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# Unit - 1

# An Overview of Business Intelligence, Analytics, and Decision Support

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- Information Systems Support for Decision Making
- Levels of Decision Support
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- Business Analytics Overview
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# Information System (IS)

**Definition-1:**

It helps organizations collect, process, store, and disseminate (**spread**) information to support decision-making across various levels i.e., **strategic, tactical,** and **operational**.

**Definition-2:**

It refers to any organized system for the collection, organization, storage, processing, and distribution of information. It involves **hardware**, **software**, **data**, **people**, and **processes**.

# Example-1: Transaction Processing Systems (TPS)

- **ATM (Automated Teller Machine):** Processes cash withdrawals, deposits, and balance inquiries.
- **Payroll Systems:** Automates the calculation of wages, deductions, and generation of paychecks/direct deposits.

# Example-2:
# Management Information Systems (MIS)

- **Sales Performance Tracking Systems:** Generates monthly or quarterly reports on sales figures by product, region, or salesperson.
- **Inventory Control Systems:** Provides reports on stock levels, reorder points, and slow-moving items for operational managers.

# Levels of Decision Support

- Operational Level DSS
- Tactical(Managerial) Level DSS
- Strategic Level DSS

# Operational Level DSS

- **Focus:** Routine, day-to-day decisions; highly structured or semi-structured problems. Often involve specific, short-term actions.
- **Users:** Front-line managers, supervisors, operational staff.
- **Data Source:** Primarily internal, detailed, real-time data from Transaction Processing Systems (TPS).
- **Output:** Specific recommendations for immediate action.

# Tactical (Managerial) Level DSS

- **Focus:** Medium-term decisions; semi-structured problems; allocating resources, monitoring performance, and improving efficiency. Often involve analysis of trends and exceptions(does not follow a rule).
- **Users:** Middle managers, department heads, functional managers.
- **Data Source:** Summarized data from TPS, internal databases, some external data (e.g., competitor pricing).
- **Output:** Performance reports, analyses of deviations, **"what-if"** scenarios, and recommendations for policy adjustments or resource allocation.

# Strategic Level DSS

- **Focus:**Long-term, unstructured decisions; defining organizational goals, policies, and broad strategies. Often involve high uncertainty and external factors.
- **Users:** Senior executives, top management, board members.
- **Data Source:** Highly aggregated internal data, extensive external data (economic forecasts, market research, competitor intelligence, regulatory changes).
- **Output:** Trend analysis, forecasts, simulations of long-term impacts, insights into market opportunities or threats.

# An Early Framework for Computerized Decision Support

- A key early framework often cited is the **Gorry and Scott Morton Framework (1971)**.
- This framework classified managerial decisions based on **two dimensions**:
  - **Problem Structure**
  - **Managerial Activity Level (from Robert Anthony's framework)**

# Problem Structure

- **Structured Decisions:** Repetitive, routine problems for which a definite procedure exists.
- **Semi-structured Decisions:** Problems where only part of the problem has a clear-cut solution, and judgment is still required.
- **Unstructured Decisions:** No predefined procedure; rely on experience.

# Gorry and Scott-Morton Framework (1971)

By combining these, Gorry and Scott Morton created a **3x3 matrix**, and then described the type of computer support suitable for each cell.

| Decision Type | Structured | Semi-Structured | Unstructured |
|---|---|---|---|
| **Strategic** | **Budget Forecasts** | **New Product Planning** | **M&A (Mergers and Acquisitions) Decisions** |
| **Tactical** | **Production Schedules** | **Credit Analysis** | **Advertising Plans** |
| **Operational** | **Payroll, Inventory** | **Sales Forecasts** | **Exception Handling** |

# Managerial Activity Level

- **Operational Control:** Day-to-day operations.
- **Managerial Control:** Acquiring and using resources efficiently.
- **Strategic Planning:** Defining goals and long-term objectives.

