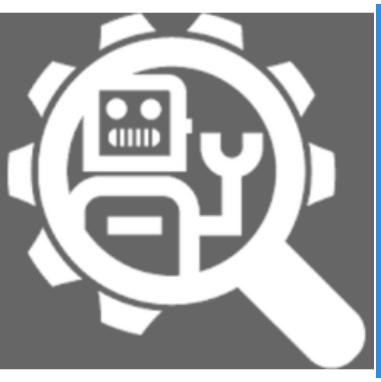


Autonomous Manufacturing

Overview

It is noted that autonomous systems provide a new magnitude of flexibility and capability for complex manufacturing requirements. All resources are modeled as intelligent entities that interact with each other in a controlled environment. Each entity has an adaptive and intelligent controller allowing the entity to autonomously pursue multiple goals as both a consumer and a producer. Environment rules are established by local and global multiple-criteria decision systems to resolve conflicts between entities and to optimize their overall performance.

Applicable Industries

- Aerospace
- Automotive
- Electronics & Embedded Devices
- Consumer Goods
- Equipment & Machinery
- Medical Devices & Equipment

Applicable Functions

- Product Development

Production - Manufacturing

Quality Assurance

Market Size

Estimate A

Electrical engineering company Siemens predicts the global market for autonomous robots to grow to USD 3.6 billion in 2019, and USD 13.9 billion in 2023.

Source: Siemens

User Viewpoint

Business Value

How does this use case impact an organization’s performance?

The production environment configures and adapts itself fully or partly to newly incoming models of the required product.

Autonomous manufacturing allows customized products to be quickly included into the production process. Overall equipment effectiveness improves.

Source: Siemens

Key Performance Indicators

How is the success of the system measured for users and for the business?

Time reduction for reconfiguration, production speed, consumed energy.

System Capabilities & Requirements

What are the typical capabilities in this use case?

Autonomous production processes based on incoming data.

Deployment Environment

Where is the ’edge’ of the solution deployed?

Complete production line involved.

Technology Viewpoint

Sensors

What sensors are typically used to provide data into the IoT system, and which factors define their deployment?

Sensors as part of the whole complex integrated solution providing real-time data of the process.

Analytics

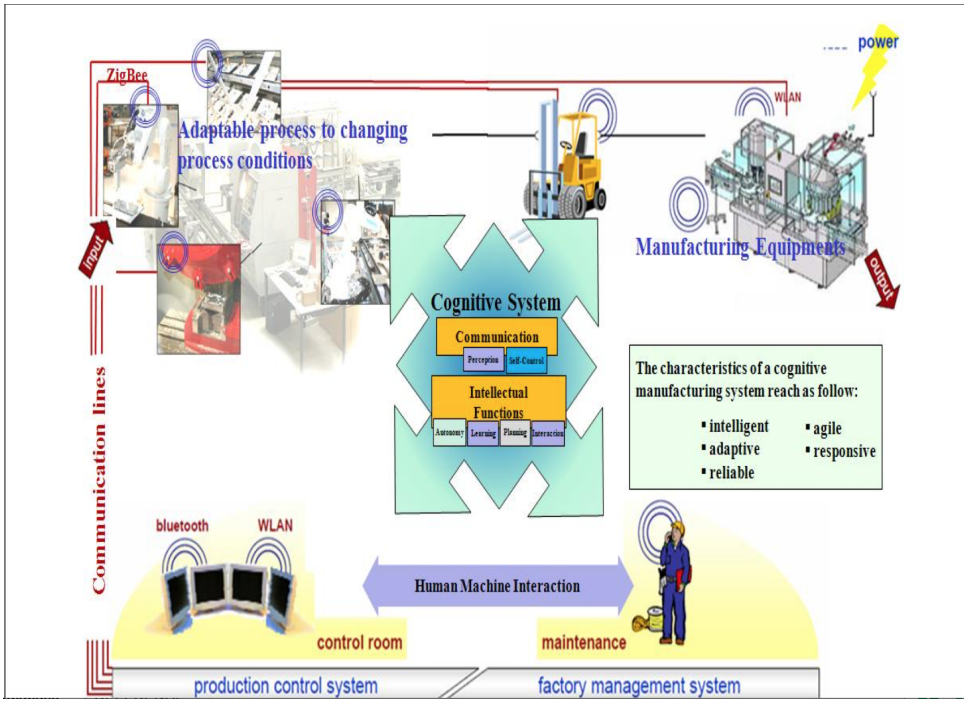
What types of analysis are typically used to transform data into actionable information?

