

Scale your manufacturing operations without increasing your costs

A playbook to competing with a lean team



Hold the line

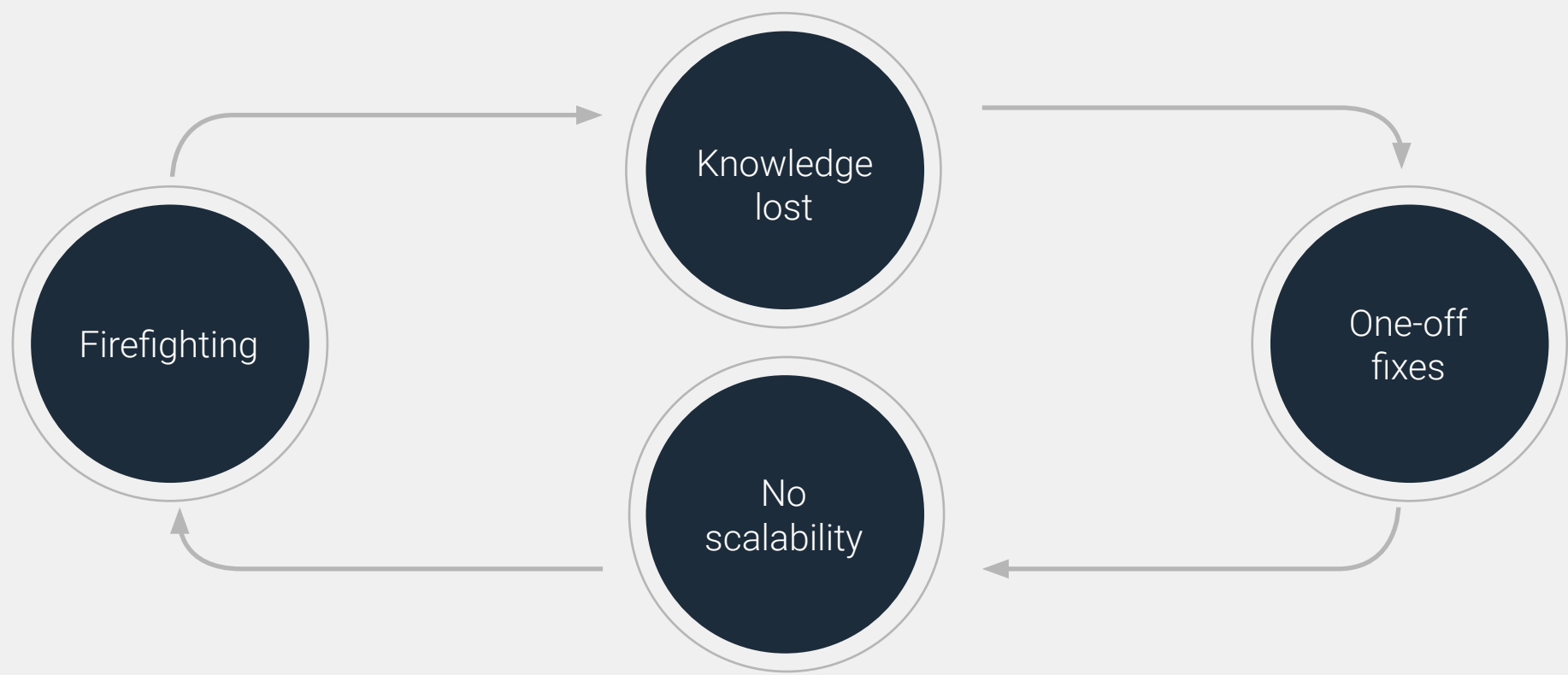
Many manufacturers face a widening gap between what the operation must deliver and what the current team can absorb. That's where margin, reliability and competitive ground get lost. Complexity keeps increasing and knowledge stays trapped — in individual experience, in disconnected systems, in improvements that work on one line but don't scale.