# Operational Control Example:
## Inventory Reordering in a Retail Store

- **Scenario:** A retail store manager uses inventory reports to monitor stock levels and ensure that products do not run out or become overstocked.

# Managerial Control Example:
# Quarterly Sales Performance Review by Regional Sales Manager

- **Scenario:** A regional sales manager in a consumer electronics company conducts a quarterly performance review to ensure that sales targets across various districts are being met.

# Strategic Planning Example:
## Launching a New Product Line by the Executive Team

- **Scenario:** The executive leadership of a smart phone manufacturing company decides to enter the wearable tech market by launching a new line of smart watches over the next 2 years.

# The Concept of Decision Support Systems

**Definition:**

A **Decision Support System (DSS)** is an interactive software system designed to support decision-makers in solving complex, non-routine problems.

# Characteristics & Components

- **Characteristics:**
  - Interactive and user-friendly.
  - Supports decision-making under uncertainty.
  - Combines data, analytical models, and user input.
- **Components:**
  - **Database:** Internal and external data sources.
  - **Model Base:** Financial, statistical, or optimization models.
  - **User Interface:** To interact with the system.

# Example-1:
## Revenue Management DSS

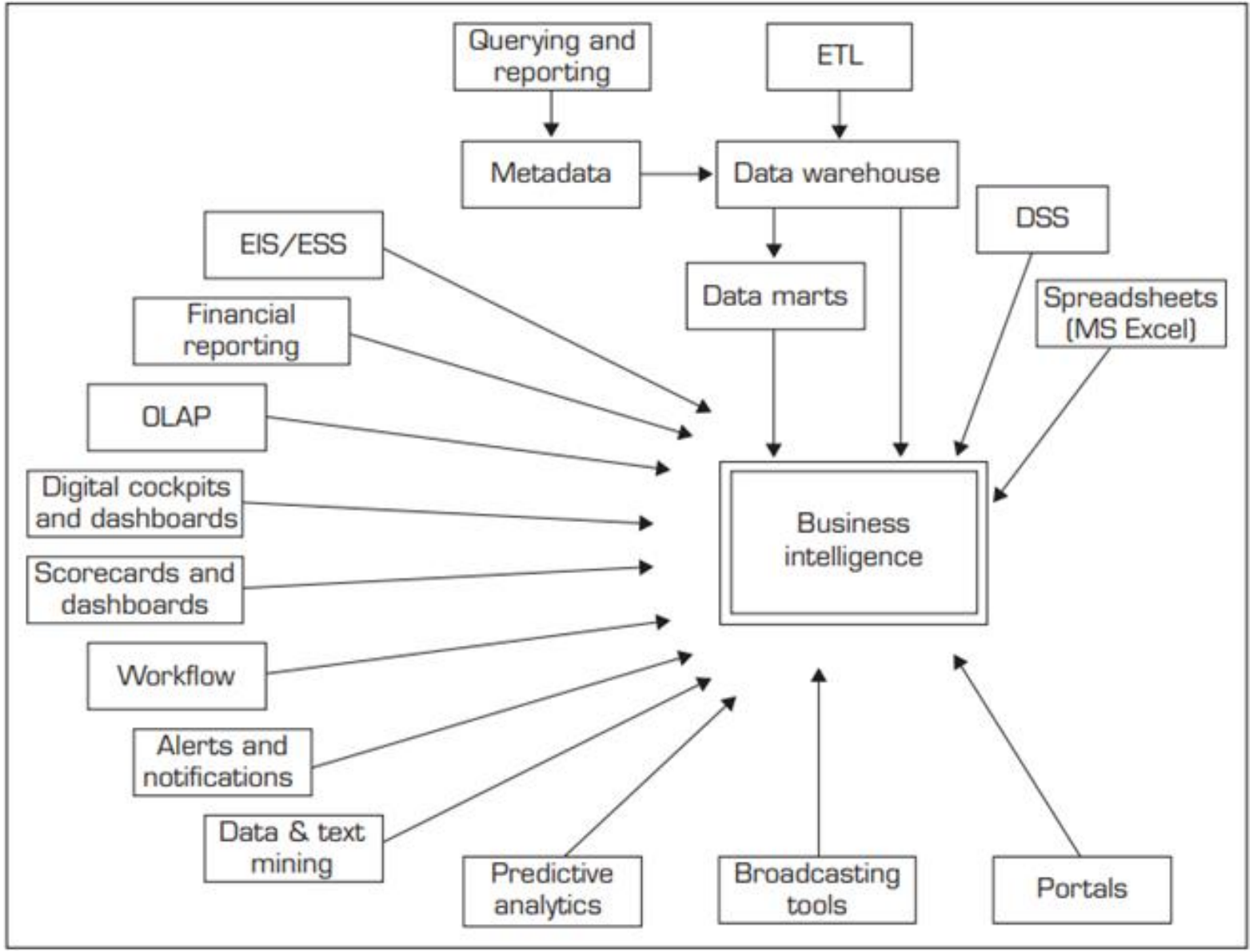
An airline uses a **Revenue Management DSS** to set ticket prices based on real-time demand, weather conditions, and competitor pricing.

