

# Industry 4.0 and the role of data-driven decision-making

Augmented Reality



## INDUSTRY 4.0



System Integration

Exploring the Fourth Industrial Revolution and the transformative power of data analytics

Additive Manufacturing



23MCT303 - Data Analytics in Automation System



Internet of Things



Cloud Computing



Cybersecurity

Big Data



Autonomous Robots

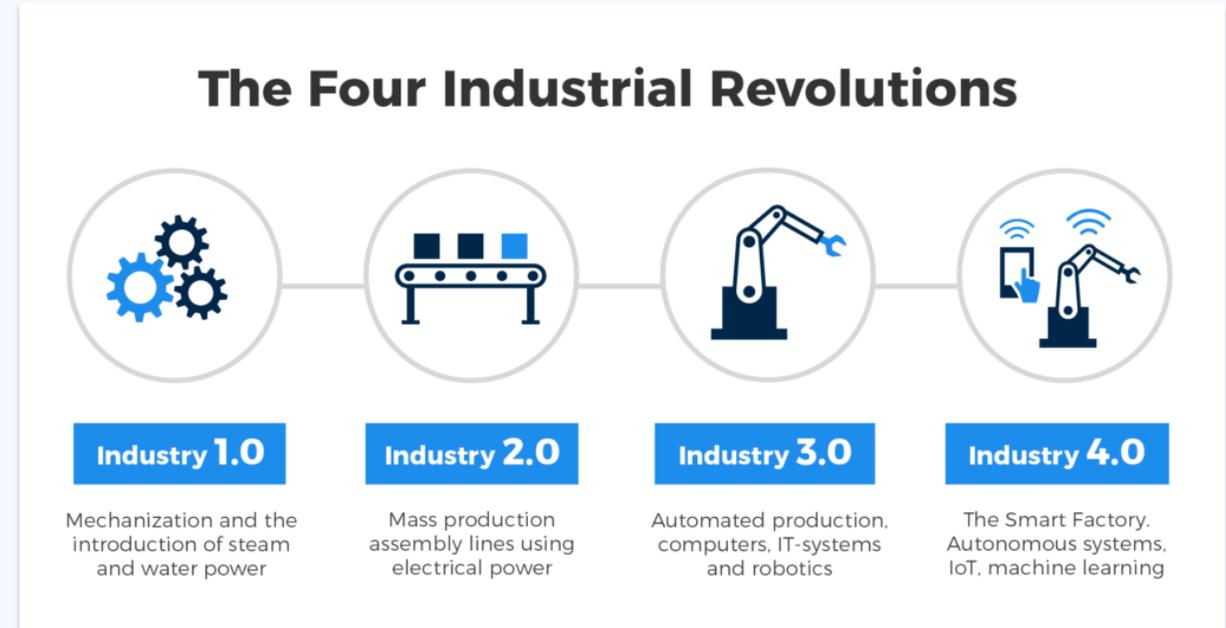


Simulation

# Introduction to Industry 4.0

**Industry 4.0** represents the Fourth Industrial Revolution — a fusion of technologies blurring lines between physical, digital, and biological spheres.

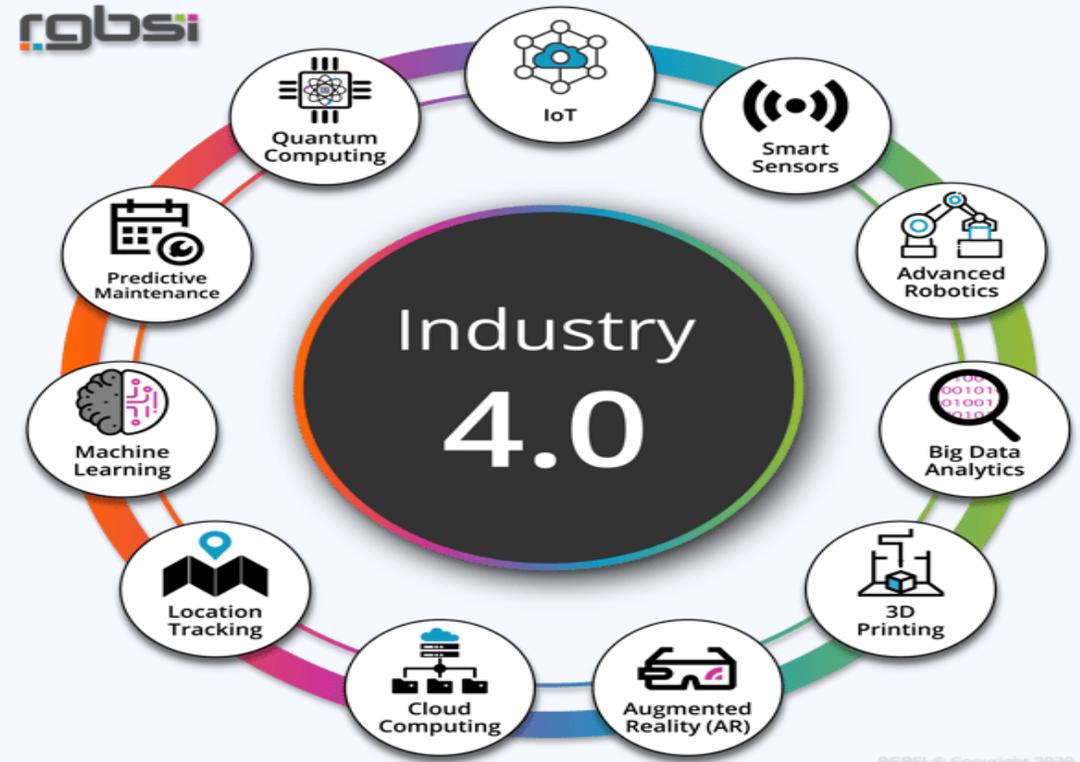
- ▶ Real-time data-driven decision making
- ▶ Interconnected systems and IoT devices
- ▶ Advanced analytics and machine learning
- ▶ Automation and smart manufacturing



