

FROM AI INSIGHT TO FRONTLINE ACTION IN MANUFACTURING

**A PLAYBOOK FOR
MAKING AI WORK
AT THE POINT OF WORK**



ROO.AI

From AI Potential to Operational Impact



Artificial intelligence adoption is snowballing in manufacturing operations. Manufacturers are applying AI to a broad spectrum of functional areas, and manufacturing back-office personnel are quickly finding uses for AI tools in their daily work. While full scale deployments are still in early stages, 72% of manufacturers report adopting AI in some form according to Parsec Automation's 2026 manufacturing survey.

Deloitte's 2025 Smart Manufacturing survey found that companies implementing smart manufacturing initiatives reported, on average, 10% to 20% improvements in production output, 7% to 20% improvements in employee productivity and 10% to 15% in unlocked capacity. Other recent research likewise points to rapidly increasing AI experimentation and benefits.

72%
OF MANUFACTURERS
ALREADY AI ADOPTERS



The opportunity now is not simply finding more ways to apply AI. It is understanding how to maximize AI impact in operations and turn AI-generated insight into action where people, equipment and processes come together.

Where AI Insights Are Powering Manufacturing

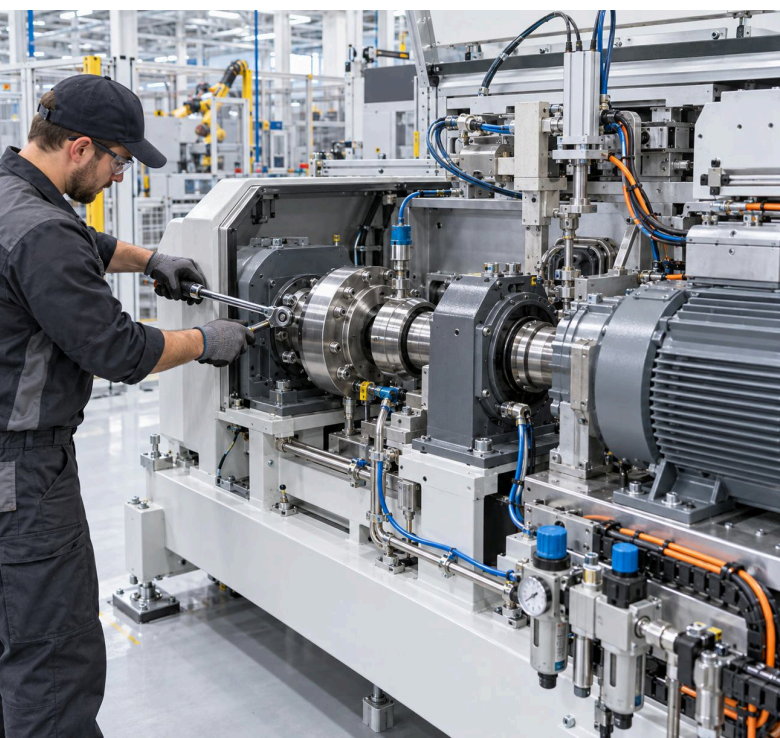


AI is already influencing decisions across virtually every layer of manufacturing. The opportunity now is to understand where these applications are creating value, where that value can be amplified, and what it takes to move from AI-generated insight to operational action that drives impact.

1 Predictive Maintenance

Predictive maintenance uses equipment sensors, operational data, maintenance histories and AI/ML to identify patterns that indicate asset degradation or potential failure. Instead of relying solely on fixed maintenance intervals or reacting after a breakdown, manufacturers can monitor asset health continuously, detect anomalies, identify likely failure modes and prioritize maintenance based on risk and condition.

The potential value is significant. Siemens reports that customers using its Senseye predictive maintenance technology have achieved results including up to a 50% reduction in unplanned downtime and a 55% increase in maintenance staff productivity. Major industrial technology providers including Siemens, IBM, ABB, Rockwell Automation, PTC and Schneider Electric offer asset performance, predictive maintenance or industrial analytics capabilities. These solutions increasingly combine condition monitoring, machine learning, anomaly detection, diagnostics and workflow capabilities.