Comprehensive data analytics of machines, material, environment.

Cybersecurity

What factors define the trustworthiness of the solution?

As the autonomous manufacturing process is directly tied into the (DSN) Digital Supply Network and the fact that the DSN is an interconnected mechanism, it is highly susceptible to hacking. Thus, organizations may want to consider ways to secure that information to prevent unauthorized users from accessing it across the network. They would also need to remain disciplined about maintaining those safeguards across all supporting processes, such as vendor acceptance, information sharing, and system access.



Cloud & Edge Platforms

What factors define the cloud and edge platforms used to integrate the solution?

Real-time edge analytics are essential to system performance. Cloud storage

enables accumulation of historical data.

Connectivity

What factors define the connectivity solutions used to provide both device-to-device and device-to-cloud communication?

Integrated communication capabilities connecting machines with each other and all other involved parts.

User Interface

What factors define the interfaces available to the system users?

Multiple users with different competency levels must receive different alerts.

Data Viewpoint

Data Sources

How is data obtained by the system?

Incoming requirements and models from customer, real-time data from sensors, historical database.

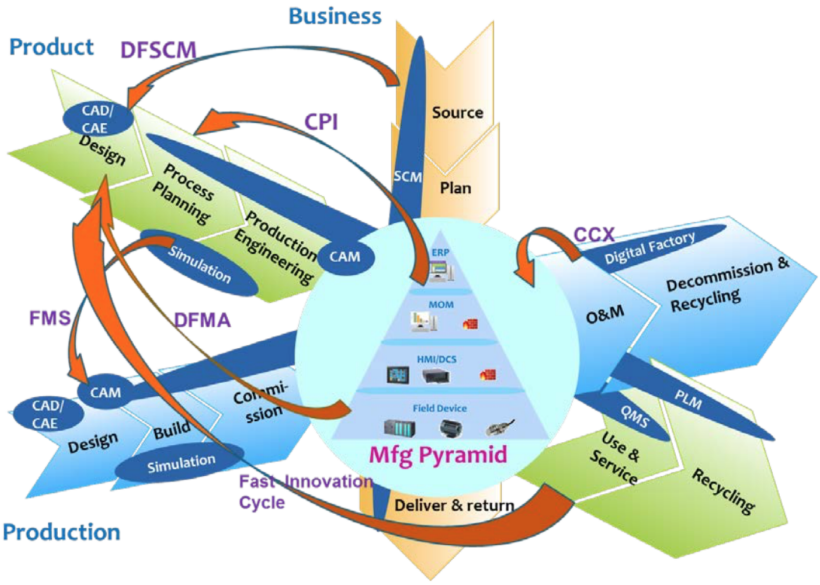


Figure 1. Smart Manufacturing Ecosystem

Data Types

What data points are typically collected by the system?

The perception module inside the system is responsible for a data acquisition from the resource through the sensors. This data observation includes many kinds of data such as visual data, auditory data, vibration data and so on. The interpretation module is responsible for transforming these data to the standard format.

Data Volume

What volume of data is expected from each deployment, and from the system as a whole?

Depends on the amount manufactured.

Data Requirements

What other requirements define data behavior?

The system in question must be implemented according to standards and data must be highly accurate as the autonomous system makes decisions based on the relayed data.

Implementation Viewpoint

Business & Organizational Challenges

What business challenges could impact deployment?

As most companies still utilize "legacy systems" that are not compatible with IOT systems, they need a complete overhaul of these systems as their old systems are not designed with wireless networks or Internet Protocol integration in mind. Another hurdle for industrial IoT adoption is the need for robust data management, especially since inputs include both unstructured data (such as text) and the typical structured data found in relational databases, data warehouses, and customer relationship management systems.

Autonomous manufacturing allows customized products to be quickly included into the production process. Overall equipment effectiveness improves.

Integration Challenges

What integration challenges could impact deployment?

Standards across all involved technologies. Integration and analytics capabilities are needed for a company to utilize the autonomous manufacturing system.

Regulatory Challenges

What regulatory challenges could impact deployment?

First regulatory challenge is that smart manufacturing requires data sharing on an unprecedented scale. Machines will communicate with each other across the supply chain, potentially exchanging huge volumes of data with a lot of different parties involved. Strict data policies by various countries poses a risk to the adoption of this technology.

IoT ONE Use Case

Accelerating the Industrial Internet of Things

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