INDUSTRIAL AI READINESS · MANUFACTURING EVIDENCE

Stuck on Line One: Why Manufacturing's AI Pilots Stall, and What Waiting Costs

A successful factory AI pilot can still fail to scale. Many barriers sit beyond the model. This is the evidence behind that pattern, what the delay costs a plant, and what separates the manufacturers who scale from the ones who keep piloting.



29 SOURCES · PRIMARILY 2024–2026, WITH SELECTED EARLIER RESEARCH

WRITTEN FOR

Plant managers, operations and digital leaders, and the executives who approve AI investment in manufacturing

WHAT IT ANSWERS

Why pilots stall, where manufacturers really stand today, what standing still costs, and what to do before the next budget round

COMPANION GUIDE

Part 2 of this series, *From Pilot to Plant-Wide*, sets out how to assess AI readiness in practice: what to examine, how to prioritise and which KPIs to track

01 SECTION 01 · INTRODUCTION

The Pilot That Worked

> *The model usually did what it was built to do.*
> *The plant around it wasn't ready.*

Most factory AI stories start the same way. A vision system on one line catches defects the inspectors kept missing. A model flags a failing bearing three days early. The demo goes well, the plant manager shows it to the regional VP, and everyone agrees it should go to every line.

Then very little happens.

A year later the pilot is still running on the line where it started. The data team is rebuilding the same pipeline for line two because nothing from line one carries over. IT wants to know who owns the compute bill. Nobody can put a number on what the model is worth.

This happens often enough to have a name. The World Economic Forum calls it pilot purgatory, and says more than 70% of companies investing in advanced analytics, AI or digital solutions never get past the pilot phase.[1]

Look closely and the algorithm is rarely the only reason. The model usually did what it was built to do. What was missing was everything around it: data that other lines could use, infrastructure that could carry a second and third use case, someone accountable for model risk, and a business case written before the build began.

All of that can be examined before you commit the next budget. This guide shows where to look.

Inside this guide

02 **Why do AI pilots stall?**
Four common barriers, many of which sit beyond the model. Section 02

03 **What does AI readiness look like?**
Where manufacturers stand today, based on manufacturing-specific evidence. Section 03

04 **What does the delay cost?**
What standing still costs, and what readiness pays back. Section 04

05 **What should your plant do next?**
Five practical actions before the next budget round. Section 05

How to read this guide

Sections 02 and 03 explain why AI pilots stall and where manufacturers stand today. Section 04 examines the cost of waiting and the benefits of scaled transformation. Section 05 provides a five-step checklist for the next budget round. The companion guide, Part 2 of this series, covers how to assess AI readiness in practice.

PILOT PURGATORY, BY THE NUMBERS



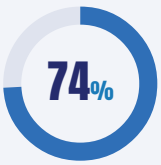
of companies investing in analytics, AI or digital solutions fail to get past the pilot phase

WORLD ECONOMIC FORUM, 2026 · [1]



of enterprise generative AI pilots studied showed little or no measurable impact on P&L

MIT NANDA, 2025 · [2]



of companies have yet to show tangible value from AI, across 1,000 executives in 59 countries

BCG, 2024 · [3]



of AI projects without AI-ready data will be abandoned through 2026, Gartner predicts

GARTNER, 2025 · [4]

Figure 1. Four independent studies, one pattern: AI adoption is widespread, and scaled value from it is rare. Full citations from page 17.

02 SECTION 02

Why AI Pilots Stall?

Gartner has been unusually blunt about this. In July 2024 it predicted that at least 30% of generative AI projects would be abandoned after proof of concept by the end of 2025.[5]

It gave four reasons: poor data quality, inadequate risk controls, escalating costs and unclear business value. None of the four is about the algorithm itself, which is a strong reason to look beyond the model, though it does not mean model issues never cause failure. The same release put the cost of more ambitious GenAI deployments at $5 million to $20 million, which is a lot of money to spend before anyone has confirmed the data is usable.

Seven months later Gartner went further. In a survey of 1,203 data management leaders, 63% said their organisation either lacks the right data management practices for AI or doesn't know whether it has them.[4] Its prediction: through 2026, organisations will abandon 60% of AI projects that aren't supported by AI-ready data.

Manufacturing has an extra problem. Plant data was mostly collected for reports and audits. It was never cleaned, labelled or connected with a model in mind.

WHERE AI PROGRAMMES ACTUALLY STRUGGLE

SHARE OF AI IMPLEMENTATION CHALLENGES



Figure 2. BCG's 2024 survey of 1,000 executives found roughly 70% of AI implementation challenges come from people and processes, 20% from technology and 10% from algorithms. Source: BCG [3].

BCG's numbers point the same way. Only 26% of the companies it surveyed had built the capabilities to move beyond proofs of concept and generate tangible value, and only 4% were consistently generating significant value across functions.[3]

The leaders weren't running more pilots. They went after about half as many opportunities as everyone else and expected more than twice the return. Over three years they also grew revenue 1.5 times faster than their peers.

The bottom line

If roughly 90% of the difficulty sits outside the algorithm, an assessment that only looks at technology is looking in the wrong place. A useful readiness check has to cover strategy, organisation, governance and data along with the tech stack.

