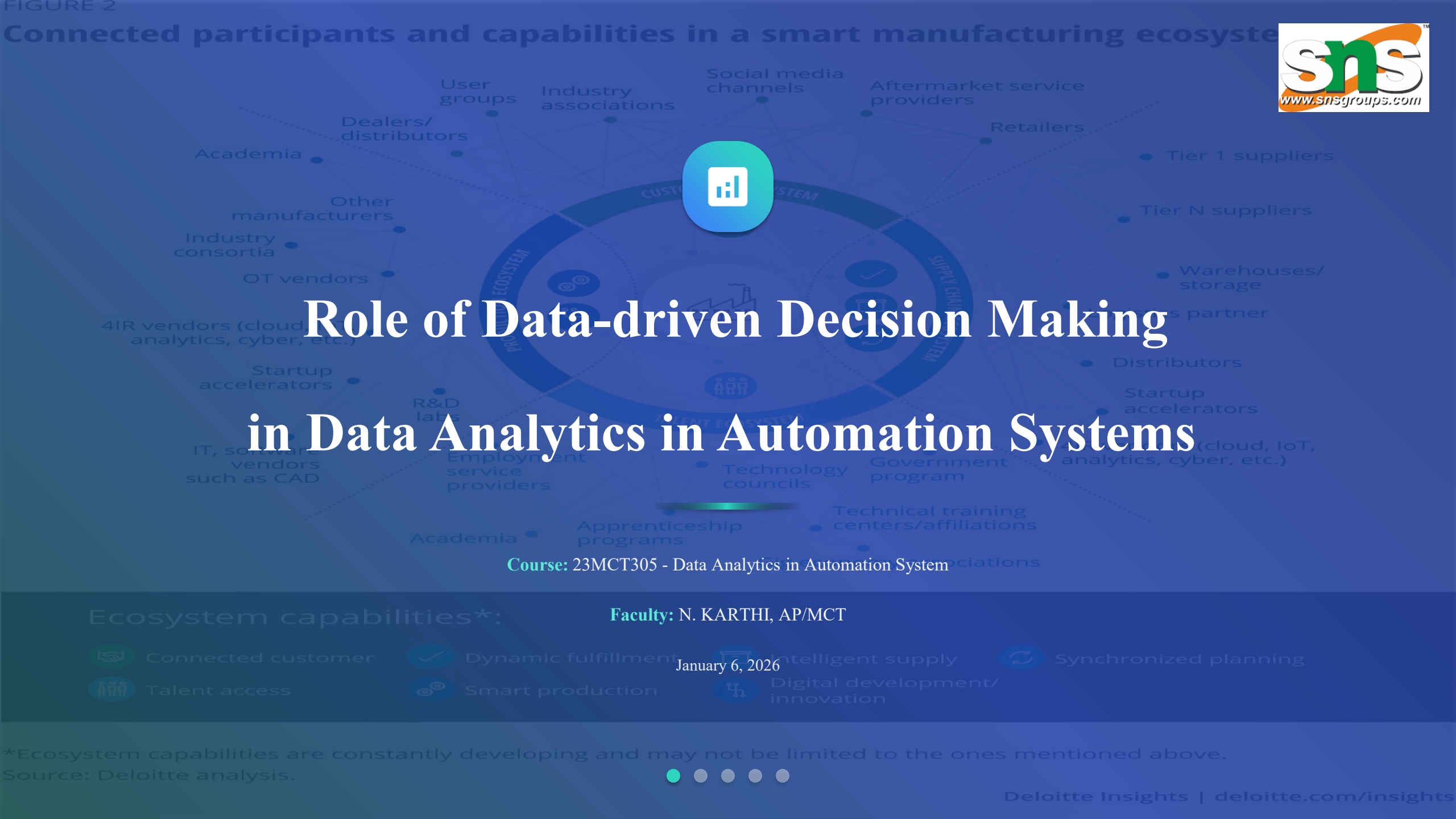


Role of Data-driven Decision Making in Data Analytics in Automation Systems

Course: 23MCT305 - Data Analytics in Automation System

Faculty: N. KARTHI, AP/MCT

January 6, 2026

Introduction to Data-driven Decision Making

Definition

Using **facts, metrics, and data** to guide strategic decisions aligned with organizational goals