Here are practical approaches for manufacturers who need to get more out of the operation they already have, without increasing headcount or operational costs.

The opportunity is here, but not every organization will take it.

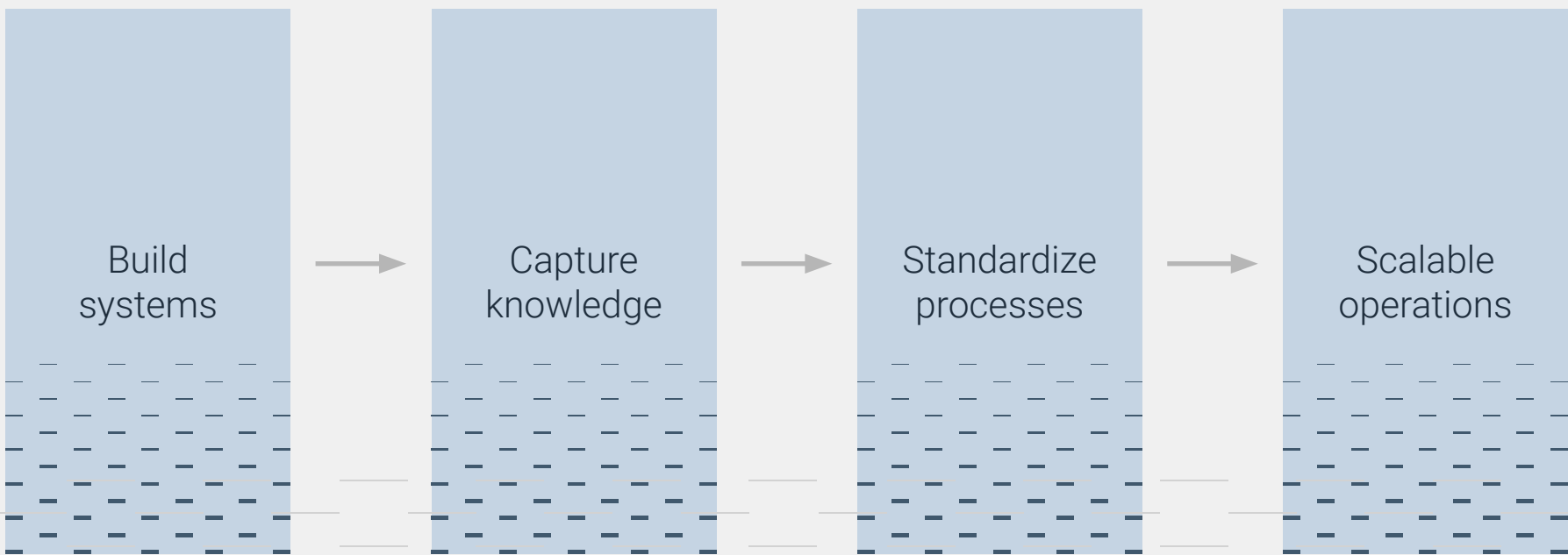
Manufacturers gaining ground today built a connected foundation where operational technology (OT) and IT systems share a common data layer, and edge systems connect to back-office environments without sacrificing security, reliability or scalability. Connected architecture enables decision-makers to get insights faster, narrowing the gap between what's happening on the floor and the team's ability to act, protecting margins.

Reactive loop



- Results:**
- Inconsistent quality
 - Burnout
 - Slow response
 - No leverage

Connected systems



- Results:**
- More output per person
 - Consistent quality
 - Faster response
 - Margin protected

Build a team that performs above its headcount

How connected systems close the knowledge gap and help manufacturers improve over time

Scenario: Gary's been on your floor for 22 years. He knows which press runs hot on cold mornings and needs an extra warm-up cycle or it'll jam by 10 a.m. He knows which supplier's parts come slightly undersized and require a compensating adjustment. He knows the sound the conveyor makes before it needs attention. The problem is none of that knowledge is in a manual and Gary's retiring in 18 months.