A readiness check in one box

Strategy
A business case and baseline KPIs agreed before the build starts

Organisation
Clear owners, the skills to run AI, and support for changing how work is done

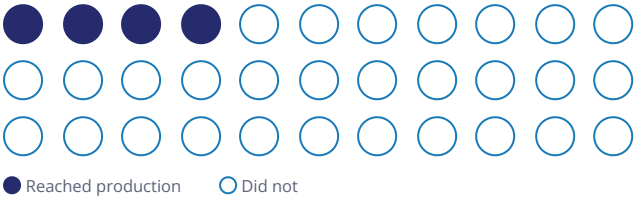
Governance
Accountability for model risk, drift, security and compliance

Data & tech
AI-ready data and infrastructure that a second and third use case can reuse

THE CONVERSION PROBLEM

From Pilot to Production: Where AI Leaks Out

Five research teams, five different methods. All of them find that most AI work never makes it out of the trial.



4 of 33

For every 33 AI proofs of concept a company launched, only four made it to production. IDC, researching with Lenovo, put the share that never reached wide deployment at 88%.[8]

IDC's own explanation: a "low level of organizational readiness in terms of data, processes and IT infrastructure." In other words, the foundations around the model rather than the model itself.

Figure 3. IDC and Lenovo's pilot-to-production ratio, drawn to scale: 33 proofs of concept, 4 in production. Source: IDC via CIO.com [8].

48%

of AI projects make it into production on average, and the move from prototype to production takes about 8 months.

GARTNER, 644 RESPONDENTS · [7]

46%

of AI proofs of concept were scrapped by the average organisation before they reached production.

S&P GLOBAL, 1,000+ FIRMS · [9]

80%+

of AI projects fail by some estimates, which is twice the failure rate of IT projects that don't involve AI.

RAND CORPORATION, 2024 · [10]

COMPANIES ABANDONING MOST OF THEIR AI INITIATIVES

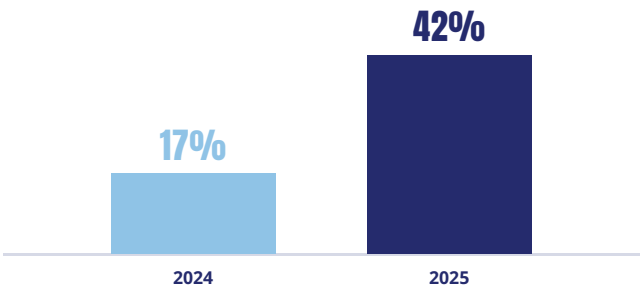


Figure 4. Share of companies that abandoned most AI initiatives. The top obstacles cited were cost, data privacy and security risk. S&P Global Market Intelligence [9].

WHAT 2,000 CEOS REPORT ABOUT THEIR AI INITIATIVES

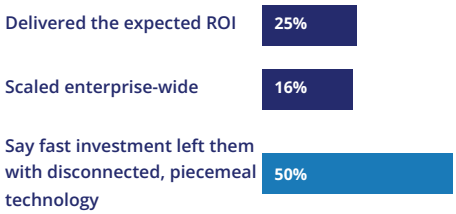


Figure 5. IBM Institute for Business Value 2025 CEO Study, 2,000 CEOs in 33 countries [11].

The good news is in the trend

A year after the 4-in-33 finding, IDC's 2026 research for Lenovo found that 46% of AI proofs of concept had progressed into production, across 3,120 IT and business decision makers.[19] Conversion rates can improve, which suggests pilot purgatory is largely a readiness problem, and readiness can be examined and strengthened.

FROM SYMPTOM TO CAPABILITY

Four Reasons, Four Places to Look

Each of Gartner's four failure causes shows up on the shop floor in a recognisable way, and each one points to a specific capability to examine.

WHY PILOTS ARE ABANDONED [5]	WHAT IT LOOKS LIKE IN A PLANT	WHERE TO LOOK	EVIDENCE TO REVIEW
Poor data quality	Sensor data sits in a historian nobody has cleaned. Quality records live in spreadsheets. Line two's tags don't match line one's.	Data lifecycle · AI-ready data	Data-quality reports, data dictionaries, tag standards, cleansing and lineage records
Inadequate risk controls	Nobody owns model risk. Once the model goes live, no one checks whether its predictions are drifting.	Risk & model ownership · Compliance & governance · Model performance monitoring	Risk registers, documented ownership, governance policies, model-validation results, drift-monitoring and incident logs
Escalating costs	Every new line needs its own pipeline, its own integration and its own compute. The second use case costs almost as much as the first.	AI infrastructure · Reusable deployment	Infrastructure architecture, pipeline reuse, deployment records, compute utilisation, integration and operating costs
Unclear business value	The pilot was approved on enthusiasm. There was no baseline KPI, so nobody can prove the improvement.	AI strategy · KPI baselines	Approved business cases, benefit ownership, and Before, Target and Actual values for KPIs such as OEE, MTTR, first pass yield and scrap rate

Figure 6. Gartner's four reasons for abandoned GenAI projects, mapped by the authors to the capability areas worth examining and the evidence that shows where a plant stands.

THE MANUFACTURING PICTURE

Plenty of pilots, much less at scale

Deloitte's 2025 Smart Manufacturing survey of 600 manufacturing executives (companies with $500 million or more in revenue) shows the gap clearly.[6] 29% are using AI or machine learning at facility or network level, and 23% are still piloting it.

Generative AI is further behind. 38% of manufacturers are piloting it, and only 24% have deployed it at facility or network scale. For now, pilots outnumber real deployments.

People are part of the problem too, as the panel below shows. A plant can buy a model in weeks. Hiring the people to run it takes much longer.