- **Data Collection**
- **Analysis**
- **Interpretation**
- **Action**

"Data is the new currency in automation systems"

Importance in Automation Systems

Real-time Insights

Instant decision support capabilities

Predictive Maintenance

Anticipate equipment failures

Process Optimization

Continuous improvement of operations

Quality Control

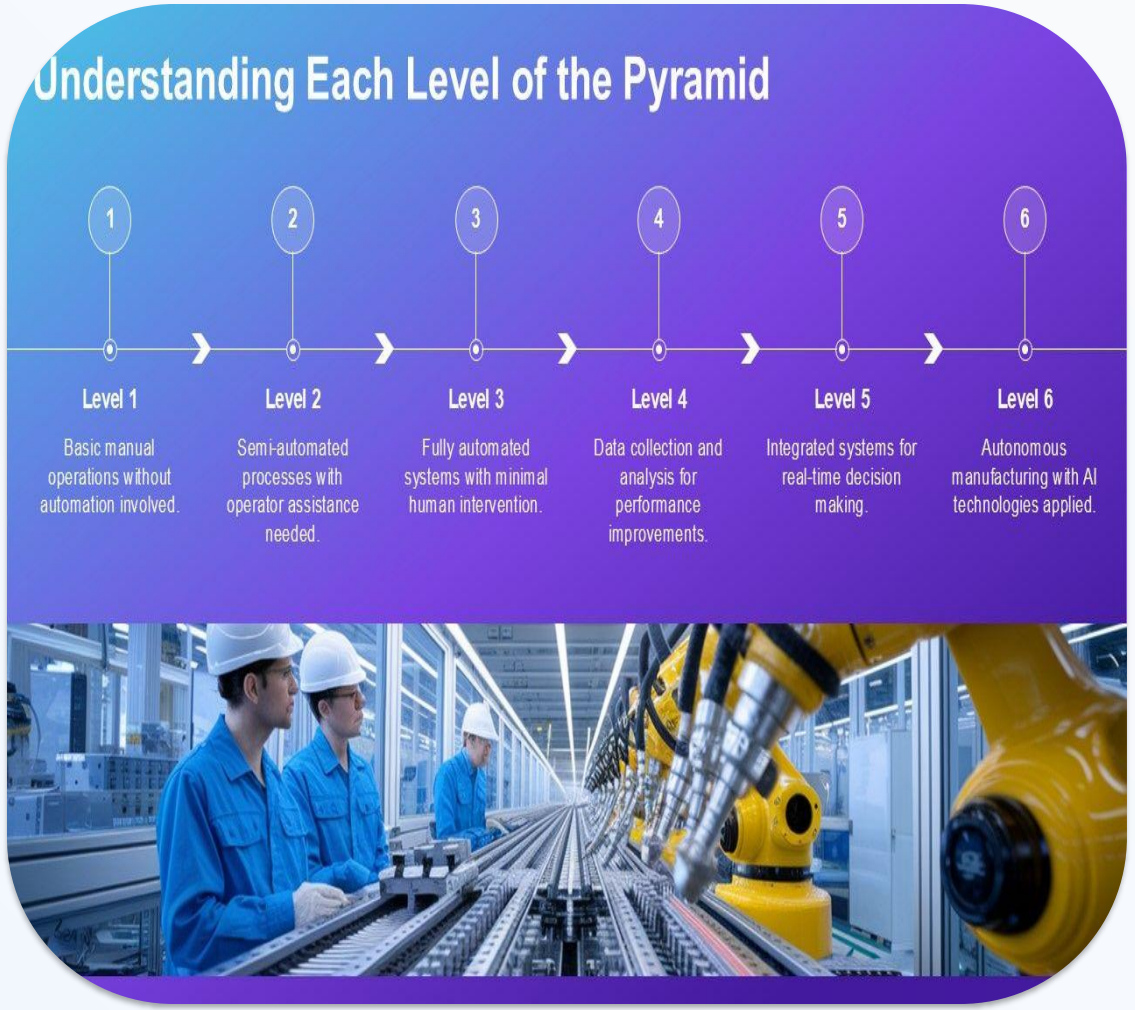