Most small and midsize manufacturing plants have several people like Gary. They carry years of hard-earned knowledge that keeps things running, but only they have it.

When a handful of individuals have critical operational insights and no consistent way to pass them on, newer operators repeat mistakes that took years to learn to avoid. Managers step in to help, but the time to build better systems never materializes. Then another experienced person leaves and the cycle starts over: preventable failures, a reactive scramble, and more lost ground.

The same issue that prevents Gary's knowledge from reaching the next operator also blocks improvements on Line 1 from benefiting Line 2. This disconnect means the system tracking equipment history can't fully support quality decisions or energy monitoring. Intelligence that can't move or grow isn't infrastructure — it's just storage.

When operational intelligence is embedded in systems, knowledge becomes a shared resource. It accumulates, evolves and remains, even as employees come and go.



The outcome: An operation that adapts to workforce changes, performs consistently and gets smarter over time.

Avoiding the knowledge drain

The cycle breaks when equipment history, failure patterns and guided responses are stored in connected systems instead of an individual's memory. This shared knowledge becomes accessible to every operator on every shift, growing and improving over time rather than resetting with each departure.

The capability is already on your floor. With the right systems, you can free up the knowledge trapped in the cycle.

Dell Pro Precision workstations and Dell Pro PCs, powered by Intel® Xeon® processors and running Windows 11 Pro for Workstations, support local analytics and guide decisions at the point of work. Information is available where it's needed, without requiring a separate analytics team.

The workforce transition in manufacturing is already underway:

26%

26% of U.S. manufacturing workers are age 55 or older.¹

~2M

~2M projected worker shortfall by 2030.²

Make operational information visible

Why disconnected systems keep improvements isolated

Scenario: You invested in a new monitoring system two years ago. It works on Line 1 but getting it onto Line 2 required three months of integration work and a consultant you can't really afford to bring back. You haven't even considered what it would take to integrate Line 3.

This situation isn't unusual because most manufacturers aren't starting from a blank slate. They're managing a mix of legacy equipment, newer connected machines and software that was never designed to share information.

