR) into a unified single source of truth.

5. Key Related Terminology:

To master BI, students must grasp these essential terms:

Data Warehouse (DWH): A central repository where data from multiple sources is integrated and stored for analysis.

Data Mining: The process of discovering hidden patterns and relationships within large datasets.

Dashboards: Visual interfaces that display Key Performance Indicators (KPIs) in a simplified, real-time format.

OLAP (Online Analytical Processing): Technology that allows users to analyze data from multiple dimensions simultaneously (e.g., viewing sales by product, time, and geography).

6. BI vs. Related Concepts:

Business Intelligence (BI) serves as the foundational analytical engine that leverages historical data to optimize current operations through a continuous feedback loop. In contrast, Economic Intelligence (EI) focuses on scanning the external environment, capturing "weak signals" or subtle market indicators to seize emerging opportunities and mitigate external threats, Strategic Intelligence (SI) acts as the visionary umbrella, synthesizing insights from both internal and external environments to chart long-term trajectories and ensure the organization's sustainable competitive advantage, Complementing these, Artificial Intelligence (AI) processes massive datasets (Big Data), employing advanced algorithms to learn from patterns, thereby evolving from descriptive analysis to autonomous knowledge generation.

All the aforementioned intelligence frameworks function as integrated mechanisms designed to enhance Enterprise Competitiveness by enabling the organization to out-think, out-pace, and out-perform its rivals in a dynamic global market.

Business Intelligence (BI) Is purpose-built for the corporate environment, Its primary mission is to analyze existing historical data to drive specific business decisions, such as improving profit margins, inventory turnover, or customer retention, It is Data for the sake of Business.

Data Science (DS) Is a much broader and more interdisciplinary field that extends beyond the corporate world to science, medicine, engineering, and more. It relies heavily on advanced

mathematics and statistics such as calculus, linear algebra, and probability to build models that don't just report data, but "discover" it, It is Science for the sake of Data**.**

Business Intelligence leverages Data Science techniques as an analytical engine to process and interpret complex business data for smarter decision-making.

Lecture 02: Stages of Business Intelligence

Stages of Business Intelligence:

Business Intelligence (BI) processes can be described in different ways depending on the perspective or methodology used. Some sources divide BI into stages focusing on technical processes, while others emphasize analytical or decision-making aspects. Below are two common ways to organize the BI stages.

BI Stages (Version 01)

Stage 1: Data Collection

Gather relevant data from multiple internal and external sources such as databases, cloud platforms, spreadsheets, analytics tools, and surveys. This step helps define business objectives and identify the data needed to achieve them.

Stage 2: Data Cleaning and Processing

Clean, organize, and process the collected data by removing errors, duplicates, and inconsistencies. Unstructured data is transformed into a structured format suitable for analysis.

Stage 3: Data Storage (Data Warehouse)

Store the processed data securely in a centralized data warehouse. Encryption and security measures are applied to protect sensitive information and ensure data integrity.

Stage 4: Data Analysis

Analyze the stored data using analytical tools, techniques, and algorithms to identify patterns, trends, and meaningful insights that support business understanding.

Stage 5: Results Visualization (Dashboards & Reports)

Present insights through dashboards, charts, graphs, and reports. Visualization makes complex data easier to interpret and share with decision-makers and stakeholders.

Stage 6: Decision Support and Decision-Making

Use the insights generated to support managers and stakeholders in selecting the best strategies and actions for the organization.

Stage 7: Achieving Competitive Advantage

Apply informed decisions to improve performance, optimize operations, enhance customer satisfaction, and strengthen the organization's competitive position in the market

BI Stages (Version 02)

Now, let's look at another common way to organize the stages of Business Intelligence, which highlights performance indicators, ETL, and data mining.

1- Data Collection:

At this stage, structured and unstructured data are collected from various sources, then stored and saved. These sources include:

Databases that may be located on a server, on a device, stored in the cloud, or even in a static file such as Excel.

2- Key Performance Indicators (KPIs):

At this stage, performance indicators are defined and the company's performance is measured accordingly. These indicators reflect how successful the company is in achieving specific goals. Examples include: number of customers, revenue, sales volume, number of visits to the website, etc. These indicators vary depending on the nature of the company's activity.

3- Data Extraction (ETL):

Business Intelligence systems usually use the ETL process (Extract, Transform, Load):

E – Extract: This stage involves obtaining and accessing data from various sources, which are often heterogeneous and distributed across different platforms (e.g., revenue-related information, etc.).

T – Transform: After extraction, the data are transformed into an appropriate format.

L – Load: The transformed data are then loaded into the data warehouse along with previously added data. They are stored in a centralized location so that applications can easily process and retrieve them as a comprehensive dataset.

4- Data Mining:

This is a technique performed using computers. It does not simply mean collecting data; rather, it involves discovering patterns and hidden relationships that were not previously known

within the data. For example, companies in the technology sector use data mining to improve customer service and identify patterns in customer behavior.

5- Reporting and Data Analysis:

This stage represents the core of Business Intelligence systems. It involves analyzing data and presenting results according to the user's needs. The ability of BI systems to present data varies; what is available in one system may not be available in another.

6- Decision Making:

At this stage, stored information is retrieved and used to make appropriate decisions that contribute to strengthening the organization's competitive position.