Emerging Opportunity:

Predictive maintenance is moving beyond “monitor and predict” toward “predict, prioritize and act.” The opportunity is to turn earlier warnings into better maintenance decisions, faster intervention and measurable reductions in downtime.



2 Skills Development

Manufacturing faces a workforce shortage at the same time that jobs are becoming more technically complex. The Manufacturing Institute and Deloitte estimate that 3.8 million manufacturing jobs could open in the United States between 2024 and 2033, with 1.9 million potentially going unfilled. More than a third of manufacturers surveyed by Deloitte also identified adapting workers to the “Factory of the Future” as a top concern.

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Emerging Opportunity: Skills development is moving from “train people for the job” toward “continuously develop capability as the job evolves.” AI can help turn insights about workforce capability into better performance, faster time-to-competency and more effective knowledge transfer.

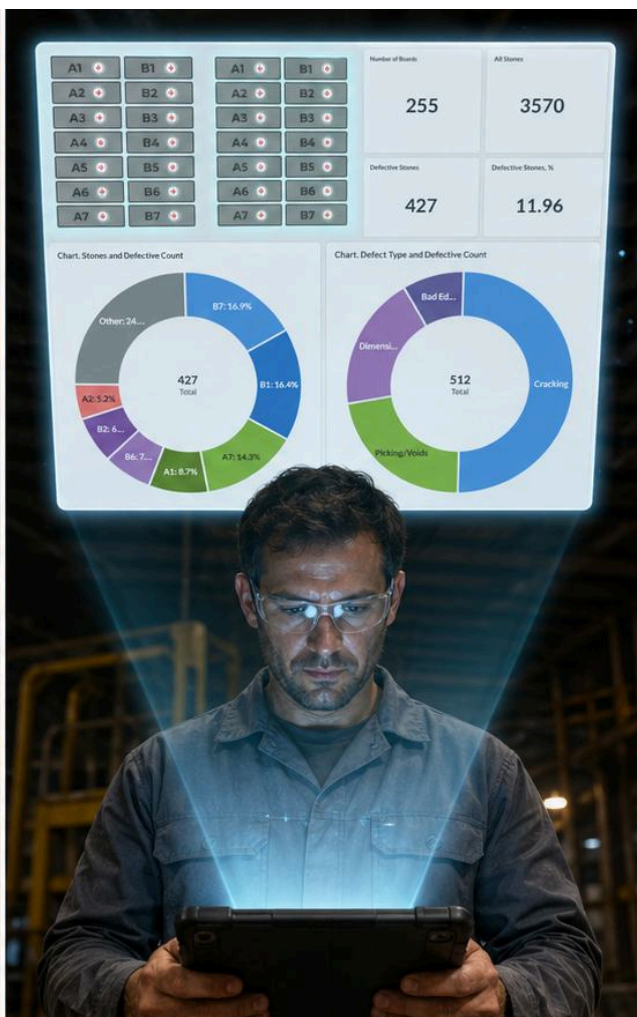
3 Resource Planning

Manufacturing planning requires balancing demand, production capacity, labor, materials, inventory, equipment availability and delivery commitments despite constantly changing conditions. AI and advanced optimization can analyze these variables simultaneously, identify constraints and tradeoffs, generate scenarios and help planners respond more quickly.

Deloitte found that 35% of manufacturers ranked advanced production scheduling as a first- or second-priority investment over the following two years. Leading providers include SAP, Kinaxis, o9 Solutions and Oracle, whose platforms increasingly combine forecasting, optimization, scenario planning and AI-assisted decision-making. More advanced systems are moving toward continuous planning, where plans are adjusted dynamically as new information becomes available.