# Key Components of Industry 4.0

- IoT & Sensors**  
Connected devices collecting real-time data
- Big Data Analytics**  
Extracting insights from massive datasets
- Advanced Robotics**  
Automated manufacturing processes

- Cloud Computing**  
Scalable data storage and processing
- AI & Machine Learning**  
Intelligent decision-making systems
- AR/VR**  
Immersive visualization and training



# Industry 4.0 Concepts & Technologies Mind Map

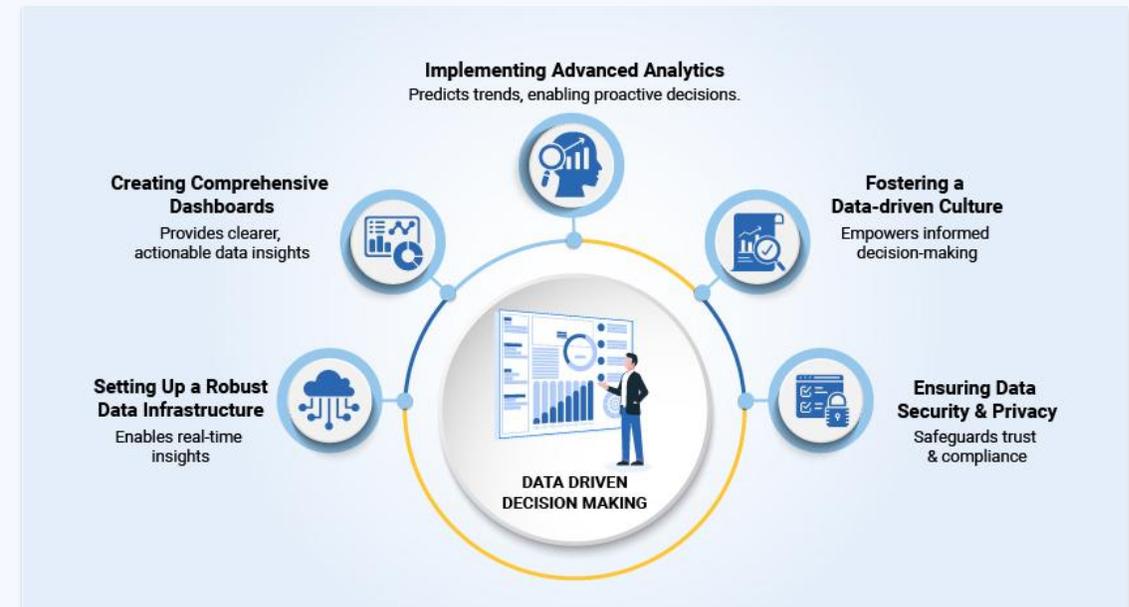


Source: <https://www.pdsol.com/news/what-is-industry-4-0/>

Interconnected technologies forming the foundation of Industry 4.0, enabling data-driven decision making and smart manufacturing

# Data-Driven Decision Making in Industry 4.0

- 1 Data Collection**  
Real-time data from IoT sensors, machines, and systems
- 2 Data Processing**  
Cleaning, integration, and transformation of raw data
- 3 Data Analysis**  
Statistical analysis, machine learning, and AI algorithms
- 4 Insight Generation**  
Identifying patterns, trends, and predictive indicators
- 5 Decision Implementation**  
Automated or human-executed actions based on insights



