

AI in Manufacturing

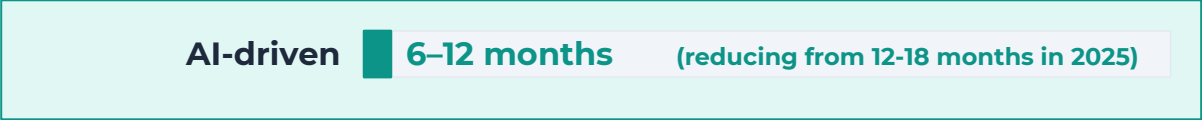
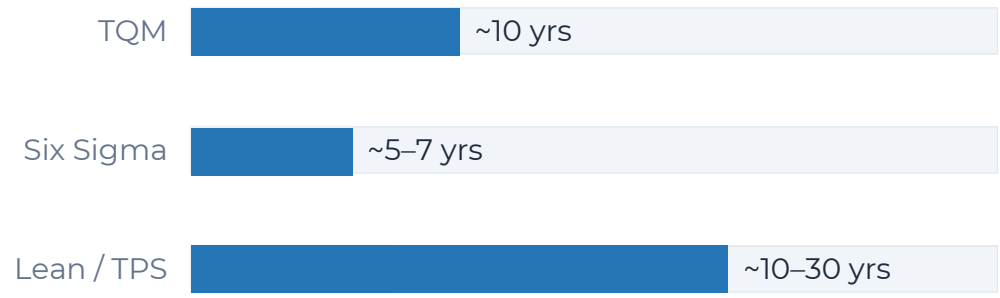
Global Trends and Opportunities

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Lean, Six Sigma and TPS reshaped manufacturing. AI is the next layer on the same stack.

YEARS TO ENTERPRISE-WIDE IMPACT — SHORTER IS FASTER



AI compounds on Lean. It doesn't replace it.

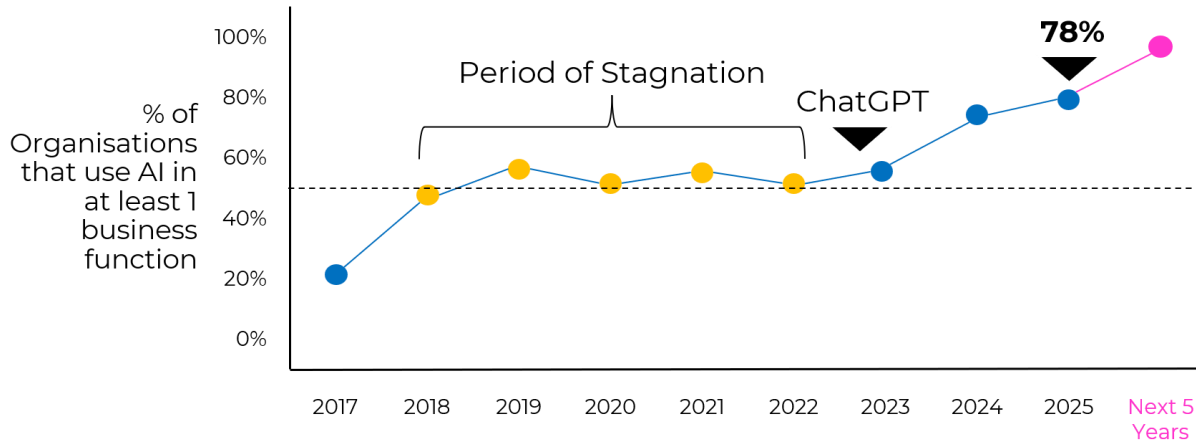
Heritage methods (time-to-impact): Oakland (TQM, 2014); Antony et al. (Six Sigma, 2017); Womack & Jones (Lean / TPS, 1996); Shingo Institute case histories.
AI payback (6-12 months): McKinsey & MIT MIMO, "Bold accelerators: How operations leaders are pulling ahead using AI", 2025.
Cycle time / downtime: McKinsey & Co., Smart-factory benchmarks, 2022-2024; ITRG Industry of the Future, 2025.

