

PERPETUAL MACHINES: *BUILDING THE AGENTIC AFTERMARKET*

How original equipment
manufacturers (OEMs)
can turn aftermarket
service into always-on
value loops



The aftermarket inflection point

In industrial markets, a quiet revolution is dismantling the old playbook. For decades, the dominant model for manufacturers was simple: make it, sell it, ship it, forget it. Once a machine left the factory floor, the relationship with the customer effectively went dormant until something broke or a warranty claim was filed. Today, that model is a museum relic.

We are entering the era of perpetual machines—always-on lifecycle value loops where value creation doesn't stop at the point of sale; it continues for the life of the asset. The industry is shifting from episodic hardware sales to a connected ecosystem of services, most notably for original equipment manufacturers (OEMs) and Tier 1 suppliers in industrial products, construction equipment, and automotive. Companies that don't evolve from just selling "iron" (hardware) to also selling measurable outcomes risk leaving high-margin lifecycle value to competitors and channels.

In the modern industrial landscape, leading manufacturers are transforming the aftermarket from a secondary support function into a primary engine of financial resilience. In industrial segments, services now generate one-third of total income¹ and grow 10% faster than new equipment sales², often commanding gross margins of up to 50% on spare parts.³ By operationalizing these service models through artificial intelligence (AI) agents and predictive maintenance—a core pillar for perpetual machines—manufacturers can realize a 30–35% reduction in cost-to-service.⁴ This shift directly addresses customer pain points, as 80% of industrial buyers are now willing to pay a premium for services that demonstrably reduce the Total Cost of Ownership (TCO) over time.⁵

This evolution toward an agent-enabled, services-led paradigm is no longer a matter of marginal efficiency; it is a requirement for survival and clear driver of shareholder value. Research underscores that this transition—moving from transactional hardware sales to managing lifecycle outcomes—enables business models previously thought unattainable under traditional constraints. Companies that successfully master this “perpetual machine” achieve a 2X higher Total Shareholder Return (TSR) than their peers,⁶ cementing their position at the forefront of industrial excellence.

The business value is realized through three specific North Star objectives:



Transform how products and services are consumed:

Move from just selling products and parts to selling outcomes.



Selectively assume financial risk:

Manufacturers confidently take on financial risk for downtime or other economic outcomes because their intelligence predicts failures before they happen and their operations are instrumented and aligned to efficiently and confidently serve.



Track and price value continuously:

Pricing can be linked to measured outcomes delivered such as hours of uptime, tons of material moved, and yield, not only to the cost of the hardware.

As a result, manufacturers can earn a premium for assumed risk, while customers gain better equipment availability and deeper operational intelligence to maximize both the uptime of their equipment and the yield of their operations.

Break-Fix: The divide between customer and product intelligence

The traditional industrial model suffers from a critical flaw: it is reactive. In the old model, a manufacturer's visibility into the product often ends when it ships. When a product fails, the process can be slow and linear, frequently taking days to resolve. A typical pattern looks like this:

- 1 Alert triage:** The customer notices a failure and manually tries to resolve the issue based on operating manuals or experience.
- 2 Customer call:** If not able to resolve, the customer contacts a product support service (often limited to set service windows).
- 3 Attempts:** Technicians may first advise remotely; if that fails, they attempt a fix, often requiring multiple visits for diagnostics and parts.
- 4 Resolution:** Days (or weeks) later, the equipment is back online but the lost time cannot be recovered.
- 5 Transparency:** The customer may receive limited clarity on root cause and cost. If it is warranty-related, the burden of proof may fall on the customer to provide purchase details and supporting documentation.

The data backs this up: 55% of all field service dispatches are for “break-fix” scenarios⁷ —unplanned events that are costly for both the supplier and the customer. 1 in 3 field visits fail due to missing parts or unclear context.¹ Meanwhile, every hour a machine is down is lost revenue for the customer and lost credibility for the vendor. In a 24/7 global economy, the break-fix model is increasingly too slow and too costly—and it runs counter to outcome-based, North Star objectives. It also forces customers (and often suppliers) into costly ‘just-in-case’ behavior—holding significantly more spare parts inventory than necessary to protect availability—tying up cash and eroding cost efficiency.