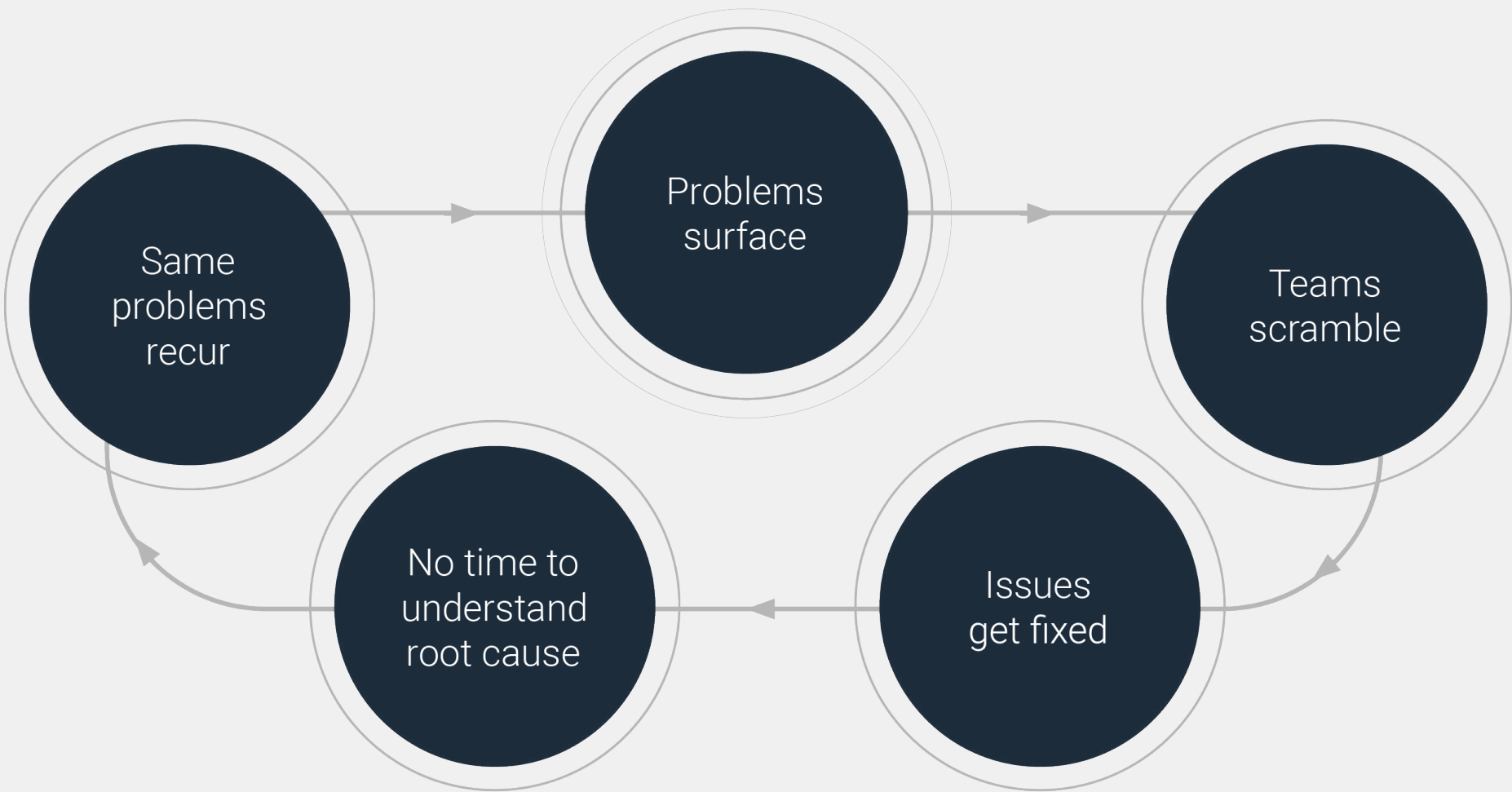
To scale improvements, organizations need to create a shared operational data layer so plant and business systems can exchange information. Once that foundation is in place, improvements on one production line can extend to the next without rebuilding integrations or starting over.

 **The outcome:** A data layer over modern IT infrastructure that can scale and make the next improvement faster and less expensive than the last one.