Emerging Opportunity:

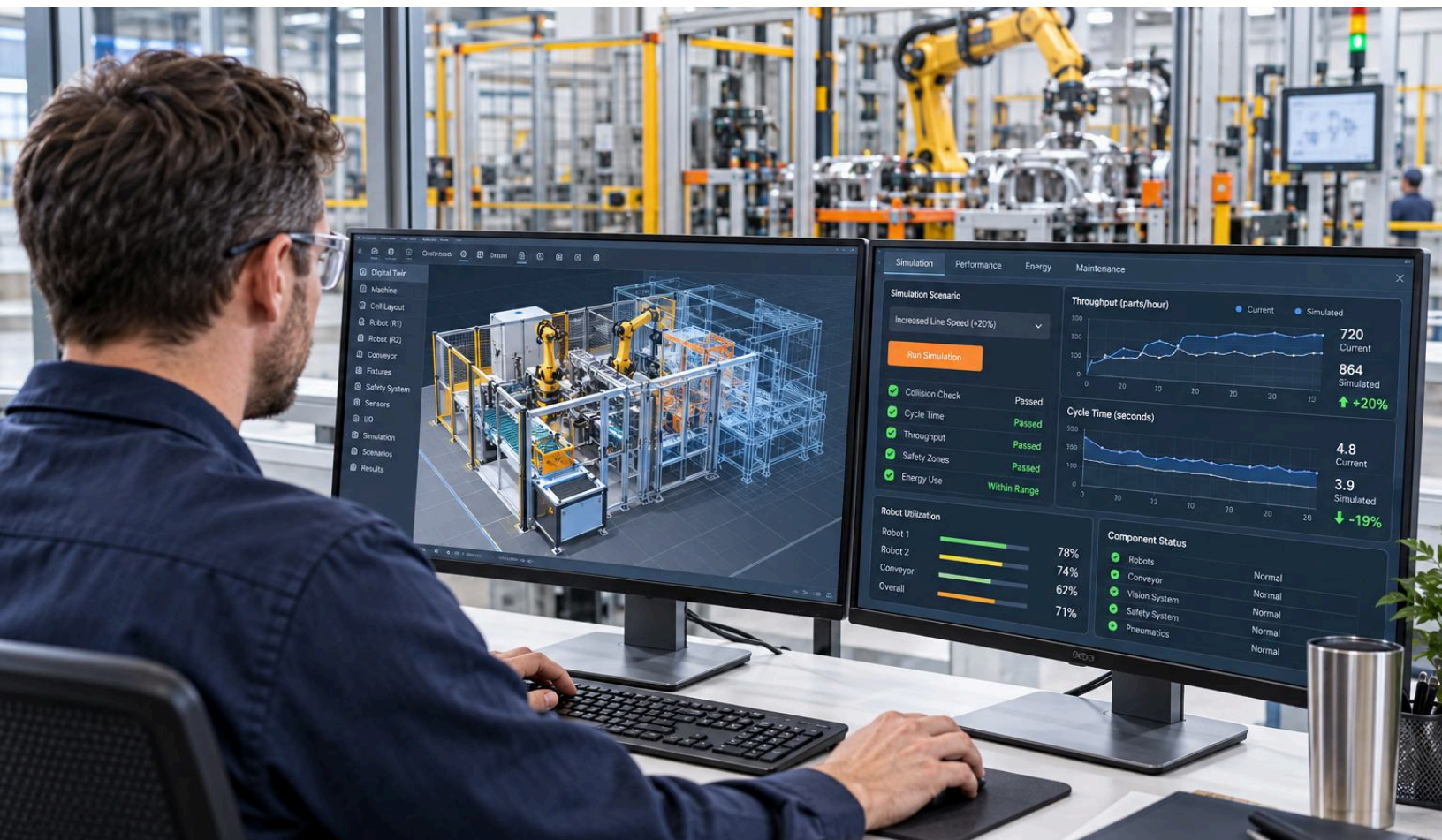
Resource planning is moving from “optimize the plan” toward “continuously sense, plan, adapt and execute.” The closer planning systems can get to real operational conditions, the more responsive and useful their recommendations can become—and the better manufacturers can respond to change while improving schedule adherence.



4 Digital Twins

Digital twins create virtual representations of products, equipment, processes or entire production environments that can be analyzed and used to simulate real-world conditions. Manufacturers can use them to test changes before implementation, optimize processes, support commissioning, identify potential problems and understand the impact of different operating scenarios.