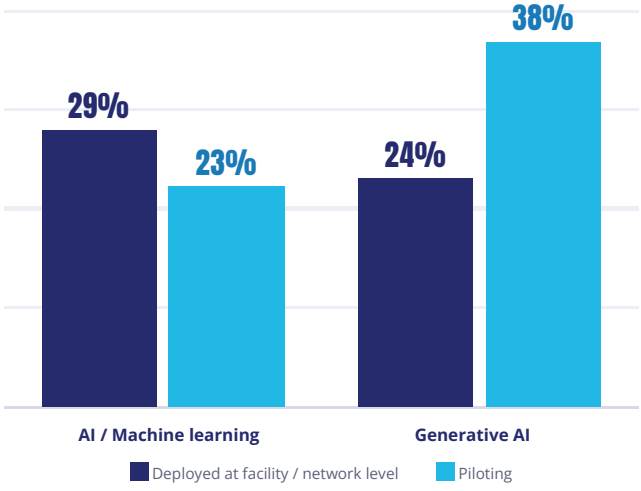


Figure 7. Manufacturers deploying AI at scale compared with those still piloting. Deloitte 2025 Smart Manufacturing and Operations Survey, n = 600 [6].

THE TALENT GAP

Same survey, same 600 executives, on the people side of scaling [6]

48% struggle to fill production and operations management roles

46% struggle to fill planning and scheduling roles

35% are concerned about upskilling their employees

WHAT THE ENGINEERS SAY

Five Root Causes, and Where to Look

RAND interviewed 65 data scientists and engineers, each with at least five years of experience building AI and machine learning models.[10]

RAND's 2024 study asked the people who actually build models why AI projects fail. Their five answers are listed below in RAND's order. Only one of them is about the limits of AI itself.

1

The wrong problem, or the wrong metric

Stakeholders misunderstand or miscommunicate what AI should solve. Models get optimised for the wrong metric, or don't fit the workflow. On a plant floor: a scrap-prediction model nobody on the line acts on.

AI strategy **Operations KPIs**

Agreed business KPIs with a recorded baseline

2

Not enough of the right data

The organisation lacks the data needed to train an effective model. On a plant floor: two years of historian data, but no labels for the failure modes that matter.

Data lifecycle **AI-ready data**

Accuracy, completeness, consistency and labelling of the data

3

Technology before users

Teams prioritise the latest technology without understanding how people will use it. The result may work technically but add friction to daily operations. On a plant floor: a GenAI assistant that operators bypass because asking a colleague is faster.

AI strategy **AI augmentation**
Workforce transformation

Adoption and usage on the shop floor

4

Infrastructure that can't deploy

No adequate infrastructure to manage data and deploy finished models. On a plant floor: a model that works in a notebook but has no route onto the line.

AI infrastructure **AI lifecycle**

Capacity, availability, security, cost efficiency and scalability

5

Problems too hard for AI

The technology is applied to a problem current AI can't solve. On a plant floor: expecting full autonomy from a process that isn't yet stable or measured.

Model capabilities

Realistic maturity targets for the process

Figure 8. RAND's five root causes of AI project failure, paraphrased, with the capability areas worth examining for each. Plant examples are the authors'. Source: RAND [10].

RAND's advice, in short

Commit each product team to one specific problem for at least a year. Focus on the problem, not the technology. Invest up front in the infrastructure for data governance and model deployment, which RAND says can substantially cut the time needed to complete AI projects. All three can be checked before the money is spent.

49%

name estimating and demonstrating AI's value as their number one obstacle to adoption, ahead of talent, technology and data.

GARTNER, 2024 · [7]

THE EVIDENCE ON MATURITY

Why Readiness Capabilities Deserve Attention

Organisations with higher AI maturity keep AI running longer. The research shows an association, not proof of cause.

Gartner scored 432 organisations on a five-level AI maturity model and compared the top with the bottom.[12] The findings show an association between higher maturity and sustained AI deployment, supporting the case for examining readiness capabilities. A plant's investment case still requires its own KPI baselines, implementation and operating costs, delivery plan and measured results.

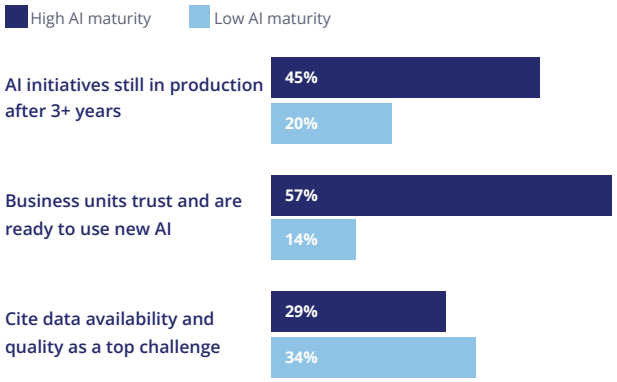


Figure 9. High versus low AI maturity. Gartner survey of 432 organisations in six countries, Q4 2024 [12]. Data problems affect both groups; what differs is whether AI lasts.

91%

of high-maturity organisations have already appointed dedicated AI leaders.

GARTNER · [12]

63%

of high-maturity leaders run ROI analysis, financial risk analysis and measure customer impact.

GARTNER · [12]

9%

of organisations were rated AI-mature in Gartner's earlier survey of 644 organisations.

GARTNER, 2024 · [7]

MCKINSEY · THE STATE OF AI IN 2026 · 1,719 RESPONDENTS IN 97 COUNTRIES [13]

44%

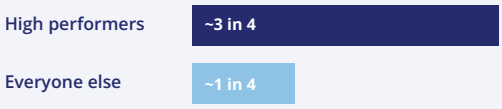
say AI is now scaling across their enterprise, up from 38% a year earlier.