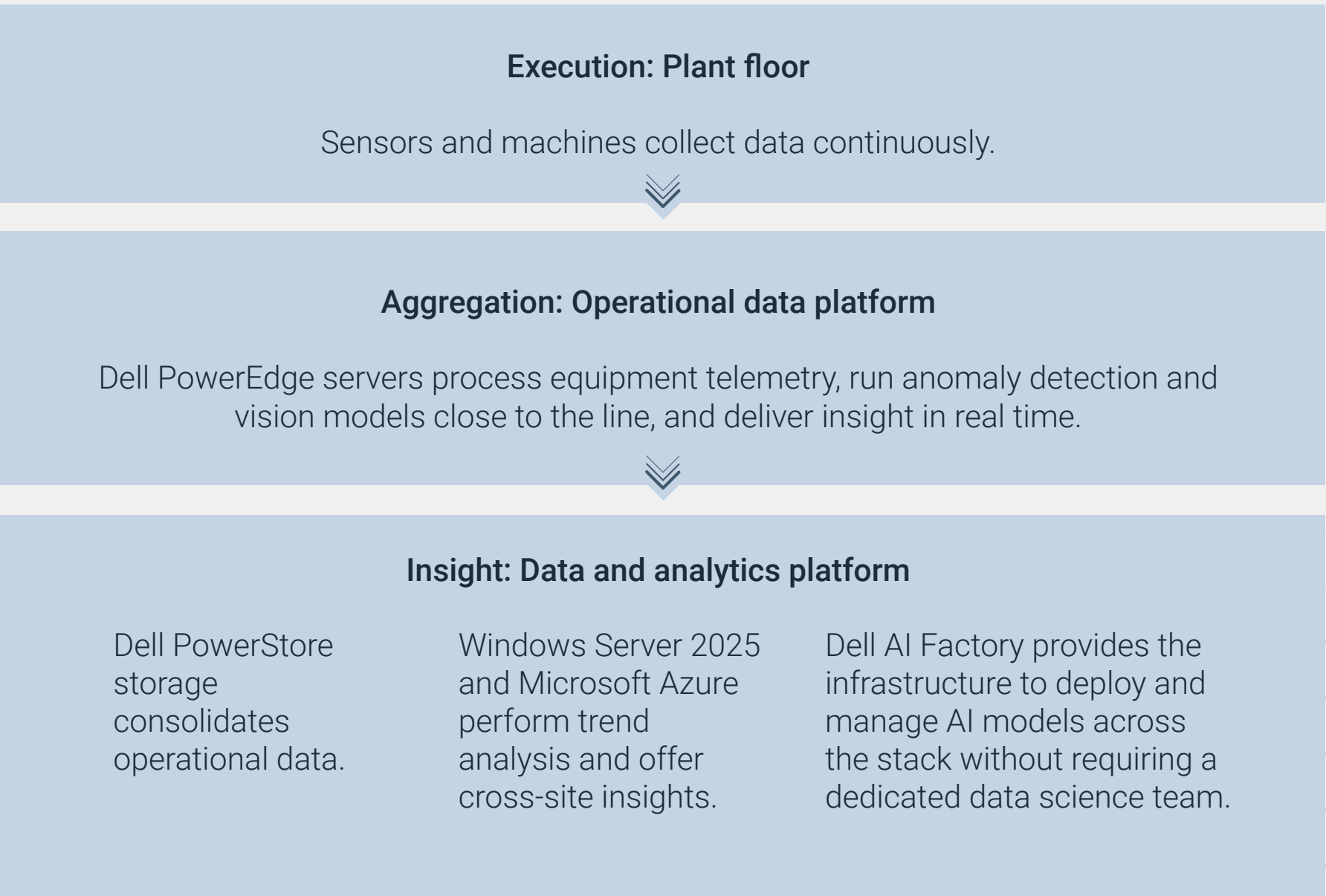
~2/3

~2/3 of plant-floor and supply-chain data is never analyzed, leaving teams to make decisions with only a partial view of what's happening in production.³

What a disconnected data foundation looks like:



What a connected data foundation looks like:



Move from reactive repairs to predictable uptime

What changes when a lean team gets timely insights

Scenario: A vibration anomaly was flagged 36 hours ago, and the replacement part is already on order. The maintenance window is scheduled for tonight's shift change. The line doesn't stop and nobody scrambles. Instead, everyone is focused on advancing the business.