# Example-2:
## A Retail Inventory Management DSS

- Imagine a large retail chain with hundreds of stores and a vast catalog of products.
- Managing inventory efficiently is crucial for profitability.
- A DSS could be implemented to help store managers and regional managers make better inventory decisions.

# Evolution of Business Intelligence (BI)

- The MIS(Management Information System) reporting systems of the 1970s were static, two dimensional, and had no analytical capabilities.



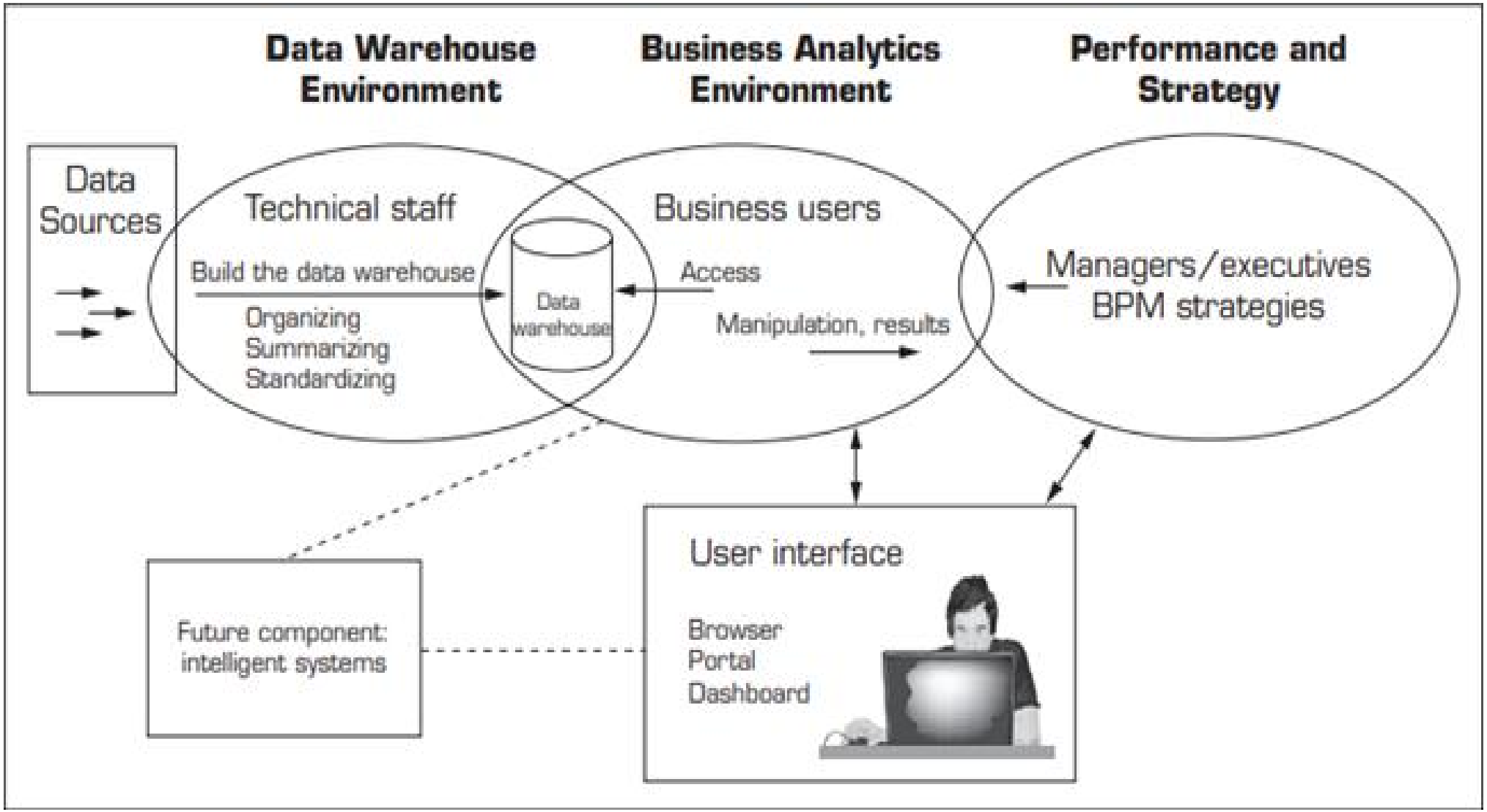
# Evolution of Business Intelligence (BI)