37%

attribute any EBIT impact at all to AI, unchanged from the year before.

6%

are AI high performers, attributing 5% or more of EBIT to AI with "significant" value.



Share that fundamentally redesigned workflows because of AI. High performers change how the work is done instead of inserting AI into existing processes. Workflow redesign is a readiness capability in its own right.

Figure 10. Adoption is rising but enterprise-level impact is flat. McKinsey Global Survey, fielded May to June 2026 [13].

03 SECTION 03 · THE MANUFACTURING PICTURE

Manufacturing's AI Moment

Rockwell Automation's 10th State of Smart Manufacturing report surveyed 1,560 manufacturers in 17 countries in March 2025.[14]

95%

of manufacturers have invested in, or plan to invest in, AI and machine learning over the next five years.

ROCKWELL AUTOMATION, 2025 · [14]

Almost every manufacturer is investing. The question has moved from "should we use AI?" to "are we ready to scale what we buy?"

81% of the same manufacturers say external and internal pressures are speeding up their digital transformation. Investment in generative and causal AI grew 12% year on year, a sign that plants are moving past experiments. Speed without readiness is how pilot purgatory fills up.

WHERE MANUFACTURERS ARE POINTING AI, AND THE CAPABILITY IT DEPENDS ON

50%

plan to apply AI/ML to product quality in 2025, the top use case for a second year running.

Operations management

ROCKWELL · [14]

49%

plan to use AI for cybersecurity in 2025, up from 40% in 2024.

AI infrastructure | Risk

ROCKWELL · [14]

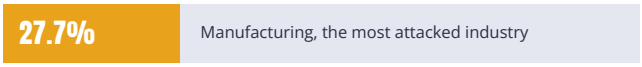
41%

are using AI and automation to help close the skills gap and cope with labour shortages.

Workforce transformation

ROCKWELL · [14]

SHARE OF ALL CYBERATTACKS BY INDUSTRY, 2025



All other industries combined make up the remaining 72.3%

Manufacturing was the most attacked industry for the fifth year in a row in IBM's X-Force index.[15] Every connected sensor and model endpoint adds to the attack surface, which is why security belongs in any AI readiness review, alongside infrastructure, risk and governance.

Figure 11. IBM X-Force Threat Intelligence Index 2026, covering 2025 incidents [15].

THE US MANUFACTURING TALENT OUTLOOK, 2024 TO 2033



Approximately half of the projected jobs could go unfilled, if skills and applicant gaps persist

Deloitte and The Manufacturing Institute project that US manufacturing could need as many as 3.8 million new workers by 2033, and 1.9 million of those jobs could go unfilled.[16] AI that nobody on the floor can run doesn't scale.

Figure 12. Deloitte and The Manufacturing Institute, April 2024 [16].

MANUFACTURING-ONLY EVIDENCE

Where Manufacturers Really Stand

Three recent studies that surveyed manufacturers and nobody else: McKinsey (2025), KPMG (2025) and TCS (2026).

The cross-industry numbers earlier in this guide hold up when you look at factories alone. McKinsey asked more than 100 COOs of manufacturers with at least $1 billion in revenue how far AI has actually gone in their operations.[20]

STAGE OF AI IMPLEMENTATION IN MANUFACTURING OPERATIONS

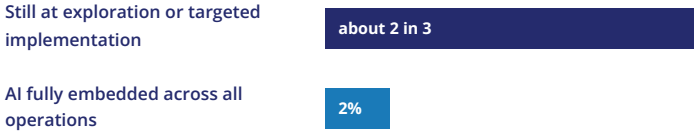


Figure 13. McKinsey global survey of manufacturing COOs, published 15 December 2025 [20].

2%

of manufacturing COOs say AI is fully embedded across all of their operations.

MCKINSEY, 2025 · [20]

68%

of manufacturers remain at non-deployment or experimental stages with physical AI on the shop floor.

TCS WITH GOOGLE CLOUD, 300 MANUFACTURERS · [21]

20%

of manufacturers consider AI a core component across all of their departments.

KPMG, 183 MANUFACTURING AI LEADERS · [22]

90%

of technology use cases in the latest applications to join the Global Lighthouse Network incorporate AI.

MCKINSEY, 2025 · [20]

THE MONEY IS COMING · DIGITAL AND AI SPEND AS A SHARE OF COST OF GOODS SOLD

1 in 3

manufacturers spent less than 1% of COGS on digital and AI over the past five years.

93%

plan to spend more over the next five years. Only 7% plan to stay below 1%.

~1 in 3

intend to spend at least 5% of COGS on digital and AI.

Figure 14. Manufacturing COO spending plans. McKinsey, 2025 [20].

What this means

Deloitte found that 78% of large manufacturers already put more than 20% of their improvement budget into smart manufacturing.[27] The budgets are growing fast. The open question for the next five years is whether that money lands on a foundation that can carry it, or on another round of pilots.

WHAT HOLDS MANUFACTURERS BACK

The Foundations Manufacturers Underfund

McKinsey found that manufacturing COOs give their lowest priority to workforce enablement, IT/OT infrastructure and cybersecurity.[20]

Those three are the foundations that decide whether an AI deployment can scale safely. Below, each manufacturing barrier is shown with the capability area it points to.

