

Business Intelligence

Week 1

Introduction to Business Intelligence

- BI Definition
- Evolution of BI
- BI vs Data Analytics
- Decision Support Systems
- Organizational Decision Making

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Objectives

At the end of this lecture students will be able to :

- Define BI
- Explain BI evolution
- Distinguish BI and Data Analytics
- Understand DSS
- Explain organizational decision making

What is Business Intelligence?

- Business Intelligence (BI) refers to a set of **technologies, processes, and tools used to collect, integrate, analyze, and visualize business data** in order to support **better strategic and operational decision making**.

Turban, E., Sharda, R., Delen, D., & King, D. (2018). Business intelligence, analytics, and data science: A managerial perspective (4th ed.). Pearson.

What is Business Intelligence?

- **Key Characteristics**

- Data-driven decision support
- Integration of data from multiple sources
- Analytical processing and reporting
- Visualization through dashboards and reports
- Monitoring performance using Key Performance Indicators (KPIs)

- **Example**

A bank can use BI to analyze customer transactions, detect fraud, evaluate loan risk, and improve customer segmentation.

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Key Components of BI

- Business Intelligence systems consist of several integrated components that work together to **collect, store, analyze, and present data for decision making.**
- **Core Components**
 - **Data Sources**

Internal and external data collected from operational systems such as ERP, CRM, transaction databases, spreadsheets, and web data.
 - **ETL (Extract, Transform, Load)**

Processes used to **extract data from various sources, clean and transform it, and load it into a centralized repository.**
 - **Data Warehouse**

A centralized repository that stores **integrated and historical data** optimized for analysis and reporting.

Kimball, R., & Ross, M. (2013). The data warehouse toolkit: The definitive guide to dimensional modeling (3rd ed.). Wiley.

Key Components of BI...

- **Core Components**

- **Analytics and OLAP**

- Analytical tools that enable **multidimensional analysis, trend discovery, and pattern identification.**

- **Data Visualization and Reporting**

- Dashboards, charts, and reports that help users **interpret data and communicate insights effectively.**

- **Conceptual BI Architecture**

- Data Sources → ETL Process → Data Warehouse → Analytics / OLAP → Dashboards & Reports → Decision Making

- **Example**

A retail company integrates **sales, inventory, and customer data** into a data warehouse to generate dashboards showing product performance and customer buying trends.

Kimball, R., & Ross, M. (2013). The data warehouse toolkit: The definitive guide to dimensional modeling (3rd ed.). Wiley.

Objectives of BI

- The primary objective of Business Intelligence (BI) is to **transform organizational data into actionable insights** that improve decision making, operational efficiency, and strategic planning.
- **Key Objectives of BI**
 - **Improve Decision Making**
Provide accurate, timely, and relevant information that helps managers make informed decisions.
 - **Monitor Business Performance**
Track Key Performance Indicators (KPIs) to evaluate organizational performance and progress toward goals.
 - **Identify Business Trends and Opportunities**
Analyze historical and current data to discover market trends, customer behavior, and potential growth opportunities.

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Objectives of BI...

- **Key Objectives of BI**

- **Enhance Operational Efficiency**

- Optimize business processes by identifying inefficiencies, reducing costs, and improving productivity.

- **Support Strategic Planning**

- Provide insights that guide long-term business strategies and competitive positioning.

- **Example**

A telecommunications company uses BI dashboards to monitor **customer churn rates, service usage patterns, and revenue trends**, enabling proactive customer retention strategies.

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Importance of Business Intelligence

- Business Intelligence (BI) provides organizations with **data-driven insights** that improve efficiency, reduce uncertainty, and give a competitive advantage.
 - Supports a **data-driven culture**
 - Enhances **operational efficiency**
 - Reduces **decision-making uncertainty**
 - Provides **competitive advantage**
- **Example**

Retailers use BI to track **inventory turnover, sales trends, and customer behavior**, enabling better supply chain and marketing decisions.