Enhanced product consistency

Impact

↑ **Efficiency**

↓ **Downtime**

↑ **Productivity**



Data Analytics Process in Automation

1. Data Collection

Gather from sensors, IoT devices, systems

2. Data Processing

Clean, transform, validate data

3. Data Analysis

Apply algorithms, statistical methods

4. Interpretation

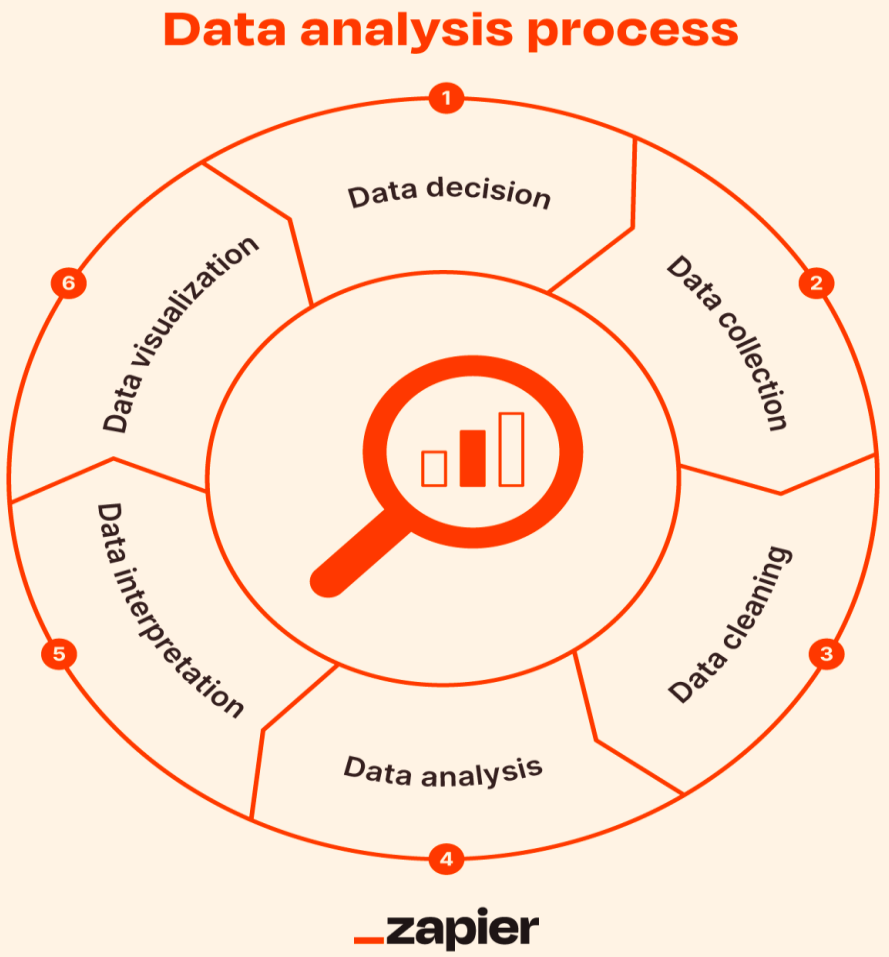