Leading digital-twin platforms include Siemens Xcelerator, NVIDIA Omniverse, Dassault Systèmes, PTC, Ansys and Microsoft Azure Digital Twins. Applications range from engineering and product development to factory design, production optimization and increasingly AI-enabled operations. The direction is toward connecting digital models with live operational data so simulations and recommendations reflect actual conditions rather than static assumptions.



Emerging Opportunity:

Digital twins are moving from “model the factory” toward “continuously connect the model to the factory.” The more accurately the digital environment reflects real-world conditions—and the more effectively insights can influence actual operations—the more valuable the twin becomes for improving throughput, quality and operational performance.



Where AI Value Gets Lost



A predictive maintenance model can identify an asset at risk. A planning system can recommend an optimized schedule. A digital twin can identify a better process. The value of each depends on what happens next. AI insight alone does not trigger operational impact.

This is where AI value can get lost. Insights need to be translated into action. Unfortunately, in many early systems that insight to action loop is not automated and AI does not play an active role in driving outcomes from its insights. Often, humans receive the insights and utilize existing manual processes to implement them, introducing delay and uncertainty which is particularly true for frontline human-powered activity.

The problem also works in the opposite direction. The AI system may not have an adequate flow of feedback and data needed to produce the best possible insight on an ongoing basis. What actually happened on the floor? What did the technician observe? Was the recommended action taken? Did an operator discover an exception? Much of this information remains unstructured, disconnected or simply never captured.

**AI NEEDS THE
FRONTLINE.
THE FRONTLINE
NEEDS AI.**

Deloitte identifies data capture and analytics as major manufacturing investment priorities, while McKinsey's 2025 research found that 46% of manufacturing COOs reported limitations in their data or IT/OT systems, with poor data quality and outdated infrastructure among the barriers to scaling AI.

The opportunity is not simply to put more AI into manufacturing. It is to create a more effective two-way connection between AI intelligence and the operation.

What the Frontline Needs



The frontline needs more than information. It needs relevant intelligence in the context of the work.

- Context**
Information relevant to the specific asset, product, process or task.
- Guidance**
Clear instructions and recommendations at the point of need.
- Assistance**
The ability to ask questions, troubleshoot problems and access organizational knowledge.
- Automation**
Workflows that move work forward, remove manual steps, and reduce administrative effort.
- Visibility**
Constant access to information needed to understand priorities, changes and exceptions.
- Feedback mechanisms**
Simple ways to record observations, defects, decisions and outcomes.
- A consistent experience**
A practical interface that can support multiple processes and use cases.

The organization also needs something from the frontline. Workers are closest to the equipment, process and customer. They see conditions that may never appear in an enterprise system. They recognize exceptions, work around constraints, identify emerging problems and make decisions that can materially affect the outcome. Capturing that information turns frontline activity into an additional source of operational intelligence. The frontline therefore becomes both a consumer of AI and a source of the data that makes AI more useful.