# Data Acquisition and Analysis in Industry 4.0



## Data Sources

IoT sensors, machines, ERP systems, supply chain



## Data Collection

Real-time streaming, batch processing, edge computing



## Data Storage

Cloud platforms, data lakes, distributed databases



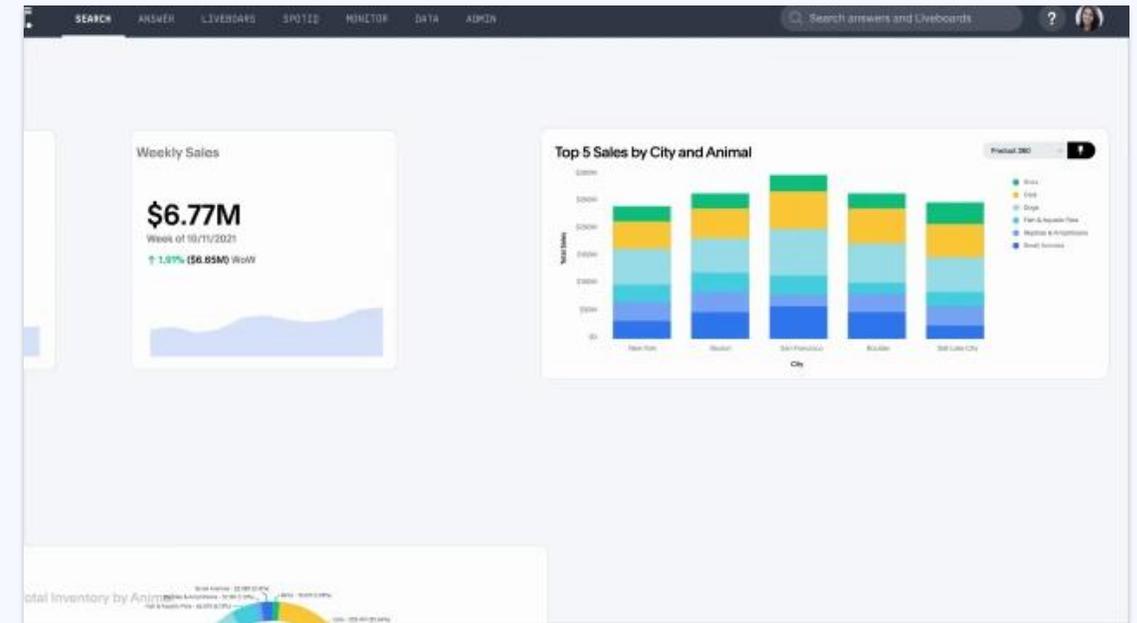
## Data Processing

Cleaning, transformation, feature engineering



## Data Analysis

Statistical analysis, ML models, predictive analytics



# Applications of Industry 4.0



## Smart Manufacturing

Connected production lines with real-time monitoring  
Siemens Amberg Electronics Plant