50-70%
faster cycle times
for early AI & automation adopters

Up to 50%
reduction in unplanned downtime
from predictive maintenance AI

78%
of organisations using AI
in at least one business function

AI investment is accelerating. Most manufacturers are still building the foundations.



95%

of manufacturers plan to invest in AI within 5 years

Rockwell Automation, 2025

29%

are using AI / ML at the facility or network level today

Deloitte, 2025

95%

of all operational data currently goes unused

Manufacturing Today

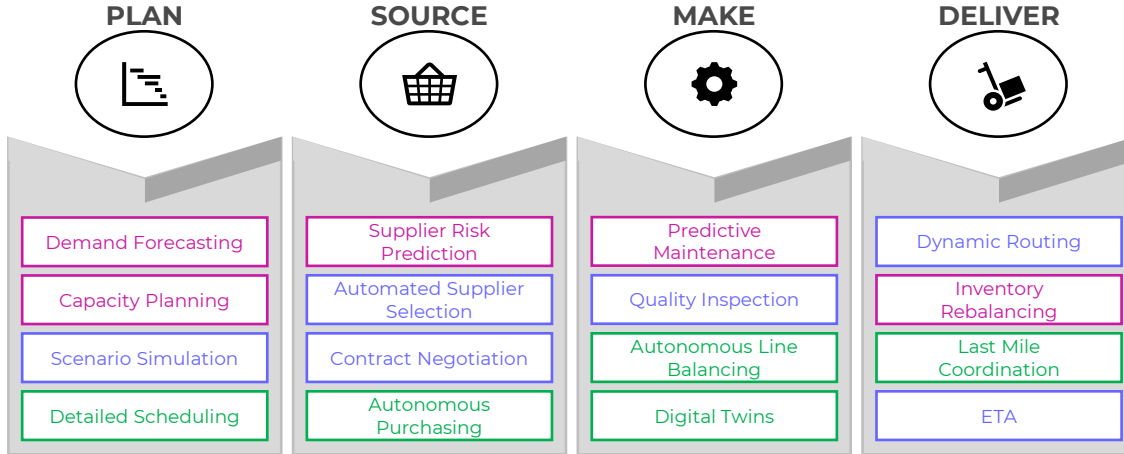
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The gap between the 95% who plan to invest and the 29% who are already operating isn't a technology problem, it's a data readiness and governance problem. Organisations that address both before selecting a use case are significantly more likely to reach production.

Four domains. Proven results. **Already deployed** in manufacturers like yours.



● Assistant ● Associate ● Agent



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Quality and maintenance deliver the fastest time-to-value for a first deployment. Production planning delivers the highest magnitude ROI. The supply chain requires the highest level of data maturity. Match your entry point to your readiness, not to the biggest headline number.

Quality Control

Computer vision detects defects in real time

→ **Up to 20% reduction in cost of quality**

48% of manufacturers prioritising AI for quality in next 12 months | Rockwell, 2025

Production Planning

AI optimises schedules against real-time constraints

→ **Up to 30% increase in throughput at scale**

ITRG peer research shows simpler ML deployments consistently outperform complex APS | ITRG, 2026

Predictive Maintenance

ML predicts equipment failures before they happen

→ **Up to 50% reduction in unplanned downtime**

Proven across discrete and process industries | McKinsey, 2022

Supply Chain

Demand sensing and inventory optimisation

→ **Up to 85% improvement in forecasting accuracy**

Up to 20% reduction in inventory-holding cost | McKinsey, 2022

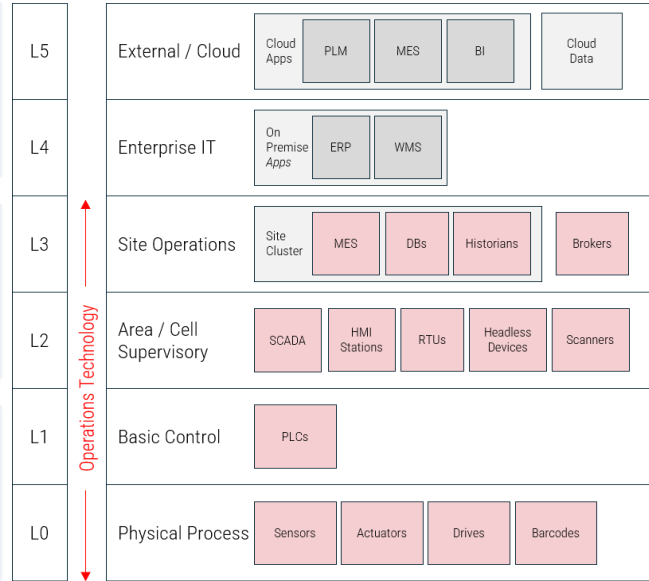
Most AI pilots underperform. Our research says they're starting with poor preparation.