Business Intelligence (BI) involves collecting and organizing data from multiple sources, cleaning and storing it securely, and then analyzing it to uncover patterns, trends, and insights.

These insights are visualized through dashboards and reports, making complex information clear and actionable. BI supports decision-making by providing managers and stakeholders with accurate information to plan strategies effectively.

Ultimately, the goal of BI is to optimize operations, improve performance, and gain a competitive advantage in the market. It is a continuous process that turns raw data into meaningful knowledge for better business outcomes

Lecture 03: Data Warehouse and Database Management System

What Is a Database?

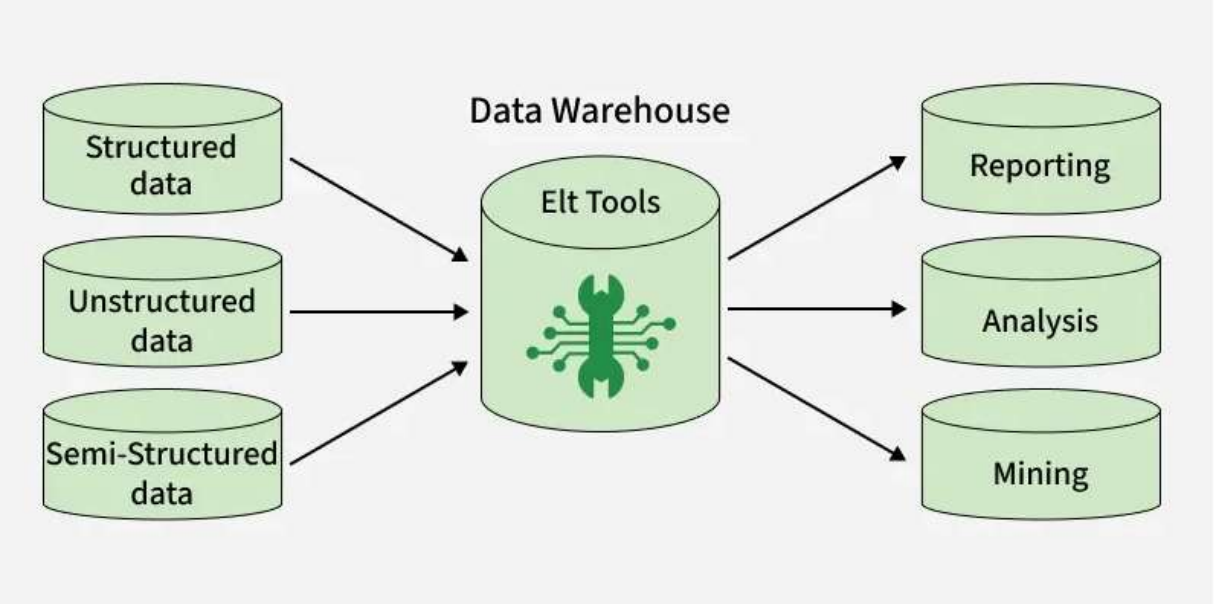
In a database, data is presented in a structured manner for easy access and manipulation. Vast amounts of information can be stored in a systematic way to ensure efficient retrieval. Organizing the data entails categorizing it into different tables or entities, establishing relationships between them, and defining their attributes or fields. Lastly, database management involves maintaining the integrity and security of the data through various processes such as backup and recovery, user access control, and enforcing data consistency rules.

What is Database Management System

Database Management System is used in the traditional way of storing and retrieving data. The major task of a database system is to perform query processing. These systems are generally referred to as online transaction processing systems. These systems are used in the day-to-day operations of any organization.

What is a Data Warehouse

Data Warehouse is the place where huge amount of data is stored. It is meant for users or knowledge workers in the role of data analysis and decision making. These systems are supposed to organize and present data in different format and different forms in order to serve the need of the specific user for specific purpose. These systems are referred as online analytical processing.



Difference Between Database Management System and Data Warehouse

Purpose:
A Database Management System (DBMS) supports daily operational processes, whereas a Data Warehouse supports analysis and performance reporting.

Data Handling:

A DBMS focuses on capturing and maintaining data, while a Data Warehouse focuses on exploring and analyzing data.

Data Type:

A DBMS works with current data, whereas a Data Warehouse stores historical data covering multiple years.

Data Scope:

In a DBMS, data is limited to a single system. In contrast, a Data Warehouse integrates and consolidates data from multiple systems.

Update Frequency:

A DBMS is updated whenever a transaction occurs, while a Data Warehouse is updated periodically through scheduled processes.

Data Verification:

In a DBMS, data verification happens at the time of data entry. In a Data Warehouse, verification occurs after data collection and integration.

Data Size:

A DBMS typically manages data ranging from megabytes to gigabytes, whereas a Data Warehouse handles much larger volumes, from hundreds of gigabytes to terabytes.

Data Model:

A DBMS is based on the Entity-Relationship (ER) model, while a Data Warehouse uses Star or Snowflake schemas.

Orientation:
A DBMS is application-oriented, whereas a Data Warehouse is subject-oriented.

Data Specificity:

A DBMS stores highly detailed and primitive data, while a Data Warehouse contains summarized and consolidated data.

Storage Structure:

A DBMS uses a flat relational structure, whereas a Data Warehouse uses a multidimensional structure.