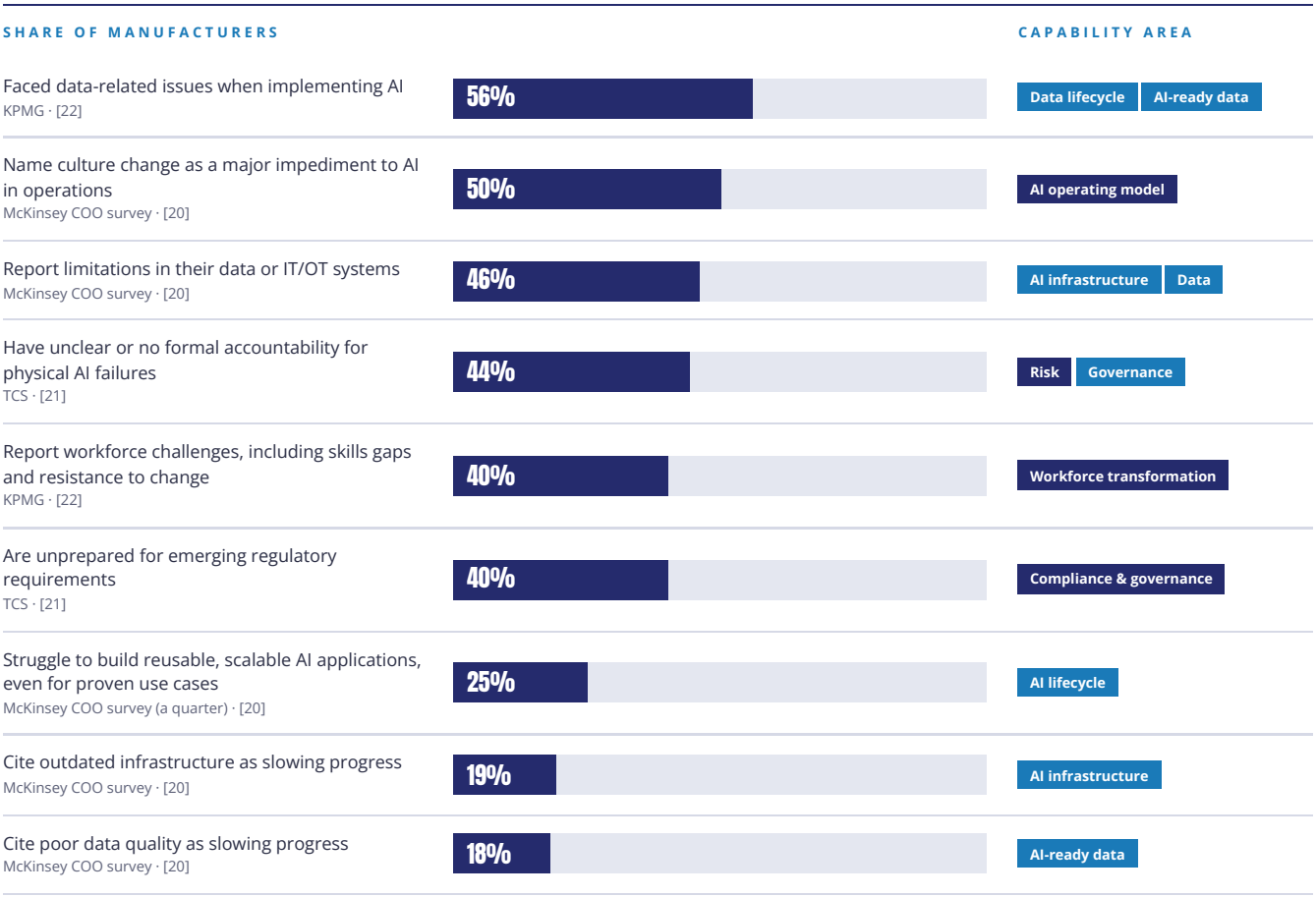


Figure 15. Barriers to AI in manufacturing from three manufacturing-only surveys, with the capability areas each points to. The surveys use different samples, so compare within a source rather than across. Sources: KPMG [22], McKinsey [20], TCS [21].

Governance is the quiet differentiator

A Manufacturing Leadership Council survey, cited by McKinsey, found most manufacturers lack AI-specific KPIs. Where those targets do exist, nearly two-thirds of companies meet or exceed them.[20] A fixed set of AI KPIs, each with Before, Target and Actual values, turns that finding into practice.

Build, buy or both

Almost three-quarters of manufacturing COOs expect a hybrid build, buy and partner operating model.[20] That's why a readiness review should cover both what you buy and what you build and run yourself.

04 SECTION 04 · WHY INVEST IN READINESS · 1 OF 2

The Cost of Standing Still

Readiness competes for budget with everything else on the plant floor. Here is the cost of not having it.

UNPLANNED DOWNTIME, PER YEAR

$1.4 trillion

lost by the world's 500 largest companies, equivalent to 11% of their total revenues.

SIEMENS, THE TRUE COST OF DOWNTIME 2024 · [23]

WHAT ONE HOUR OF DOWNTIME COSTS

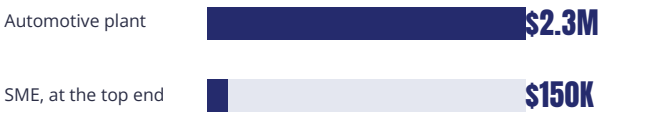


Figure 16. Cost of one hour of downtime, drawn to scale. Siemens [23].