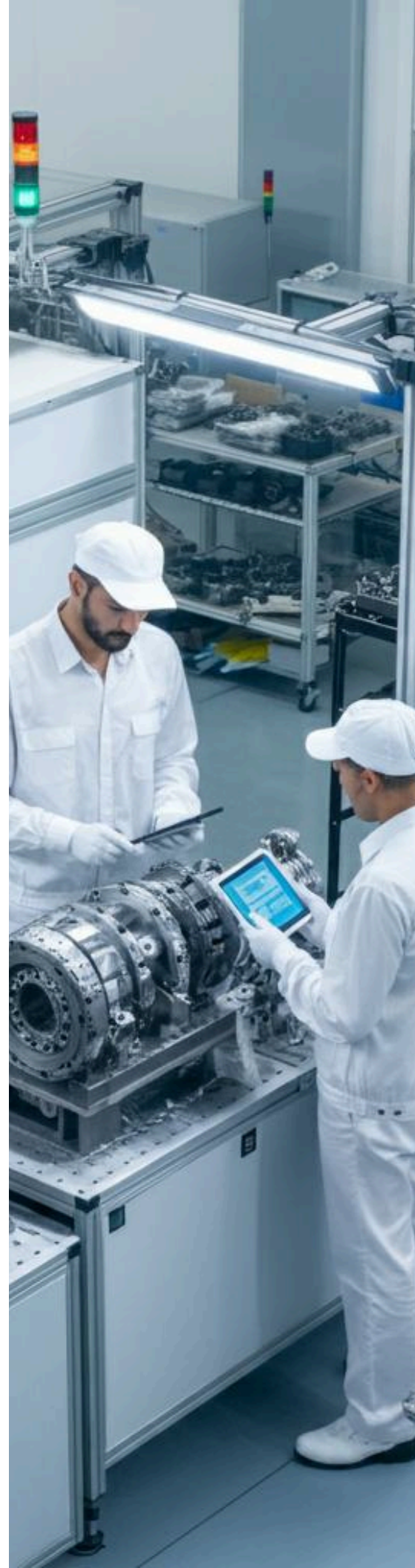


From AI Insight to Frontline Action — and Back Again

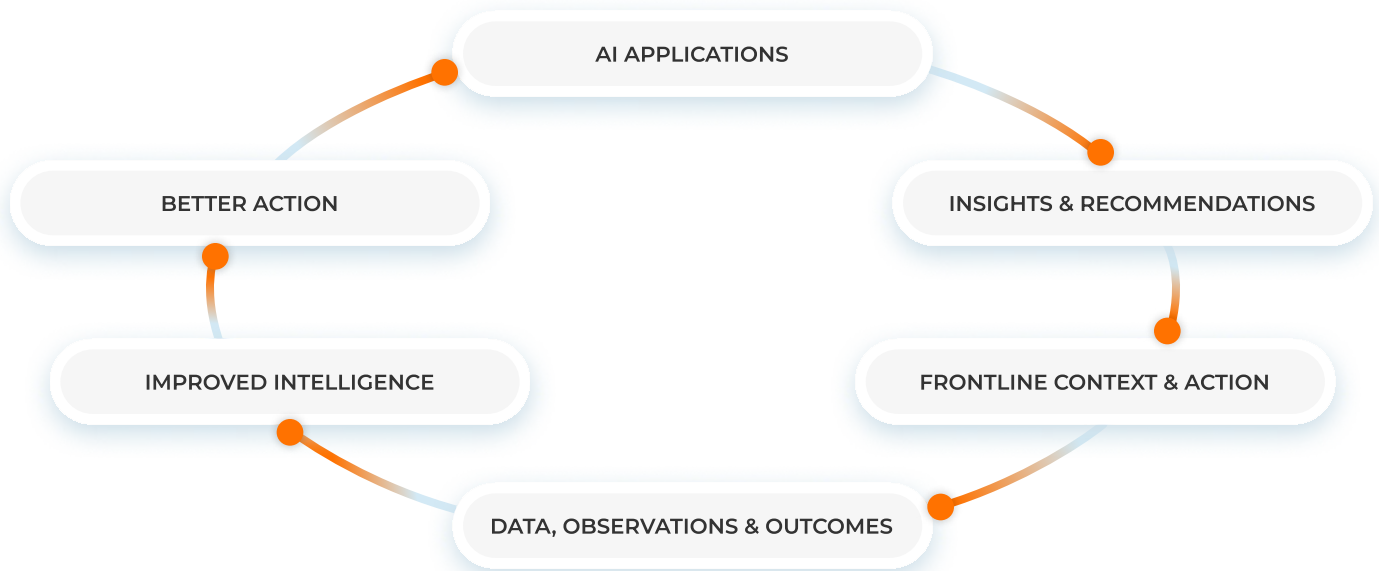


The technology exists today to bridge this gap and enable a bidirectional connection between AI and the frontline. A Frontline AI Platform can provide an operational layer between AI applications, enterprise systems and the people doing the work. It can deliver intelligence into the flow of work, help workers act on it, automate appropriate processes and capture what happens as a result. Key components include:

- **Frontline user interface:** A simple, accessible experience that puts information, workflows and AI assistance where work happens.
- **AI in the flow of work:** AI-powered guidance, recommendations, knowledge and decision support delivered in the context of the task.
- **Process automation:** Digital workflows that turn observations and recommendations into assignments, actions, escalations and follow-up.
- **Closed-loop processes:** Connecting the initial insight or issue through action, verification and resolution.
- **Data capture and structured tagging:** Turning observations, inspections, defects, images, decisions, actions and outcomes into usable operational data.
- **Integration:** Connecting frontline activity with enterprise applications, equipment and operational systems.
- **Multifunction capability:** Supporting multiple frontline processes through a common platform rather than creating another isolated application for every use case.