Historical Background of BI

- BI evolved from **Management Information Systems (MIS)**, **Decision Support Systems (DSS)**, and **Executive Information Systems (EIS)**.
- Early **MIS** focused on reporting and operational control
- **DSS** introduced interactive decision support
- **EIS** provided executive dashboards for top management
- Large corporations in the 1980s used DSS for **budgeting and financial planning simulations**.

Turban, E., Aronson, J., & Liang, T. (2005). Decision support systems and intelligent systems (7th ed.). Pearson.

Early Information Systems (1960s–1970s)

- These systems were primarily **transaction-oriented**, focusing on **record-keeping and operational efficiency**.
- **Transaction Processing Systems (TPS)** collected operational data
- Data primarily used for **daily operations**, not analysis
- Limited analytical and reporting capability
- **Example**
Early payroll and inventory systems in manufacturing companies.

Decision Support Era (1980s)

- DSS emerged to **assist managers in semi-structured decisions** using data models and analytical tools.
- DSS allowed **“what-if” scenario analysis**
- Supported semi-structured and managerial decisions
- Introduced **interactive analysis**
- **Example**
Financial planning DSS helped managers simulate **budget allocation scenarios**.

Data Warehousing Era (1990s)

- Data warehouses provided a **centralized repository** for integrated, historical data supporting BI.
- Consolidates data from multiple sources
- Supports **analytics and reporting**
- Facilitates trend analysis over time
- **Example**
Retail chains consolidate sales data from all stores to analyze **product performance**.

Modern BI (2000s–Present)

- Modern BI leverages **cloud platforms, real-time analytics, and AI** for faster, smarter decision making.
- Cloud-based BI platforms enable **scalable analysis**
- Real-time dashboards provide **up-to-date insights**
- AI integration enhances predictive and prescriptive analytics
- **Example**
E-commerce companies monitor **customer behavior and transactions in real time.**

Marr, B. (2016). Big data in practice: How 45 successful companies used big data analytics to deliver extraordinary results. Wiley.

Future Trends in BI

- BI is evolving to be **self-service, predictive, and embedded into daily workflows.**
- AI-driven analytics for automated insights
- Self-service BI empowers business users
- Embedded analytics integrates insights into **ERP, CRM, and apps**
- Predictive and prescriptive analytics support **proactive decisions**

What is Data Analytics?

- Data Analytics involves **examining raw data to discover patterns, trends, and actionable insights.**
- Includes **descriptive, diagnostic, predictive, and prescriptive analytics**
- Uses **statistics, machine learning, and visualization**
- Supports **data-driven decision making**
- **Example**
Predicting customer churn using **historical transaction and behavioral data.**

BI and Analytics Relationship

- BI and Data Analytics are **complementary disciplines** supporting organizational decisions.
- BI focuses on **descriptive and diagnostic analysis**
- Analytics includes **predictive and prescriptive modeling**
- Together they enable **comprehensive data-driven decisions**
- **Example**
BI: Monthly sales dashboards
Analytics: Forecasting next quarter's sales trends

BI vs Data Analytics

- BI and Data Analytics differ in **scope, focus, tools, and users.**

Aspect	BI	Data Analytics
Focus	Past & Present	Future Predictions
Techniques	Reporting, Dashboards	Statistical modeling, ML
Users	Managers	Data Scientists
Tools	Power BI, Tableau	Python, R

Complementary Roles

- BI and Analytics **work together to enable smarter decisions.**
- BI provides **insights from past data**
- Analytics provides **predictions for the future**
- Organizations achieve **holistic data-driven decision making**
- **Example**
A bank uses BI dashboards for performance monitoring and analytics to **detect fraud.**

Decision Support Systems (DSS)

- DSS are **computer-based systems that assist managers in decision making** using data, models, and analytical tools.
- Supports **semi-structured decisions**
- Provides **interactive analysis and simulations**
- Integrates **data and analytical models**
- **Example**
A financial planning DSS allows managers to simulate **budget allocation and investment scenarios**.