RISE IN THE COST OF DOWNTIME, 2019 TO 2023

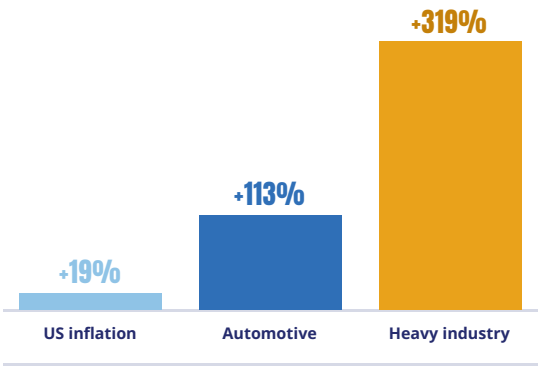


Figure 17. Downtime costs have far outpaced inflation. Siemens [23].

WHAT PREDICTIVE MAINTENANCE TYPICALLY DELIVERS

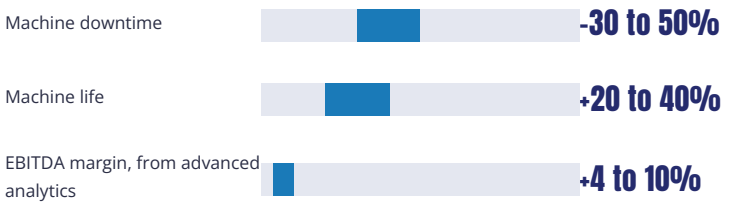


Figure 18. Typical ranges reported by McKinsey for process manufacturers, 2017 [24]. The shaded band shows the range.

WHERE YOUR MAINTENANCE SITS ON THE MATURITY LADDER

Level 0
No AI
Routine maintenance is automated but rigid. Data and alerts exist, with no AI or advanced diagnostics.

Level 1
Visibility
Real-time visibility of machine status. Maintenance follows data, but rules are entered by hand.

Level 2
Diagnostic
AI diagnoses problems and flags inefficient maintenance. People carry out the fixes.

▼ PREDICTIVE MAINTENANCE STARTS HERE

Level 3
Predictive
AI predicts machine issues. Operators act on the predictions, with limited automatic adjustment.

Level 4
Prescriptive
AI recommends actions in real time. Semi-autonomous systems handle routine maintenance.

Level 5
Autonomous
AI runs maintenance at all levels in real time. People focus on oversight and exceptions.

Figure 19. Maintenance maturity ladder, adapted by the authors from INCIT's industrial AI maturity framework [29]. The McKinsey savings shown above come from the predictive stage, Level 3 and above.

NOW PUT YOUR OWN NUMBER ON IT

Unplanned downtime hours last month _____

Contribution margin lost per hour _____

Cost of one month of downtime _____

Annual return if you cut it by 30% (use margin, not revenue) _____

Where a readiness assessment comes in

A readiness assessment places your maintenance on this ladder using evidence, not opinion, then checks whether your infrastructure can support the next level. You learn whether the savings above are within reach today, or which foundation has to come first. Track the result through MTTR against a recorded baseline.

SECTION 04 · WHY INVEST IN READINESS · 2 OF 2

What Readiness Pays Back

Results from manufacturers that scaled AI and digital technology, rather than piloting it.

THE 2025 GLOBAL LIGHTHOUSE COHORT · 12 NEW SITES, BRINGING THE NETWORK TO 201 [25]

+40%	-48%	-41%	-28%	-44%
labour productivity, on average	lead time, on average	product defects, in AI-enabled top use cases	energy consumption, in AI-enabled top use cases	cycle time, in AI-enabled top use cases

Figure 20. AI and generative AI enabled up to 50% of the cohort's top use cases. World Economic Forum, 16 September 2025 [25].

NET BENEFITS REPORTED SINCE ADOPTING SMART MANUFACTURING

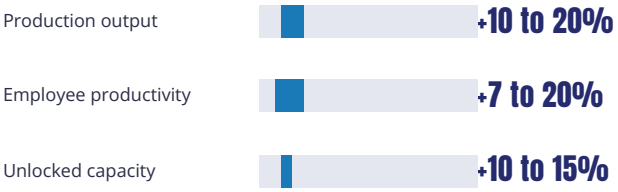


Figure 21. Deloitte 2025 Smart Manufacturing and Operations Survey, 600 US manufacturers [27].

WHAT MANUFACTURING AI LEADERS REPORT

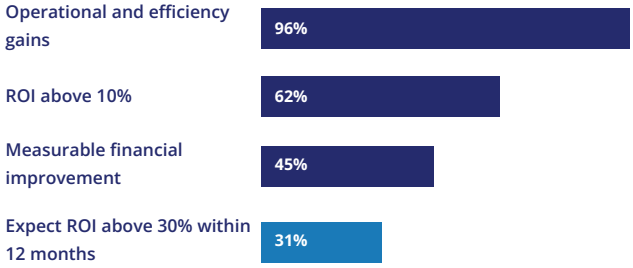


Figure 22. KPMG Intelligent Manufacturing, 183 senior manufacturing AI leaders in eight countries, 2025 [22].

93%

of manufacturing AI leaders believe companies that fully integrate AI will gain a significant competitive edge over those that don't.

KPMG · [22]

94%

of successful Lighthouse transformations combine several technology domains, with AI most often alongside IoT, cloud and digital twins.

WEF, JANUARY 2026 · [26]

16%+

average outperformance by Lighthouses that pair technology with workforce and sustainability initiatives.

