The Industrial AI Layers

Cheat Sheet

SEIDOR

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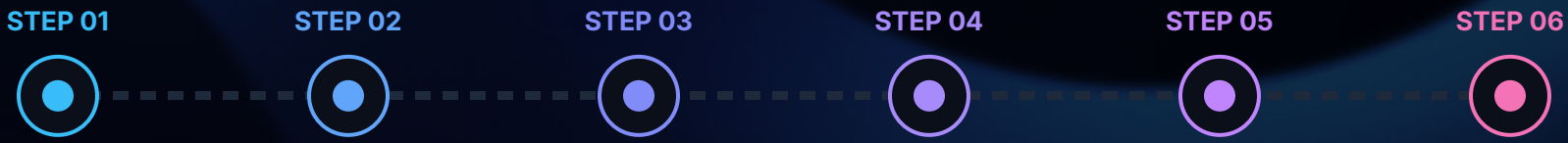
Data-to-Action Architecture

The six-stage end-to-end framework for enterprise intelligence and autonomous execution



Sources
Raw data origins & systems of record

Connectivity
Ingestion pipelines & real-time sync

Context
Knowledge graphs & vector enrichment

Governance
Security protocols, compliance & rules

Models & Agents
AI orchestration & cognitive reasoning

Action
Downstream systems & business impact

Sources: Preserve Authoritative Systems

The source layer begins with the systems already running the organization.

OT Side

May include PLCs, DCS, SCADA, sensors, robotics, CNC systems, machine vision, and historians.

Operations Level

May include MES/MOM, quality, maintenance, scheduling, and warehouse systems.

Enterprise & Engineering

ERP, PLM, CAD, procurement, supply-chain platforms, and document repositories.

Core Architectural Principle

An AI architecture should not casually duplicate or redefine the authority of those systems. It must always know where the authoritative information lives.

Connectivity: Create Controlled Pathways

Connectivity makes info usable beyond its original system (OPC UA, MQTT, APIs, gateways). But connected does not mean unrestricted.

LEVEL 01

Read Access

AI can inspect data to provide insights and visibility without modifying the source.

LEVEL 02

Recommended

AI proposes a response or setpoint optimization for explicit human approval.

LEVEL 03

Workflow

AI can trigger a predefined, sandboxed enterprise process automatically.

LEVEL 04 (HIGH RISK)

Control Action

AI directly influences or executes changes in an operational system or physical process.

Oversight & Risk Mandate

These pathways represent increasingly significant levels of risk. The closer AI gets to physical action, the more important identity, authorization, validation, fail-safe behavior, and human oversight become.

Context: Transform Signals into Operational Meaning

Context is arguably the most important layer for Industrial AI.

Structured Signals

A raw vibration reading tells a model very little. It must be associated with a specific motor, operating load, product, and maintenance history.

Unstructured Context

Critical information lives in maintenance manuals, service reports, engineering drawings, and quality investigations that never appear in standard time-series databases.

Data Sovereignty

Whether using centralized, federated, or distributed patterns, any architecture can succeed provided that interfaces, identities, metadata, and ownership are clear.

Manufacturing Data Platform Principle

Value lies in making info usable in context. SEIDOR's AI Stack Starter establishes secure access to knowledge, while IoT Bricks & Delfos connect telemetry as requirements grow.

Governance: Decide What AI is Allowed to Know and Do

Governance should not be added after successful pilots; it is a fundamental part of the core architecture.

For each AI capability, the organization should be able to answer:

01 / DATA ACCESS

What information can the model access?

Where can that information be processed?

02 / MODEL IDENTITY

Which models are approved?

How are identities and permissions enforced?

03 / EVALUATION

How is model output evaluated?

Can the system initiate actions automatically?

04 / HUMAN AUDIT

Which actions require human approval?

Can decisions be fully reconstructed and audited?

NIST AI Risk Management Framework & Manufacturing Context

Provides structure across design, deployment, and use. In manufacturing, these principles must operate alongside cybersecurity controls and OT safety boundaries—tightly interconnecting governance, data sovereignty, and architecture.

Models and Agents: Select the Right Intelligence

There is no single "Industrial AI model." Different operational problems require distinct techniques and architectures.

PREDICTION

Machine Learning

Used for forecasting, anomaly detection, and predictive maintenance.

PERCEPTION

Computer Vision

Used for inspection, dimensional analysis, and visual verification.

KNOWLEDGE

Gen AI & RAG

Enables engineering knowledge access, maintenance support, and natural dialogue.

OPTIMIZATION

Physics Models

Handles process tuning, scheduling, yield improvement, and physical simulations.

AUTONOMY

AI Agents

Reasons across multiple sources and coordinates complex workflows.

Architecture & Digital Twins

A digital twin is highly valuable for simulation, virtual commissioning, or state modeling, but it is not a prerequisite to becoming AI-ready. Architecture must always follow the actual operational problem, not the terminology currently receiving the most market attention.

Action: Close the Loop Carefully

AI produces value when information changes a decision or action.

PHASE 01 / INITIALLY

Simple Alerting

The system focuses on foundational observation:

Detect → Alert

PHASE 02 / THEN

Assisted Decisions

The system explains context and provides guidance:

Detect → Explain → Recommend

PHASE 03 / LATER

Active Orchestration

Full reasoning leading to direct system orchestration:

Detect → Reason → Recommend → Approve → **Execute**

Architecture & Autonomy Mandate

In selected low-risk environments, some workflows may ultimately become more autonomous. The architecture should support that evolution without assuming full autonomy from the beginning.

About SEIDOR

SEIDOR is a global technology and transformation partner helping manufacturers turn AI ambition into secure, scalable operational capability.

We combine strategy, industrial technology, data, AI, cloud, and software engineering to connect complex IT and OT environments, modernize around existing systems, and deploy AI where it can deliver measurable business and operational value. From AI readiness and governance to IT/OT integration, edge intelligence, custom AI, and agentic systems, SEIDOR helps organizations build the architecture and capabilities required to scale Industrial AI with confidence.

Also consider

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