Derive meaningful insights

5. Implementation

Take data-driven action

6. Monitoring

Continuous improvement and optimization



Key Components of Data-driven Decision Making

Data Collection

Internal & external sources, sensors, IoT devices

Data Processing

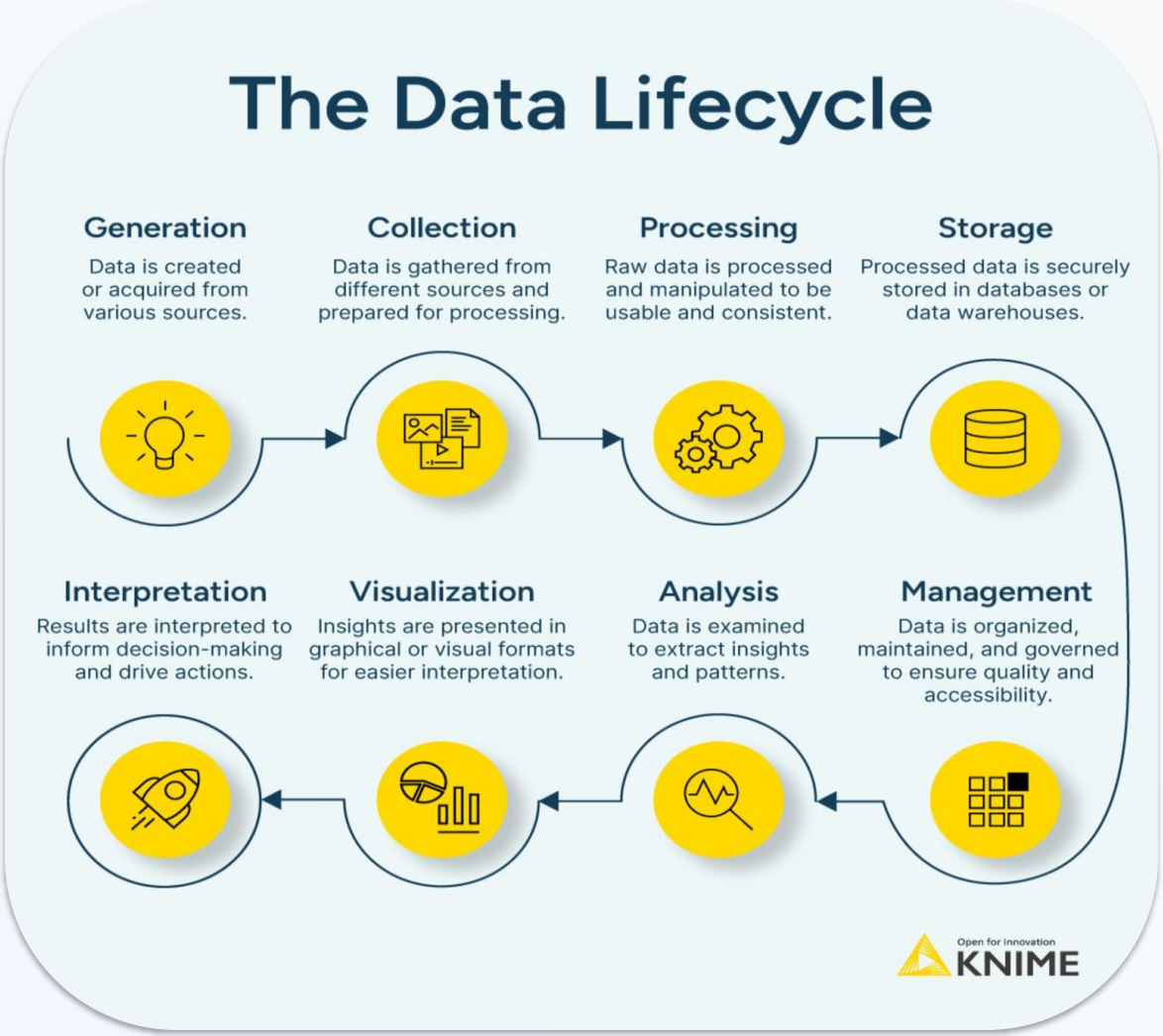
Cleaning, integration, transformation, validation