WEF, JANUARY 2026 · [26]

Scaling AI requires integrated systems, capable people and effective governance. Assessing these capabilities first helps manufacturers identify gaps and prioritise improvements before committing investment. Financial value is realised through implementation and demonstrated through measured results against clear KPI baselines.

WHAT GOOD LOOKS LIKE

Four Plants That Got Past the Pilot

Named sites recognised by the World Economic Forum's Global Lighthouse Network, with the results they reported.

Averages make the case. Named plants make it believable. Each of these sites scaled AI across the operation rather than proving it on one line, and each published what moved.

EATON · CHANGZHOU, CHINA · ELECTRICAL EQUIPMENT

164,000 SKUs, over 5,000 new custom designs a year

Managing a large, highly customised portfolio required greater agility and consistent quality.

The site combined AI, simulation, robotics, generative AI and digital twins to improve design and manufacturing responsiveness.

-39%	+50%	+129%
LEAD TIME	OPERATIONAL EFFICIENCY	REVENUE, WITHOUT ADDITIONAL HEADCOUNT

GLOBALFOUNDRIES · FAB 7, SINGAPORE · SEMICONDUCTORS

Talent shortage, rising complexity

Surging demand, including new automotive devices, met tighter quality requirements and longer prototype cycles.

Implemented more than 60 Fourth Industrial Revolution use cases across machine-learning predictive maintenance, remote support, ML quality control and workflow digitalisation, working with AI vendors and universities.

+40%	-30%
LABOUR PRODUCTIVITY	NEW PRODUCT PROTOTYPING TIME

METTLER-TOLEDO · CHANGZHOU, CHINA · PRECISION INSTRUMENTS

When a third of orders are single items

Demand shifted towards tailored solutions in a fragmented market, with 34.8% of orders being single-item orders.

Deployed 49 use cases, including AI-accelerated product configuration, reconfigurable modular workstations and machine-learning welding inspection with closed-loop adjustment.

98.4%	-22%	84.9
ON-TIME DELIVERY	LEAD TIME	NET PROMOTER SCORE

ROCKWELL AUTOMATION · SINGAPORE · INDUSTRIAL AUTOMATION

Over 1,000 SKUs, over 20,000 annual changeovers

Staying flexible across a broad product range, while reducing reliance on operator experience, was the core challenge.

The site introduced more than 50 digital and AI solutions, including flexible automation, AI-enabled quality control and intelligent maintenance, to improve flexibility, quality and workforce capability.

+43%	-35%	-67%
UNITS PER PERSON-HOUR	DEFECTS	TIME TO COMPETENCY

Figure 23. Results as reported by the World Economic Forum for Global Lighthouse sites recognised in September 2025 [25] and in the Forum's 2026 network update [1].

What the four have in common

None of them is a single clever model. Each combined several technologies at once, which is the pattern across the network: 94% of successful transformations combine multiple technology domains, most often AI with IoT, cloud and digital twins, and sites that pair technology with workforce and sustainability programmes outperform their peers by 16% or more.[26] That combination is what a readiness assessment examines, and what a single-line pilot never tests.

BEYOND THE MODEL

The "Soft" Areas Carry Hard Numbers

Ethics, governance and energy are easy to skip in a pilot. At scale they carry real costs, and each one belongs in a readiness review.

RISK & GOVERNANCE

Regulation now has a price tag

The EU AI Act sets maximum fines as whichever is higher of a fixed amount or a share of worldwide annual turnover.[17]

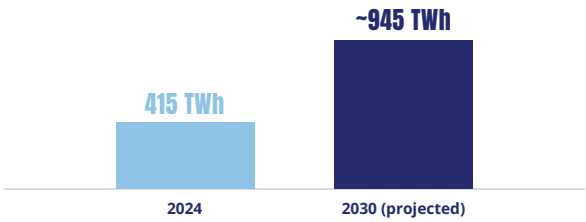
€35M or 7%	Prohibited AI practices
€15M or 3%	Breaches of other obligations, including those on providers and deployers of high-risk systems
€7.5M or 1%	Incorrect, incomplete or misleading information to authorities

Obligations are being phased in. Check which apply to your AI systems and markets with legal counsel. ISO/IEC 42001:2023, the first AI management system standard, sets out what a governance system should contain [28]. Source: EU AI Act, Article 99 [17].

ETHICAL & ECO-EFFICIENT AI

AI has an energy bill of its own

Data centres used about 415 TWh in 2024, around 1.5% of the world's electricity. The IEA expects that to more than double by 2030.[18]



Plant decisions matter: choose a model suited to the task, set inference frequency to operational needs, and compare edge, on-site and cloud computing. Track energy per useful output alongside accuracy and reliability.

Data centre consumption has grown about 12% a year since 2017, more than four times faster than total electricity use. IEA, Energy and AI [18].

AI ORGANISATION

Leadership is a measurable capability

91% of high-maturity organisations have appointed dedicated AI leaders.[12] Those leaders focus on AI innovation (65%), delivering AI infrastructure (56%), building AI teams (50%) and AI architecture (48%).

A readiness review should cover the operating model and workforce behind AI, not just the tools. Source: Gartner [12].

STRATEGY

Fewer bets, bigger returns

AI leaders pursue about half as many opportunities as their peers and expect more than twice the ROI.[3] High-maturity organisations choose projects on business value and technical feasibility, and back them with governance.[12]

Reviewing your AI strategy shows whether your portfolio is focused or scattered. Sources: BCG [3], Gartner [12].

Figure 24. Four readiness areas that pilots often leave out, with the external evidence for why they matter at scale.