1 Wrong framing
AI is treated as a technology project. It requires business sponsorship, change management, and cross-functional governance from day one.

2 Starting too big
Big-bang deployments consistently fail. The evidence is unambiguous: start with one process, one line, one machine. Complexity is the enemy of first-value.

3 Data not ready
Getting clean, consistent data is 60-70% of the effort. Expect 6-12 months of data work before meaningful AI results. Expect 50-70% of demo performance in real production.



Most manufacturers need **6 - 12 months of data preparation** before AI.

95% of operational data currently goes unused

Getting clean, consistent data is **60 - 70%** of the effort

Expect **50 - 70%** of demo performance in real production

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The OT/IT stack on the right shows why data readiness is harder than it looks. Most manufacturers have rich data locked at L0-L2 (sensors, PLCs, SCADA) that never reaches the analytics layer. Bridging that gap is 60-70% of the AI implementation effort. This is where most projects stall, and where a readiness assessment pays for itself immediately.

\$120M precision components manufacturer

Use Case: AI will optimise the production schedule to maximise throughput and minimise changeovers.

ATTEMPT 1 — FAILURE

Complex APS deployment + massive data migration

Investment	\$200K
Duration	12 months
Schedule stability	40%
On-time delivery	69%

Over-optimised schedules 60% of the time, disrupting production.

ATTEMPT 2 — SUCCESS

Simple ML integrated with existing scheduling system

Investment	\$45K
Duration	6 months
Schedule stability	84%
On-time delivery	93%

Total ROI: 520% in year one

The \$45K solution outperformed the \$200K one.

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This is not an outlier. Across ITRG's manufacturing research, simpler and narrower deployments consistently outperform complex ones on year-one ROI. The combination that works: a focused ML model + engineering rules + statistical control boundaries + human override. Remove any element and performance degrades significantly.

The winning formula isn't the most sophisticated AI. It's the most focused.



Start narrow

- 01** One machine. One line. One process. Not a platform, not a transformation programme. The \$45K solution above delivered 520% ROI precisely because it was focused on a single constraint.

Integrate with what you have

- 02** The best AI sits inside existing workflows, not beside them. Solutions that require replacing current systems to function are the leading cause of stalled deployments.

Measure what the business cares about

- 03** Throughput. Delivery performance. Downtime. Not model accuracy. If you can't connect it to a KPI the business already tracks, rethink the use case, not the technology.

What we see successful organisations do...

- 1. Tie AI use to actual impact** on throughput, yield, downtime, working capital and changes in operator behaviour & cycle time.
- 2. Prioritise context** (asset hierarchy, process context, batch lineage) over raw data volume.
- 3. Codify operator knowledge and engineering rules** into the solution.
- 4. Maintain human-in-the-loop mechanisms** for edge cases and exceptions.
- 5. Scale by identifying and repeating decision patterns** (e.g., anomaly detection, sequencing optimisation).

Info-Tech Research Group | INSIGHT — THE PATTERN

MODEL + RULES + STATISTICAL BOUNDARY CONTROLS + HUMAN OVERRIDE **WORKS!**

Readiness beats ambition.

Ask these three questions first.



1 What data do we actually have — and is it usable?

1

Getting clean, consistent data is 60–70% of the effort. Most manufacturers need 6–12 months of preparation before AI delivers meaningful results. Expect 50–70% of demo performance in real production.

Data readiness is the binding constraint in the majority of failed deployments.