The result is a bidirectional operational layer:



This is where the value of a frontline platform extends beyond worker enablement. It provides a way for AI to become part of how work gets done while making the work itself a richer source of data and intelligence.

For manufacturers, that creates the possibility of a compounding effect: better data supports better AI; better AI supports better decisions; better decisions and execution generate better data.



A Practical Starting Point



Implementing an AI project on the frontline can be a transformative step for any industrial organization, offering opportunities for enhanced efficiency, improved accuracy and quality, and better decision-making. However, understanding key aspects of the infrastructure needs and data requirements is crucial before embarking on such a project. The good news is that there are benefits to be gained from putting the right infrastructure in place even before applying AI to frontline operations.

First, it is important to acknowledge that frontline workers use technology differently than workers who sit behind a desk. Companies should first put in place a digital platform for frontline workers designed to deliver usable AI to the point of work. To optimize for this critical first step, look for an intuitive, visual digital infrastructure that automates process and data collection across production, quality, field service and maintenance workstreams. Usability is critical to adoption, and frontline workers will need time to become accustomed to using a digital platform consistently.



Second, understand that delivery of AI insight to the frontline and its subsequent translation into action is a journey. AI insights can be embedded in everyday work in a variety of ways. Look for options to start simply with AI-powered inspection briefings, worker coaching and AI CoPilots for fast natural language access to information and recommendations. As AI models evolve, such as those for predictive maintenance and resource planning, expand AI insights more directly into workflow guidance, task assignment and team collaboration.

Finally, consider both the model's data enrichment requirements and the ways data can be returned to AI models from the frontline. From early stages, begin to include data collection and feedback steps into workflows. Build the recognition and habits with frontline workers that their data and inputs are critical and will improve the automations and accuracy for the entire operation.

1 Digitalize

Establish the digital foundation for frontline work by enabling workers with a digital toolkit or platform. Such a platform should be implemented and used to replace clipboards, paper travelers, work instruction binders and spreadsheets to digitalize the processes workers already perform: inspections, procedures, safety checklists, issue reporting, work instructions, handoffs, incident reporting and other routine workflows. The objective is not AI yet. It is to replace fragmented paper, spreadsheets, disconnected applications and informal communication with consistent digital workflows to create the backbone for AI delivery and data enrichment.

At this stage, establish:

-  A frontline user interface
-  Digital workflows and forms
-  Structured data capture and tagging
-  Access to relevant information and work instructions
-  Basic integrations with existing enterprise and operational systems
-  The identity, roles and permissions needed to support frontline work

The result is a **digital representation of the work itself** — and the beginning of a reliable stream of frontline operational data.

Success looks like:

Workers adopt the platform as part of normal work, and the organization is capturing structured information that previously disappeared into paper, conversations or disconnected systems.

2 Acclimate

Make digital work part of the everyday frontline experience. Digitalization does not automatically create adoption and consistent use. Workers and frontline leaders need to experience the technology as something that makes work easier and more useful, rather than another system they have been asked to use. In this phase simple AI-powered capabilities can be introduced. The objective is to establish **trust, familiarity and habitual use** before asking workers to rely on increasingly sophisticated AI.

Introduce simple, high-value capabilities first:

- + Faster access to information and AI CoPilots
- + Easier reporting and documentation
- + Digital guidance such as work pre-briefing
- + Notifications and relevant alerts
- + Simple issue escalation
- + Visibility into priorities and status
- + Immediate feedback from the system

This is also where frontline leaders become important. Recent PwC/Manufacturing Institute research found that 45% of manufacturing leaders surveyed said exclusion of frontline leaders from AI design and rollout contributed to unsuccessful initiatives, while 54% reported low or very low confidence in their frontline leaders' ability to lead AI-driven change.