- In the early 1980s, the concept of Executive Information Systems (EIS) / Employee Self-Service (ESS) emerged and was expanded the computerized support to top-level managers and executives.
- The features were dynamic multidimensional (ad hoc or on-demand) reporting, forecasting and prediction, trend analysis, drill-down to details, status access, and critical success factors. These features appeared in dozens of commercial products until the mid-1990s.
- The term BI was coined by the Gartner Group in the mid-1990s. Then the same capabilities and some new ones appeared under the name BI. Finally, the original concept of EIS was transformed into BI.

# Evolution of Business Intelligence (BI)

- By 2005, BI systems started to include Artificial Intelligence capabilities as well as powerful Analytical capabilities.
- The above Figure illustrates the various tools and techniques that may be included in a BI system.
- The above Figure illustrates the evolution of BI.
- The tools shown in the above Figure provide the capabilities of BI.

# Architecture of Business Intelligence (BI)



# Architecture of Business Intelligence (BI)

- The architecture of BI depends on its applications.
- MicroStrategy Corporation distinguishes five styles of BI and offers special tools for each.
- The five styles are:
  - Report Delivery and Alerting
  - Enterprise Reporting (using dashboards and scorecards)
  - Cube Analysis (also known as slice-and-dice analysis)
  - Ad hoc (on demand) queries
  - Statistics and Data Mining

# A Framework for Business Intelligence (BI)

**Definition:**

**Business Intelligence(BI)** refers to technologies, applications, and practices for the collection, integration, analysis, and presentation of business information to support better decision-making.

# BI Process Framework

1) **Data Sources:** Gather data from multiple sources (e.g., databases, CRMs, ERPs, web logs)
2) **Data Integration:** Clean, transform, and combine data (ETL process)
3) **Data Storage:** Store data in data warehouses or data lakes
4) **Data Analysis:** Use analytics tools (SQL, dashboards, ML) to analyze data
5) **Reporting & Visualization (Information Delivery):** Generate dashboards, KPIs**(Key Performer Indicators)**, and reports.
6) **Decision-Making:** Business users act on insights to optimize performance.