2 Which process would deliver the most value if we improved it?

2

The highest-value use case is rarely the most technically interesting. Quality, maintenance, and scheduling are where manufacturers find the fastest ROI. Match the entry point to your readiness level.

Don't choose a use case because it sounds impressive. Choose it because you have the data and the business case.

3 Do we have the governance and skills to sustain a deployment?

3

79%* of manufacturing employees know co-workers using unapproved AI tools. Shadow AI is already in your organisation. The question is whether you're leading it or chasing it.

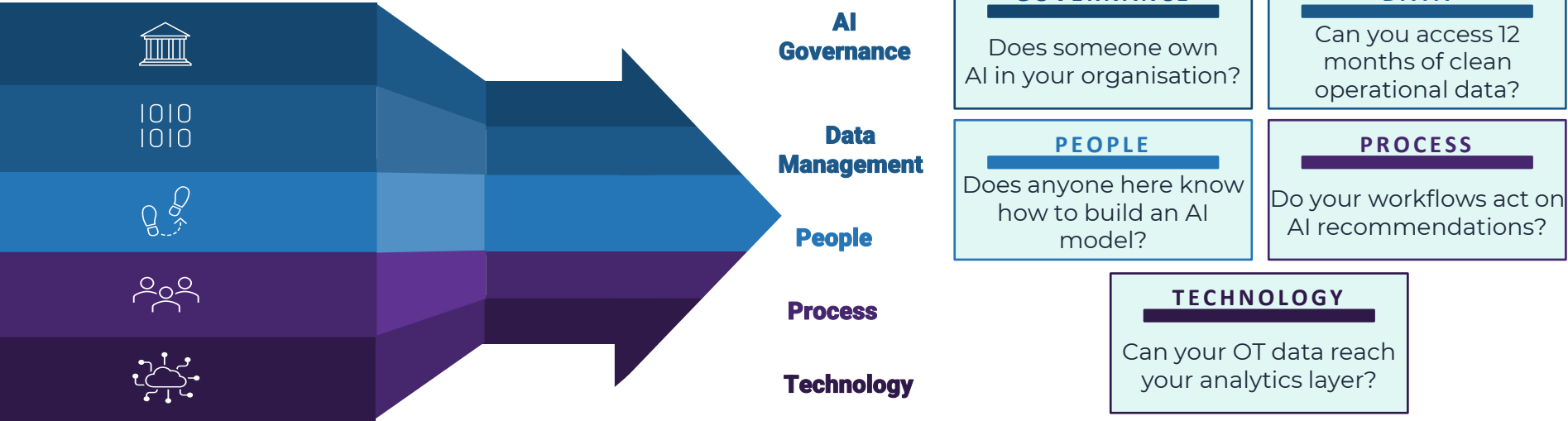
Governance gaps don't just create compliance risk, they destroy adoption at scale.

* Source: Manufacturing.net, 2025

Knowing where you are is more valuable than knowing where you want to be.



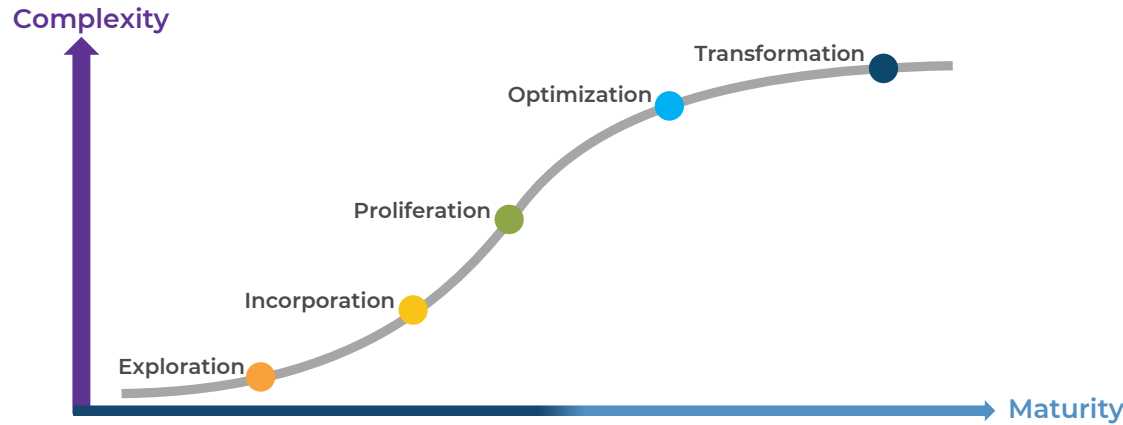
Assess your AI maturity to understand your organization's ability to deliver in a digital age.