Success looks like:

Workers routinely use the digital environment because it improves how work gets done — not simply because management requires it.

3 Empower

Begin delivering AI intelligence directly into the work. Once usage of the digital workflow is established and workers are comfortable using it, AI can progressively guide and direct that workflow. The first applications should generally augment decisions rather than attempt to automate them. The important change is that AI is no longer simply producing an insight somewhere else in the enterprise. **The insight arrives where the decision or action occurs.**

- + Predictive alerts
- + Recommendations
- + Troubleshooting assistance
- + Contextual work instructions
- + Anomaly identification
- + Skills and learning recommendations
- + Planning or scheduling guidance

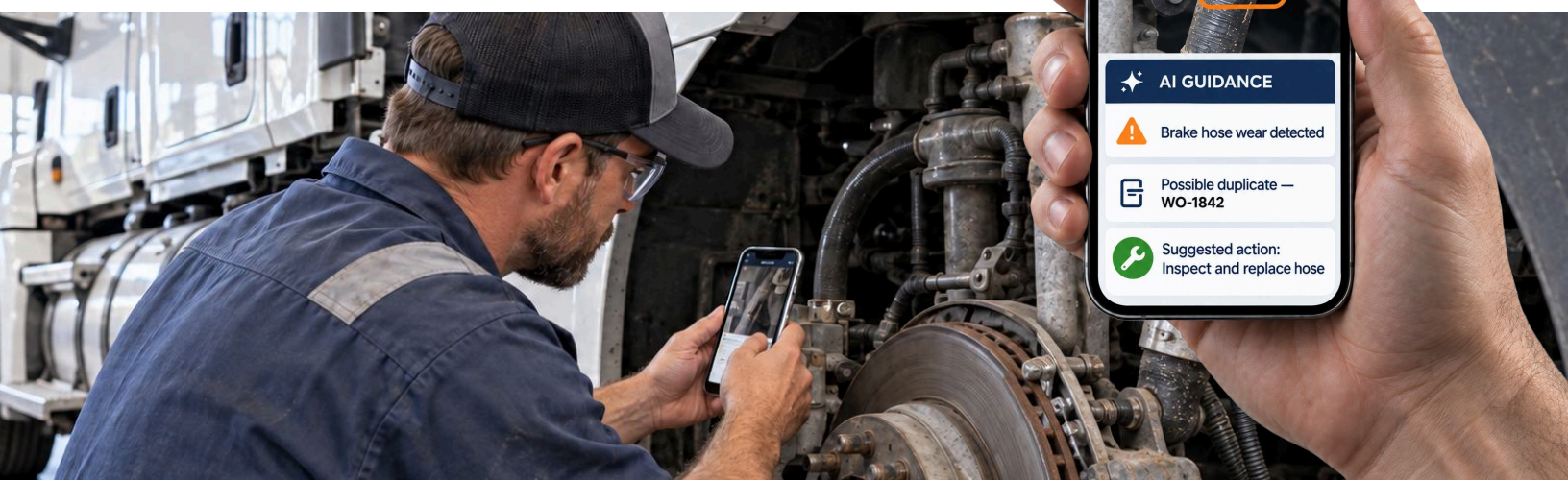
At the same time, the platform captures the worker's response. That creates a meaningful feedback loop between AI and frontline execution.

What did the worker see?

What did they decide?

What action did they take?

What happened afterward?