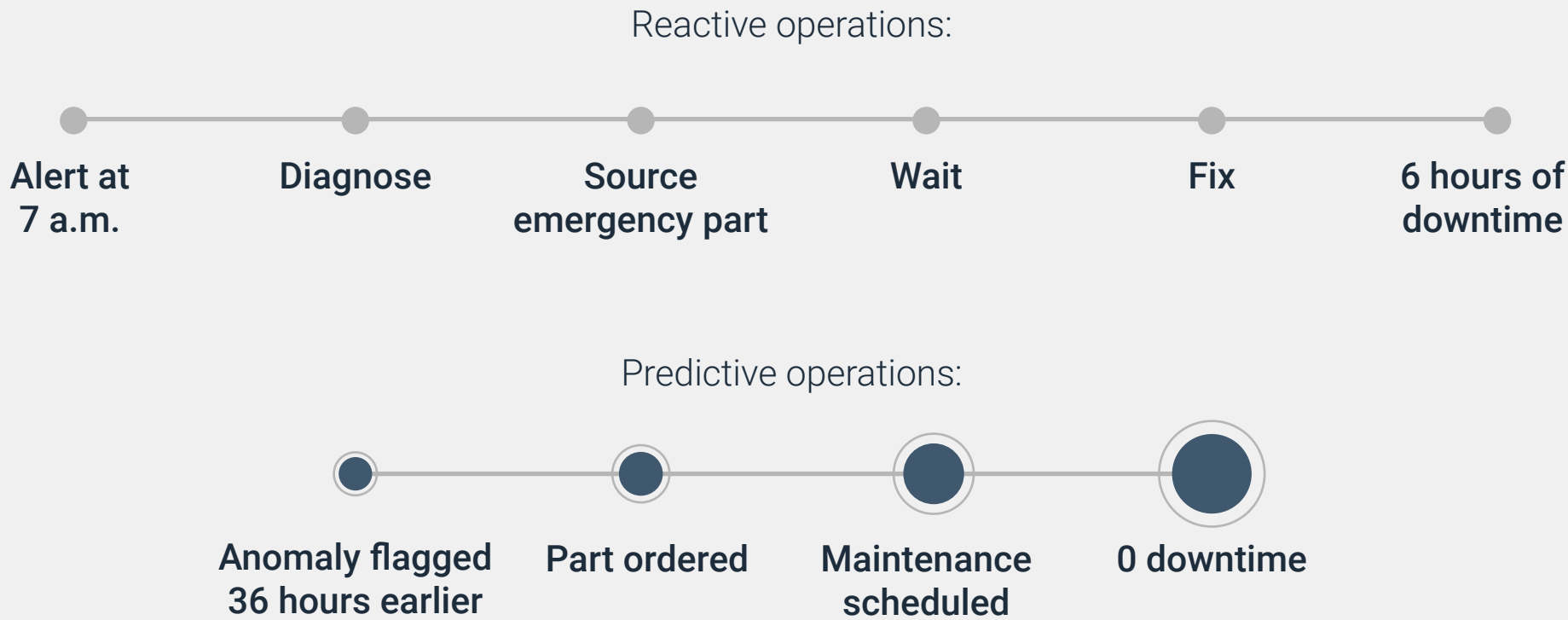
Most manufacturers already know predictive maintenance (PdM) is just the starting point. The harder question is why getting to the next use case feels like starting over. Same floor, same equipment, same team — and yet somehow a second improvement costs almost as much in time and effort as the first.

That's not a technology problem. It's a foundation problem. When the infrastructure is built to be extended rather than just to work once, the second use case builds on the first instead of competing with it for resources.



The outcome: Fewer surprises, faster recovery and a foundation where each improvement compounds the one before it.

What is your team spending its time on?



Insight before impact

Manufacturing decisions can't wait for data to travel to a centralized system and back. When models run close to the equipment, insights are available while there's still time to act.

Dell PowerEdge servers with Intel®-based accelerated compute can process sensor data directly on the plant floor. Signals like vibration patterns, temperature drift and motor amperage changes are analyzed in real time. Early anomalies can surface as alerts, not alarms, giving the team time to plan a response rather than react to a failure.

The infrastructure that makes it possible to deploy and manage those models at scale, without a dedicated data science team, is Dell AI Factory. Microsoft Azure hybrid services extend the analytics layer when cloud connectivity is available and keep operations running when it isn't.

50%

Up to 50% reduction in unplanned downtime via predictive maintenance models.⁴

25%

Up to 25% savings in maintenance costs with PdM.⁵

10-12%

10–12% improvement in overall equipment effectiveness (OEE).⁶

Scaling what works

How a connected foundation makes improvements repeatable

Manufacturers are already among the most active AI adopters, with 44% in full adoption,⁷ outpacing healthcare and professional services.