Characteristics of DSS

- DSS have specific characteristics that make them effective for managerial decisions.
- **Interactive and flexible** interface
- Supports **semi-structured and unstructured decisions**
- Combines **data, models, and knowledge base**
- Provides **analytical support**
- **Example**
Supply chain DSS simulates **inventory and logistics decisions**

Components of DSS

- A DSS is composed of four main components:
- **Data Management System:** Organizes and stores data
- **Model Management System:** Provides analytical and simulation models
- **User Interface:** Enables interactive use
- **Knowledge Base:** Contains business rules and heuristics
- **Example**

A healthcare DSS uses **patient data, predictive models, and clinical rules** to suggest treatment options.

Types of DSS

- DSS can be classified based on focus and function.
- **Data-driven DSS:** Focus on data analysis
- **Model-driven DSS:** Uses analytical models
- **Knowledge-driven DSS:** Provides recommendations based on expertise
- **Group DSS:** Supports collaborative decision-making
- **Example**
A group DSS allows **multiple managers to plan budgets collaboratively.**

DSS Applications

- DSS are used in multiple organizational domains.
 - **Financial planning** – budgeting, investment analysis
 - **Supply chain optimization** – logistics, inventory control
 - **Risk management** – credit risk, insurance
 - **Healthcare** – patient diagnosis, treatment planning
- **Example**

Banks use DSS to **evaluate loan approvals and forecast defaults.**

Decision Making in Organizations

- Organizational decision making is the **process of selecting the best alternative** from multiple options.
- **Strategic decisions:** Long-term, organization-wide
- **Tactical decisions:** Short-term, departmental
- **Operational decisions:** Day-to-day, routine tasks
- **Example**
 - Strategic: Market expansion
 - Tactical: Annual budget allocation
 - Operational: Daily production scheduling

Types of Organizational Decisions

- Decisions differ based on **scope and structure**.
- **Strategic:** Long-term, high impact (e.g., new product launch)
- **Tactical:** Medium-term, departmental (e.g., marketing campaign planning)
- **Operational:** Short-term, routine (e.g., order processing)
- **Example**
 - Strategic: Expanding to a new country
 - Tactical: Hiring seasonal staff
 - Operational: Scheduling deliveries

Structured vs Unstructured Decisions

- Decisions vary in **complexity and predictability**.
- **Structured:** Routine and repetitive (e.g., payroll)
- **Semi-structured:** Partially defined (e.g., budget planning)
- **Unstructured:** Complex and novel (e.g., market expansion strategy)
- **Example**
A company deciding **whether to enter a new market** faces an unstructured decision.

Decision Making Process

- A structured approach improves **accuracy and consistency**.
- **Problem Identification** – Define the issue
- **Data Collection** – Gather relevant information
- **Analysis** – Examine alternatives and scenarios
- **Alternative Evaluation** – Compare options
- **Decision Implementation** – Execute and monitor results

- **Example**

Budget allocation process in a manufacturing firm follows all five steps.

Role of BI in Decision Making

- BI supports **faster, more accurate, and informed decisions.**
- Provides **real-time information**
- Enhances **decision accuracy and confidence**
- Supports **strategic, tactical, and operational planning**
- **Example**
Banks use BI dashboards to **monitor loan performance and detect fraud early.**

BI in Banking Example

- Illustrates practical BI application in financial services.
- **Customer behavior analysis** – segmentation and targeting
- **Fraud detection** – anomaly monitoring
- **Loan risk evaluation** – predictive scoring
- **Marketing insights** – campaign effectiveness
- **Example**

A bank detects **suspicious transactions** and reduces loan defaults using BI dashboards.

Summary

- In today's lecture we have discussed about;
 - Critical insights from BI
 - BI **transforms raw data into actionable insights**
 - BI evolved from **MIS and DSS**
 - BI and analytics are **complementary**
 - DSS supports **managerial decision making**
 - Examples

References

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