Data Analysis

Descriptive, diagnostic, predictive, prescriptive

Implementation

Decision execution, feedback loop, continuous improvement



Implementation Strategies

Build Data Infrastructure

Robust pipelines, cloud storage, ETL processes

Deploy Analytics Tools

BI platforms, ML algorithms, real-time analytics

Train Personnel

Data literacy programs, skill development

Governance

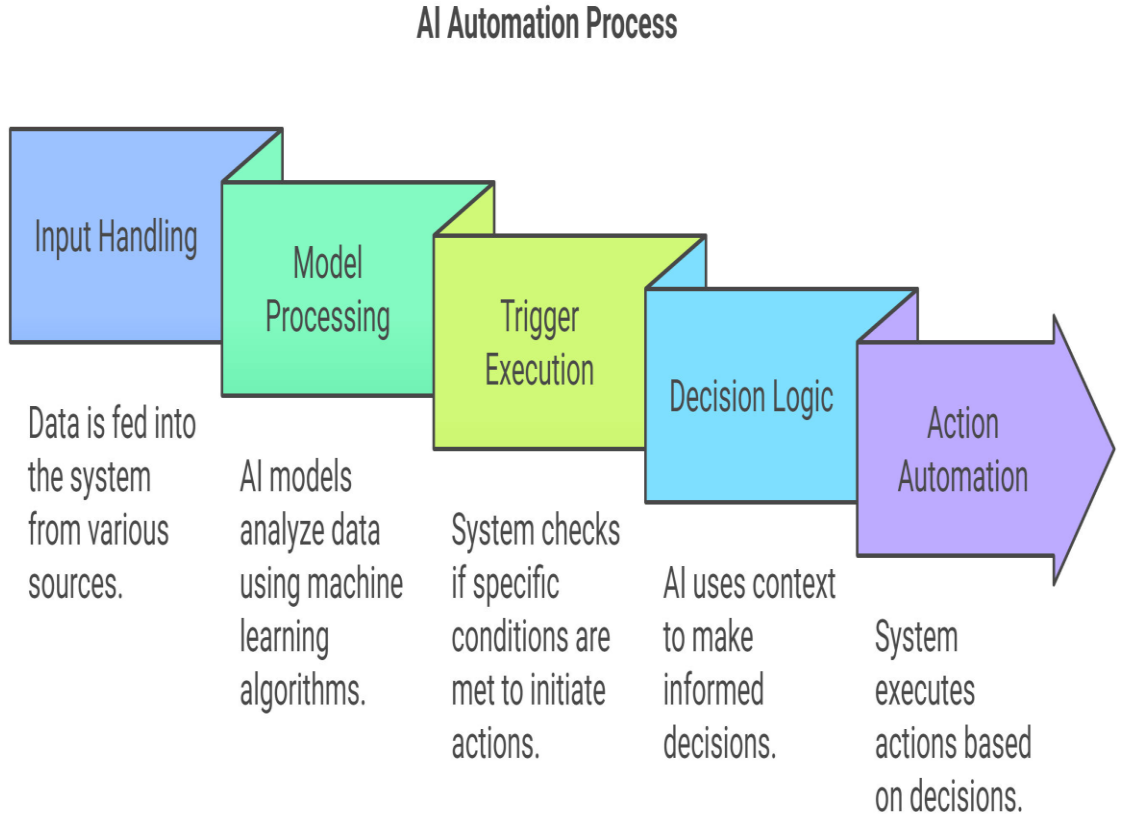
Quality standards, security protocols

Integration

Connect all automation components

Key Success Factors

Phased implementation, stakeholder buy-in, continuous monitoring



Benefits of Data-driven Decision Making

Improved Accuracy

Decisions based on factual evidence, reduced bias

Enhanced Efficiency

Faster decisions, streamlined operations

Proactive Approach

Predict trends, prevent issues before escalation

Competitive Advantage

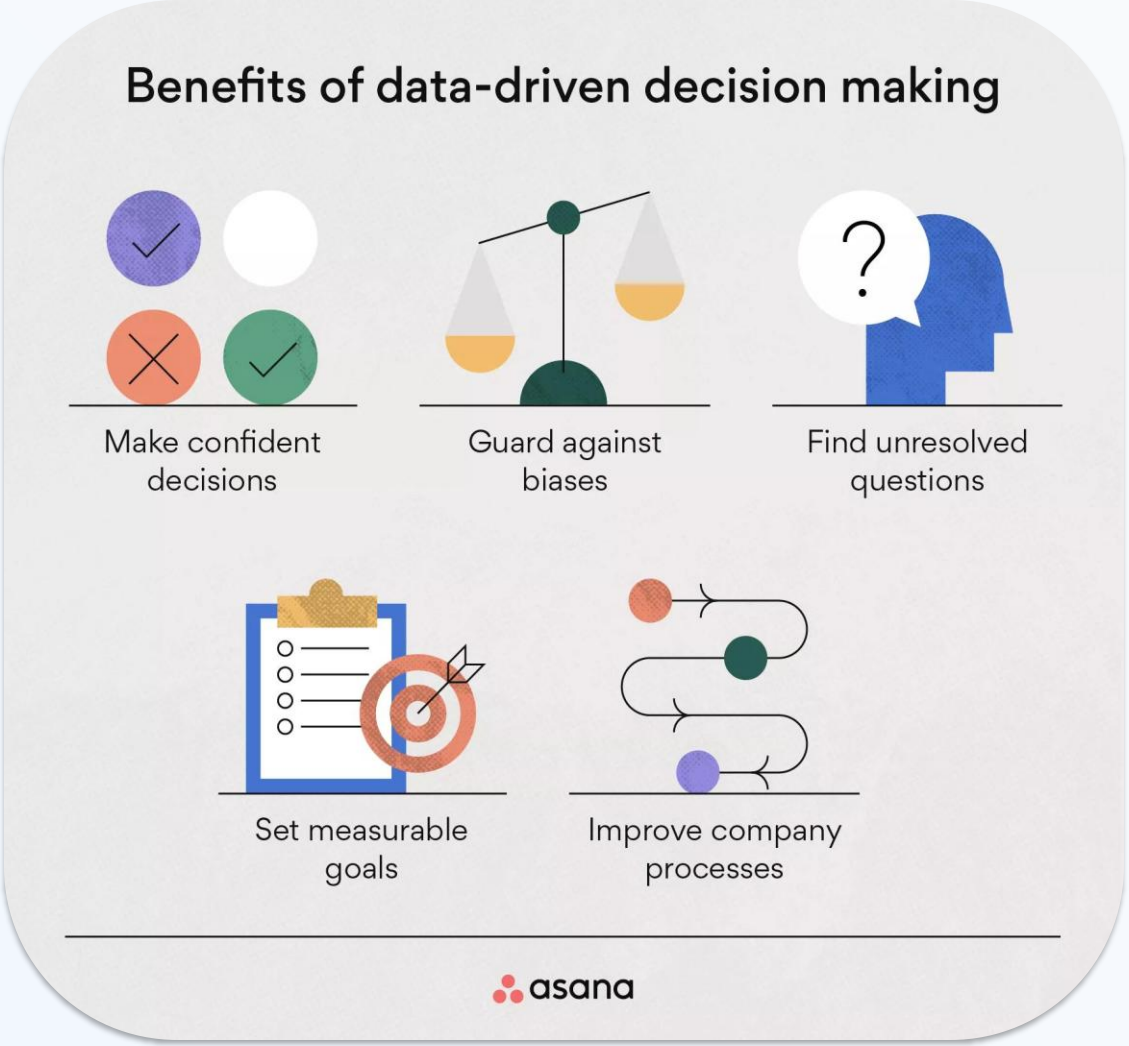
Market insights, strategic positioning

Resource Optimization

Optimize allocation, reduce waste

Overall Impact

Cost reduction, customer satisfaction, sustainable growth



Mind Map: Data Analytics in Automation Systems

Data Sources

IoT Sensors, SCADA, PLC, MES, ERP Systems

Analytical Methods

Predictive Analytics, Machine Learning, Real-time Analytics, Statistical Analysis

Automation Technologies

Robotics, PLCs, SCADA Systems, Digital Twins, Industrial IoT

Applications

Manufacturing, Energy Management, Quality Control, Supply Chain Optimization

GenAI-Generated Insights

Integration of advanced analytics with automation for intelligent decision support

Recap and Summary

Key Takeaways

Transforms Automation Systems

Enables intelligent decision-making

Structured Process

Collection → Processing → Analysis → Implementation

Key Benefits

Accuracy, Efficiency, Competitive Advantage

Strategic Approach

Address challenges through planning and investment

Future Integration

AI, IoT, Advanced Analytics

Summary

Data-driven decision making is essential for modern automation, enabling smarter, faster, and more efficient operations across industries.