But adoption and scale are different things. Most manufacturers who've been through an AI pilot know how this goes: AI works in one place, for one purpose. Getting it to the next line costs almost as much time and effort as the first. Adding a second use case on the same line is also painful, requiring rebuilding what you thought was already done. The barrier is that most pilots are built to prove a point, not to extend across lines and use cases.

A connected foundation changes that. The predictive models, quality checks and anomaly detection that prove their value on one line become reusable assets rather than one-time builds — configurable to the next line without rebuilding the infrastructure underneath.

Monitor

Eliminate blind spots across lines

Connect existing OT and IT systems so operational data from the plant floor is visible during production, not exclusively after the shift. When those systems share a common data layer, insights from one line can be applied to the next without rebuilding integrations.

- **Establish** a shared compute layer on the plant floor with Dell PowerEdge servers powered by Intel® Xeon® processors.
- **Protect** operational data and infrastructure with built-in security features across Dell PowerEdge servers, helping ensure systems remain resilient, trusted and available during production.
- **Consolidate** operational and quality data using Dell PowerStore storage.
- **Extend** visibility with Microsoft Windows Server and Azure hybrid services without creating cloud dependency.
- **Standardize** environments so what works on one line scales to the next.

Diagnose

Act before disruption

Visibility alone isn't enough if the analysis arrives the next morning. When predictive models are deployed to systems at the edge, close to the equipment generating the data, anomalies can be detected during production and alerts reach technicians early enough to act.

- **Run** predictive maintenance and anomaly detection directly at the edge on Dell PowerEdge with Intel®-accelerated compute.
- **Analyze** vibration, temperature and motor data during the shift.
- **Support** AI-based quality inspection at line speed without routing decisions to a remote data center.
- **Maintain** production continuity even if external connectivity fluctuates.

Optimize

Stabilize performance and scale what works

Once the floor is connected and the team is responding to early signals, the next layer is making sure that intelligence reaches people where and when they need it, whether that's on the line, at a workstation or at the inspection point.

- **Enable** engineering simulation and analytics on Dell Precision workstations.
- **Deliver** guided workflows and operational insight through Dell Pro PCs and thin clients.
- **Keep** sensitive data secure from modern cyberthreats with endpoint security solutions from Dell Trusted Workspace. Manage Dell Pro PCs from the cloud with Dell Management Portal and Microsoft Intune.
- **Support** governed AI workloads through the Dell AI Factory portfolio.



The outcome: Real-time visibility, consistent environments and repeatable improvements without replacing equipment.



The outcome: Fewer unexpected failures, shorter recovery windows and improved availability.



The outcome: Each improvement extends to the next, knowledge is embedded into daily workflows and the floor gets more capable over time.

One connected foundation, multiple operational gains

Three ways the same operational data creates new value across the plant

Monitoring the plant floor, diagnosing the causes behind performance issues and optimizing operations over time describes the progression many manufacturers follow.

Because each of these capabilities builds on the one before it, the value of the data continues to increase. Three areas show that compounding value most clearly in practice: quality inspection, energy use and real-time operational visibility.

1: Improving inspection without slowing the line

On a busy production line, manual inspection usually catches most defects. The challenge is consistency. As line speed increases and teams get stretched, small defects can slip through and multiply across a production run before anyone notices, which can create downstream rework that costs far more than the original problem.

Computer vision systems change that by analyzing each unit as it moves through inspection points, comparing visual patterns in real time and flagging anomalies before they propagate through an entire batch. AI-based inspection systems can reach over 97% defect detection accuracy compared with 60–70% for manual inspection.⁸ When deployed at the edge, these systems operate at line speed, identifying potential quality issues without interrupting production.