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# Real-World Example: Retail Chain BI Process

| BI Stage | Description |
|---|---|
| **Data Sourcing** | Collects sales, customer, and inventory data from POS, online, CRM systems. |
| **Data Integration** | Uses ETL tools to clean and consolidate data into a central warehouse. |
| **Data Storage** | Loads data into a **Snowflake** data warehouse. |
| **Data Analysis** | Analysts use **Power BI** and **Python** for customer segmentation. |
| **Reporting** | Dashboards show real-time sales and low-stock alerts. |
| **Decision Support** | Management uses insights to plan stock replenishment and personalized offers. |

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# TOOLS COMMONLY USED IN BI PROCESS

- **ETL:** Talend, Apache Nifi, Informatica
- **Storage:** SQL Server, Snowflake, Google BigQuery
- **Analytics:** Excel, Power BI, Tableau, Python, R
- **Visualization:** Power BI, Tableau
- **Decision Support:** CRM Tools, ERP Dashboards

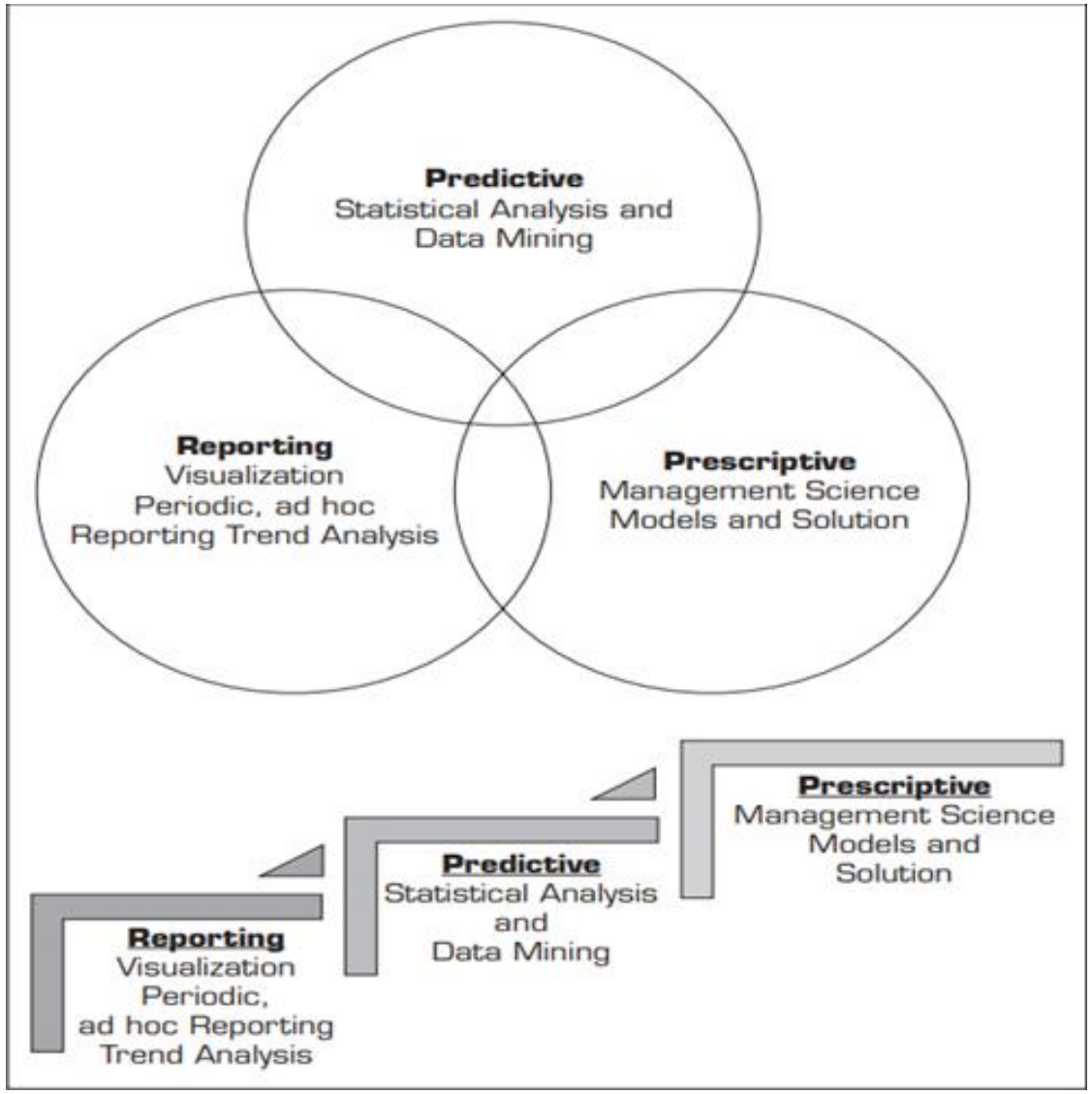
# Business Analytics Overview

**Definition:**

**Business Analytics (BA)** is the practice of iterative, systematic exploration of data with emphasis on statistical analysis.

# Types of Analytics

- Descriptive / Reporting Analytics
- Predictive Analytics
- Prescriptive Analytics



# Descriptive / Reporting Analytics

- **Definition:**
- **It refers to the interpretation of historical data to better understand changes that have occurred in a business or system.**
- **It answers the question: "What happened?" (e.g., Sales reports).**

# Predictive Analytics

- **Definition:**
- **It uses historical data, statistical algorithms, and machine learning techniques to identify the likelihood of future outcomes.**
- **It answers the question: "What is likely to happen?" (e.g., Forecasting demand using ML).**

# Prescriptive Analytics

- **Definition:**
- **It recommends actions you can take to affect desired outcomes.**
- **It answers the question: "What should we do?" or "What should be done?" (e.g., Optimization models for logistics).**

# Brief Introduction to Big Data Analytics

- **What is Big Data?**