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Across ITRG's assessments, Data Management and Governance are consistently the two dimensions that organisations most often underestimate. Technology infrastructure is almost never the binding constraint, yet it receives the most investment attention. Organisations that fix governance and data first reduce their AI implementation risk by a significant margin.

Most manufacturers are between Level 1 & 2. That's not a failing, it's exactly where the opportunity starts.



L1 Exploration
Learning what AI is. No use cases deployed.

L2 Incorporation
Running pilots. Learning what works in your environment.

L3 Proliferation
AI in production in specific areas. Cross-functional adoption is starting.

L4 Optimisation
AI shapes strategic decisions. Governance and data culture established.

L5 Transformation
AI-native culture. Continuously reengineering processes to compete.

← Most manufacturers sit here today

Technology-Centric

As you explore and pilot AI technologies, you will start by addressing the technical challenges of building a functional AI model.

Principles-Based

As you move from pilots to production, you must adopt principles that guide model development responsibly to address consumer and government demands.

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Most organisations self-assess as Level 2. Most are actually Level 1. The gap between perception and reality is where AI investments get wasted. The AI Maturity Assessment available through KC UI closes that gap with structured evidence rather than opinion.

Governance is not the last step. It is the first condition.



Four domains your organisation must address in parallel with use case development — not after it.

DATA GOVERNANCE

Know where your data comes from, who can use it, and whether it's good enough to trust.

Without this: models drift and nobody knows why.

MODEL GOVERNANCE

Decide who owns the model once it's live, who trains it, who notices when it stops working, and who decides to switch it off.

Without this, pilots succeed, then silently degrade.

SECURITY & CYBER RISK

Connecting plant data to analytics widens what attackers can reach. AI also creates new ways to be attacked, through the data and AI model itself.

⚠ This is an IT Security conversation — not just an AI one.

CHANGE GOVERNANCE

When the model says one thing and the operator says another, who wins? Agree that before you deploy.

Without this, adoption stalls at the shop floor.

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79%* of manufacturing employees know colleagues using unapproved AI tools. Shadow AI is already in your organisation. The question is whether you are leading it or chasing it. Governance established early is an enabler, governance retrofitted after scale is an emergency. The IT/OT attack risk increases the moment OT data flows to an analytics layer, and most organisations lack a unified cybersecurity posture before that connection is made.

*Source: Manufacturing.net, 2025

Three actions. In this order.

The sequence matters. Governance before use cases. Honesty before ambition.

1

FIRST

Assess your actual AI maturity, honestly

Run a structured assessment across five dimensions: governance, data, people, process, and technology. Most organisations discover they are one level below where they think they are. That gap is where AI investments get wasted.

Ask: where does our organisation actually sit, not where we want it to?

2

SECOND

Set up governance before selecting a use case

Appoint an AI owner with mandate and a budget. Draft an acceptable use policy. Engage IT Security to review OT data exposure. These take weeks, not months, and they determine whether a pilot scales or stalls.

Ask: does someone own AI in our organization, with real authority?

3

THIRD

Pick one use case based on data readiness, not headline ROI

Quality inspection and predictive maintenance deliver the fastest time-to-value. Production planning delivers the highest ROI but demands higher data maturity. Match your entry point to where your data is, not to the biggest number in a vendor deck.

Ask: do we have 12 months of clean operational data for this process?

Most AI programmes don't stall at the model. They stall in the gap between where teams think they are and what their data can actually support.

The manufacturers who will lead in five years
aren't necessarily those with the most sophisticated AI today.
They're the ones who start honestly, build solid foundations,
and keep going.

Stay with us, as later we'll show you exactly how
to assess where your organisation sits today.