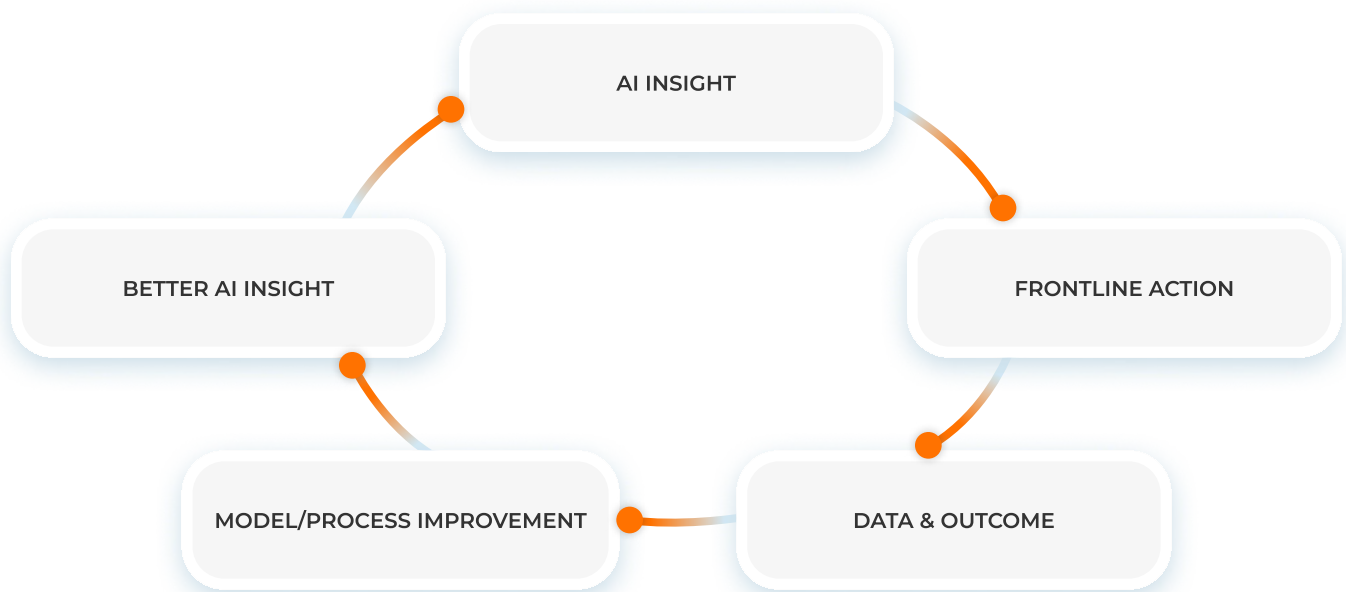
Success looks like:

AI is helping workers make better or faster decisions, while frontline actions and outcomes are becoming usable inputs for the next generation of AI.

4 Improve

Close the loop and continuously expand the value of AI. As the organization accumulates frontline data, AI models can become more informed by actual operating conditions. As workers interact with AI, the organization can identify where recommendations are useful, where they are ignored, where exceptions occur and where workflows themselves should change.

The feedback loop becomes:



At this stage, organizations can increase the **depth** of AI integration:



INFORMATION	→	RECOMMENDATIONS
RECOMMENDATIONS	→	GUIDED DECISIONS
GUIDED DECISIONS	→	AUTOMATED WORKFLOWS
INDIVIDUAL ACTIONS	→	CLOSED-LOOP PROCESSES
HISTORICAL DATA	→	REAL-TIME OPERATIONAL INTELLIGENCE

They can increase the **breadth** of AI across workstreams and functions such as maintenance, quality, production and safety. AI and the digital platform begin to both guide and orchestrate the work of individuals and teams boosting collaboration and productivity. Additionally, the same digital frontline platform can support new use cases and new applications of AI without requiring the workers to adapt to a new experience.

Success looks like:

AI becomes increasingly embedded in operational processes, frontline data continuously improves the intelligence being delivered, and successful patterns can be replicated across plants, processes and workstreams.

The Takeaway

Manufacturing's AI journey is moving beyond the question of "What can AI do?" As AI adoption accelerates, the more important question becomes: "How do we maximize the impact of AI in our operations?"

That requires more than powerful AI applications. It requires connecting AI intelligence with the people doing the work and capturing the intelligence generated by the work itself. A frontline digital platform creates an operational layer that makes that connection possible, allowing AI to become part of how work gets done while making the work itself a source of intelligence for the next generation of AI.



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