2: Understanding energy use during production

Energy is one of the few costs that's visible on every monthly bill but nearly invisible during production. Most manufacturers have a general sense that certain machines, shifts or production runs consume more power than others, but by the time that shows up on the bill, the conditions that caused it may be long gone and there's nothing left to act on.

Continuous monitoring means operators can validate adjustments during the shift rather than waiting for next month's bill. For example, when energy data is analyzed alongside production activity in real time, a line running at reduced speed during a changeover drawing the same power as full production will trigger an alert. Organizations using AI-driven energy optimization have reported a 20–30% reduction in consumption by making those patterns visible while there's still time to respond.⁹

3: Uncovering operational issues before they cascade

Manufacturing teams often sense when something isn't running quite right before the data confirms it — throughput dropping in the second half of a shift, scrap climbing on one line but not the others, or work-in-process inventory building between stations in a way that doesn't match the schedule. The signals are there but are scattered across systems that don't talk to each other. By the time they surface in a shift report, the window to act has already closed.

When equipment data, quality signals and production metrics move across connected systems, those indicators become visible while the shift is still running. A throughput drift that would have shown up in tomorrow morning's report becomes apparent three hours in, when adjustments are still possible. Real-time operational visibility gives lean teams the ability to manage the shift.



The outcome: When these indicators are visible during the shift rather than after it, teams stop managing consequences and start managing the operation. That difference begins to show up everywhere: in availability, in quality rates and in an operation that keeps getting easier to run.

Getting started

What day one looks like with Dell Technologies

The manufacturers pulling ahead today aren’t necessarily the biggest or best funded. They began with a single improvement and created a foundation that allowed each subsequent improvement to build on the last.

Most manufacturers start with a single line and use case — usually predictive maintenance because the payoff is visible and the risk of getting it wrong is low. The goal isn’t a finished operation by the end of month one. It’s to see a real outcome on that line, such as a stoppage avoided or a maintenance call made before a failure. That first result builds the internal case for the next step.

With Dell Technologies, start where you can and scale when you're ready.

Dell APEX provides consumption-based infrastructure and PC as a Service, letting manufacturers modernize incrementally across data centers and end-user devices without a large upfront investment. Device management and security stay consistent no matter the current footprint, supporting businesses as they grow. The starting point doesn't limit future potential — the solution just needs to work on day one.

Self-diagnostic

Before choosing a starting point, ask one question about your current operation:

When something breaks, is your team surprised or were they expecting it?

- ☐ **Usually surprised:** You have no visibility. Pick one line and connect the data. Understand what's actually happening and stop being caught off guard.
- ☐ **Sometimes expecting it:** You have a signal. The next step is making it reliable and actionable, so predictive maintenance is the right entry point. Build the early warning capability your team needs.
- ☐ **Rarely surprised:** You're running a predictive operation. Now it's time to extend intelligence across use cases and the floor so that each improvement builds on the last.

What to look for in a starting point:

- **Works at the edge:** It doesn't require constant connectivity or centralized processing to function during a shift.
- **Low IT overhead:** Your team can manage it without a dedicated specialist or consultant on retainer.
- **Integrates with what you have:** It doesn't require replacing equipment before it delivers value.
- **Fast time to value:** You'll realize a meaningful outcome on one line before committing to the next.



Learn more about manufacturing solutions from Dell Technologies.

1. Rasmus Leichter, How Many Manufacturing Jobs Are Unfilled in the US? Cargoson, October 7, 2025.
2. Ibid.
3. Jeff Winter, Smart Machines, Dumb Data, 2025.
4. Manufacturing Today, Why Predictive Maintenance Is Manufacturing's Next Big Advantage: The High Cost of Downtime in 2025, June 19, 2025.
5. Ibid.
6. Ibid.
7. Dell Technologies, ESG Research, SMB AI Insight Survey, 2025.
8. Averroes, Stats & Impact of AI in Manufacturing [2025], March 11, 2025.
9. Ibid.

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