## Supply Chain Optimization

AI-driven logistics and inventory management  
Amazon's predictive shipping



## Predictive Maintenance

Equipment failure prediction and prevention  
GE's Predix platform



## Autonomous Logistics

Self-driving vehicles and drones for delivery  
Tesla's automated factories



## Worker Safety Systems

Wearable sensors and environmental monitoring  
Boeing's smart factory safety



## Sustainable Production

Energy optimization and waste reduction  
Schneider Electric's smart factories

# Benefits of Industry 4.0 and Data-Driven Approaches



## Increased Efficiency

Optimized processes and reduced downtime



## Better Decision Making

Real-time data-driven insights



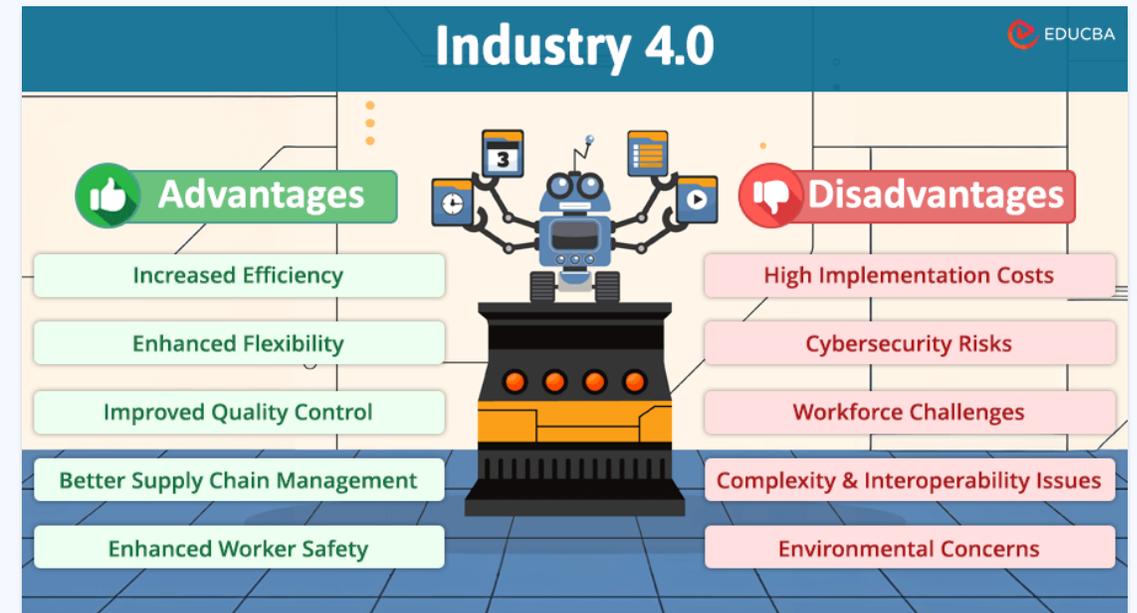
## Cost Reduction

Lower operational and maintenance expenses



## Enhanced Quality

Improved product consistency and reliability



# Challenges in Implementing Industry 4.0



## Data Security

Protecting sensitive industrial data from cyber threats



## System Integration

Connecting legacy systems with modern technologies



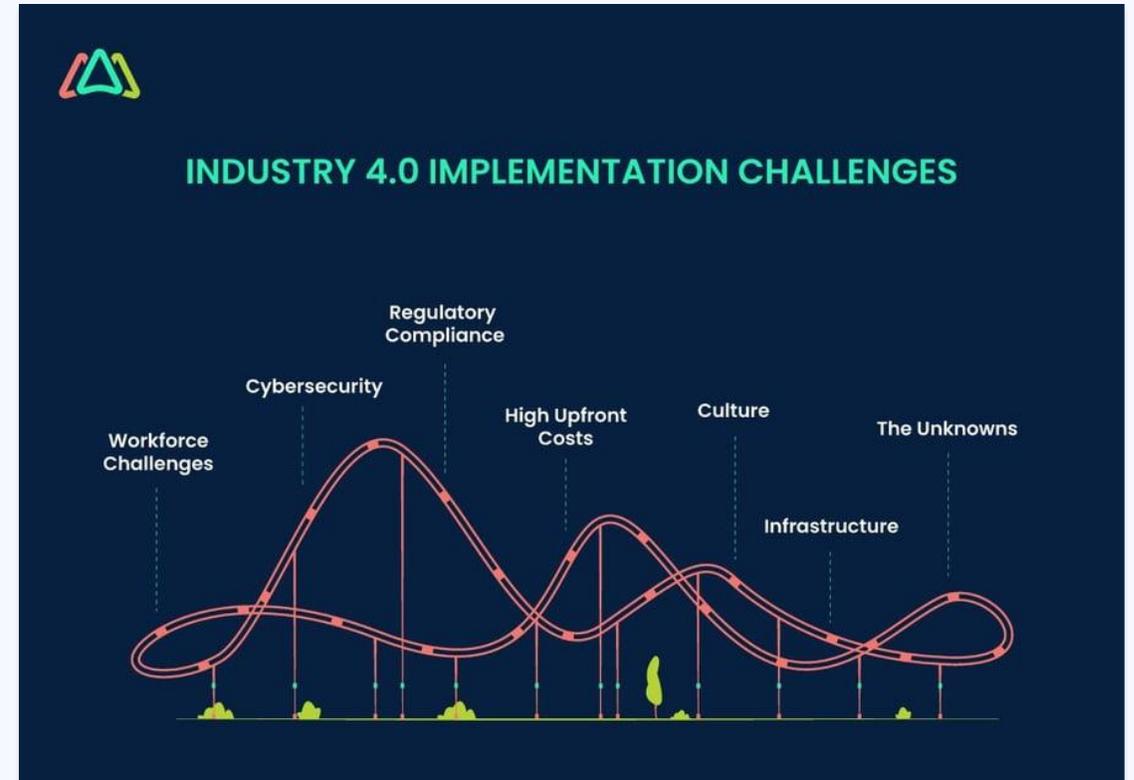
## Skills Gap

Workforce training for new technologies and processes



## High Investment

Significant upfront costs for infrastructure and technology



# Future Trends in Industry 4.0 and Data Analytics



## Advanced AI Integration

Self-learning systems with autonomous decision-making



## Digital Twins

Virtual replicas of physical systems for simulation



## Human-Machine Collaboration

Enhanced interfaces for seamless interaction



## Edge Computing

Processing data closer to source for real-time insights



# Summary and Recap

-  **Industry 4.0 Transformation**  
Integration of physical, digital, and biological systems
-  **Data-Driven Decision Making**  
Real-time insights for optimized operations
-  **Benefits & Challenges**  
Increased efficiency vs. implementation complexity
-  **Future Outlook**  
AI integration, digital twins, and human-machine collaboration

