

MODULE-1:Introduction

Chapter 1

1. Changing Business Environments and Evolving Needs for Decision Support and Analytics

Organizations today operate in fast-changing, unpredictable environments characterized by global competition, shifting customer expectations, and rapid technological advancements.

Key Environmental Changes:

- Market volatility and economic uncertainties.
- Increase in data availability (Big Data) from sensors, social media, IoT, etc.
- Demand for real-time decision-making and agile responses.
- Globalization leading to complex supply chains and distributed operations.
- Digital disruption through AI, cloud, and mobile technologies.

Evolving Needs for Decision Support:

- Traditional decision-making approaches are no longer sufficient.
- Need for automated, data-driven, and intelligent decision-support systems.
- Real-time dashboards, predictive analytics, and simulation models support:
 - Faster insights
 - Improved accuracy
 - Enhanced collaboration
- Shift from intuition-based to evidence-based decision-making.

2. Evolution of Computerized Decision Support to Analytics/Data Science

Computerized decision support has evolved significantly over decades, transitioning from basic MIS to advanced analytics and data science.

Historical Evolution:

1960s–1970s

- Management Information Systems (MIS) emerged.
- Supported structured decisions through periodic reports.
- Focused on internal transactional data.

1980s–1990s

- Rise of Decision Support Systems (DSS) and Executive Information Systems (EIS).
- DSS enabled interactive, model-driven support for semi-structured problems.

- EIS catered to top executives with drill-down capabilities and summary views.

1990s–2000s

- Introduction of Business Intelligence (BI).
- BI integrated data warehouses, dashboards, and reporting tools.
- Emphasis shifted to data integration, querying, and visualization.

2005–Present

- Emergence of Advanced Analytics and Data Science.
- Incorporates machine learning, AI, text mining, and predictive modeling.
- Focus on proactive insights, scenario simulation, and prescriptive recommendations.
- Supports real-time, automated, and scalable decision-making.

3. A Framework for Business Intelligence

Business Intelligence (BI) is a technology-driven process that collects, integrates, analyzes, and presents business information to support better decision-making.

Key Components of a BI Framework:

- Data Sources:
 - Internal: ERP, CRM, databases.
 - External: Market data, social media, web logs, sensors.
- ETL (Extract, Transform, Load) Processes:
 - Extract data from multiple sources.
 - Transform data into usable formats.
 - Load into a central data repository.
- Data Storage:
 - Data Warehouses: Centralized structured data.
 - Data Lakes: Store raw, unstructured data (often used with Big Data).
- Business Analytics Tools:
 - Dashboards and scorecards.
 - OLAP (Online Analytical Processing).
 - Data mining tools.
- User Interface (UI):
 - Web-based portals, reports, mobile apps.
 - Interactive visuals for easy exploration by decision-makers.

Purpose:

To deliver timely, accurate, and actionable insights, and to enable strategic, tactical, and operational decision-making.

Analytics Overview

Analytics refers to the scientific process of transforming data into insight for effective decision-making.

Types of Analytics:

- Descriptive Analytics – What happened?
Example: Monthly sales reports, dashboard summaries.
- Diagnostic Analytics – Why did it happen?
Example: Identifying reasons for a drop in customer satisfaction.
- Predictive Analytics – What is likely to happen?
Example: Forecasting customer churn or demand.
- Prescriptive Analytics – What should be done?
Example: Recommending pricing strategies or inventory levels.

Tools & Techniques:

Data mining, machine learning, AI models, text mining, sentiment analysis, social network analysis.

Applications:

Automating decisions, enhancing human decision-making with insights, and enabling personalized experiences.

4. Analytics Examples in Selected Domains

Healthcare

- Predictive analytics to detect patient deterioration.
- Image recognition for diagnostics (e.g., cancer detection).
- Text mining for analyzing clinical notes.
- Outcome-based reimbursement using data to assess treatment effectiveness.
- Remote patient monitoring with AI-driven alerts.

Retail

- Market basket analysis for cross-selling.
- Personalized recommendations using customer behavior.
- Sentiment analysis from social media to assess brand perception.
- Inventory optimization using demand forecasting models.

Finance

- Fraud detection using pattern recognition.
- Algorithmic trading based on real-time data.
- Credit scoring using predictive analytics.
- Risk management through stress-testing and scenario analysis.

Manufacturing

- Predictive maintenance to prevent equipment failures.
- Quality control using image analytics on assembly lines.
- Supply chain optimization with real-time inventory tracking.

Sports

- Performance analytics: Player tracking and improvement strategies.
- Injury prediction models using biometric data.
- Fan engagement analytics via social media and app behavior.

Public Sector / Government

- Smart city planning using traffic pattern analysis.
- Law enforcement with crime hotspot prediction.
- Disaster response: Real-time data for relief coordination.