A pilot can ignore regulation, energy and leadership for six months. A plant running AI on every line cannot ignore them at all. That is why readiness is as much about organisation and governance as it is about technology.

05 SECTION 05 · WHAT TO DO NEXT

Where Does Your Plant Sit?

Ten statements drawn from the evidence in this article. Tick the ones that are true of your plant today.

This is a conversation starter for your next operations meeting. It uses the same failure patterns the research describes, so an honest discussion shows where your constraints are likely to sit.

- [ ] Our best AI use case still runs on the line where it started.
- [ ] We cannot state, in numbers, what that use case is worth per year.
- [ ] There is no recorded "before" value for the KPI it was meant to improve.
- [ ] Putting it on a second line would mean rebuilding the data pipeline.
- [ ] Tag names, units or quality records differ between lines or plants.
- [ ] No single person is accountable for model risk, drift or compliance.
- [ ] Our AI budget is mostly models and tools, with little for training and change.
- [ ] Operators work around the AI output, or ignore it, on at least one shift.
- [ ] We could not show an auditor evidence for how the AI makes its decisions.
- [ ] The plant has no agreed AI priorities for the next budget cycle.

Note. These questions are discussion prompts, not a readiness assessment or maturity classification. A formal assessment evaluates evidence against defined criteria and is conducted by a qualified assessor.

TURN EACH CHECKED ITEM INTO AN ACTION

01

Discuss the constraint

Identify where it occurs, who it affects and how it limits deployment or value.

02

Review the evidence

Check data-quality records, deployment and monitoring logs, ownership documents, and the Before, Target and Actual values of the relevant KPIs.

03

Agree ownership and next steps

Name a responsible owner, define the next action and set a review date. Confirm how progress will be measured.

Figure 25. Discussion checklist prepared by the authors from the research in Sections 02 to 04. Responses are not scored and do not assign a maturity level.

From discussion to structured assessment

Use the discussion to identify issues that need deeper examination. A structured readiness assessment, such as INCIT's Industrial AI Maturity Readiness Index (AIMRI), can help establish capability gaps and prioritise improvements to inform investment decisions. To explore an assessment for your plant, contact INCIT or visit incit.org/what-we-do/aimri.

SECTION 05 · WHAT TO DO NEXT

What to Do Before the Next Budget Round

Five things any plant can do this quarter, whatever its AI maturity. None of them needs a new platform, and all five make the next investment decision easier to defend.

1 **Count your pilots honestly**

List every AI use case running today: where it runs, who owns it, and whether it has left the line it started on. IDC found only 4 of every 33 proofs of concept reached production.[8] Most plants are surprised by their own list.

2 **Baseline the KPIs you would defend in front of the CFO**

OEE, mean time to repair, first pass yield, scrap rate, energy per unit. Twelve months of trended data, with the source system named for each. A pilot without a "before" value cannot prove anything later, and unclear business value is one of the four reasons Gartner gives for abandoned projects.[5]

3 **Test one pilot against the rollout, on paper**

Pick your best pilot and ask what line two would need: the same data, the same integration, the same compute. If the answer is "rebuild it", the constraint is the foundation, not the model. That is the pattern behind 46% of manufacturing COOs reporting data or IT/OT limitations.[20]

4 **Name an owner for model risk**

Someone accountable for drift, security and compliance, before the first incident rather than after it. 44% of manufacturers have unclear or no formal accountability for AI failures.[21] The EU AI Act sets fines of up to 35 million euros or 7% of worldwide turnover for prohibited practices,[17] and ISO/IEC 42001 gives a management-system reference to work from.[28]

5 **Get an independent readiness assessment before you commit the money**

A structured assessment evaluates your capabilities against evidence, identifies gaps and prioritises improvement areas to inform investment decisions. Funding and implementation decisions remain with your organisation. High-maturity organisations keep AI in production for three years or more at more than twice the rate of low-maturity ones.[12]

What the assessment adds

Steps 1 to 4 establish an initial picture. A readiness assessment adds evidence-based maturity scores, assessor insights, benchmarking and prioritisation to inform investment decisions, along with a structure for tracking KPIs against baselines and targets. Financial benefits depend on implementation and measured results.

NEXT IN THIS SERIES

From Pilot to Plant-Wide

Part 2 is the practitioner's guide to assessing AI readiness: the capabilities to examine, how maturity is scored, how to prioritise improvements, the KPIs to track, and a printable preparation checklist.

Ready to measure instead of guess?

INCIT's Official AIMRI Assessments are run by Certified AIMRI Assessors. To scope one for your plant, contact INCIT or visit incit.org/what-we-do/aimri.

EVIDENCE BASE

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A note on how the numbers are used

Where a source studied generative AI or all industries rather than manufacturing, the article says so. Plant-floor examples beside research findings are the authors' illustrations, not part of the cited studies.

A pilot tests an idea. Readiness assessment helps identify the capabilities needed to scale it.

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The series

- **Part 1, this article.** Why manufacturing's AI pilots stall, what the delay costs, and what readiness pays back.
- **Part 2, From Pilot to Plant-Wide.** Assessing AI readiness in practice: capabilities, maturity, priorities, KPIs and preparation.

About INCIT

The International Centre for Industrial Transformation develops and maintains a family of manufacturing indexes: SIRI for Industry 4.0, COSIRI for sustainability, OPERI for operational excellence and AIMRI for industrial AI. AIMRI was co-developed with Detecon International, with scientific advisors from TUM, the University of Maryland and Tecnológico de Monterrey.

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