  **Big Data refers to extremely large datasets that may be analyzed computationally to reveal patterns, trends, and associations.**

# 5 V's of Big Data

1) Volume – Size of data
2) Velocity – Speed of generation
3) Variety – Structured, semi-structured, unstructured
4) Veracity – Quality or trustworthiness
5) Value – Insights gained from analysis

# VOLUME

- **Definition:**
- It refers to the amount of data generated and stored.
- It represents the size of the data, which is usually massive in big data environments—ranging from Terabytes to Zettabytes.

- **Example:**
- Facebook generates over 4 petabytes of data per day from user interactions, posts, images, and videos.

# VELOCITY

- **Definition:**
- It is the speed at which data is generated, collected, and analyzed.
- It emphasizes real-time or near-real-time data processing.

- **Example:**
- Stock Trading Platforms analyze millions of transactions per second to make instant trading decisions.

# VARIETY

- **Definition:**
- **It refers to the different types and sources of data—structured, semi-structured, and unstructured.**

- **Example:**
- **E-Commerce Websites process structured data (transaction records), semi-structured data (XML/JSON files), and unstructured data (customer reviews, images).**

# VERACITY

- **Definition:**
- It refers to the quality, accuracy, and trustworthiness of data.
- It deals with uncertainty or inconsistencies in data.

- **Example:**
- Social Media Sentiment Data may be biased or contain fake news, affecting business analytics or brand perception.

# VALUE

- **Definition:**
- **It is the usefulness or benefit derived from data.**
- **Big data is only valuable if it can be transformed into actionable insights.**

- **Example:**
- **Netflix uses data analytics to recommend shows to users, improving user experience and retention.**

# TOOLS & TECHNOLOGIES

- Hadoop: Distributed storage and processing
- Spark: Fast data processing engine
- NoSQL Databases: MongoDB, Cassandra
- Real-Time Analytics: Kafka, Storm

- Example:
- Social Media Platforms use Big Data Analytics to track user sentiment in real time during major events (e.g., elections or product launches).

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# Thank You