So why is it so hard to move from reactive to proactive? One major reason is data fragmentation.⁸ The traditional industrial playbook relies on a disconnected patchwork of systems and software-as-a-service (SaaS) tools:



CRM (customer relationship management)

for customer management



ERP (enterprise resource planning)

for billing and parts



PLM (product lifecycle management)

for product definition and configuration



Telematics and Internet of Things (IoT)

for equipment performance and equipment health monitoring



DMS (dealer management systems)

for customer purchase and service history



FSM (field service management)

for work orders



CLM (contract lifecycle management)

for customer contracts



Technical documentation

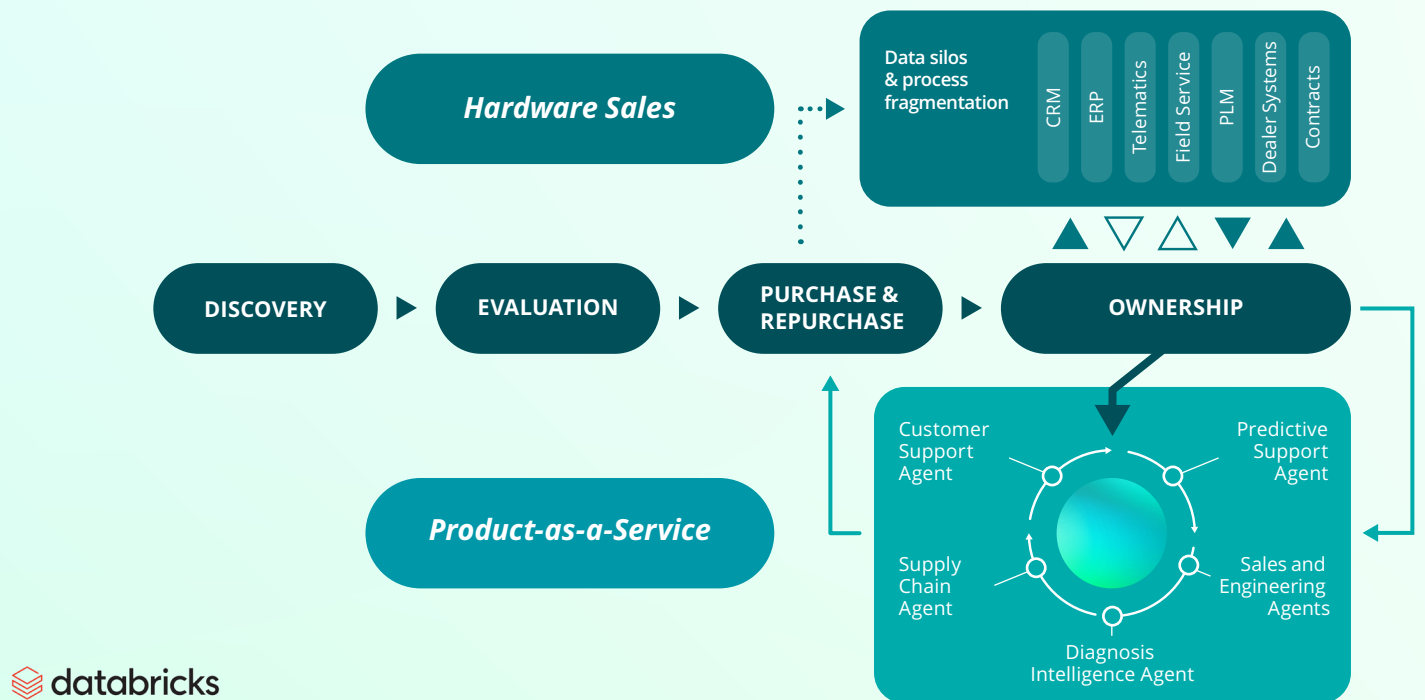
for technical manuals (often in PDF format)

These systems generally do not share data effectively or are outright restricted to share data due to immaturity of tools that result in restrictive data sharing policies. Many organizations also operate multiple instances and variants of these platforms, creating inconsistencies across regions and records. As a result, a support representative might see a customer's contract but not the live telemetry indicating overheating. An engineer might see an error code but not the recurring history of failures at a specific site or for a specific piece of equipment.

Without a shared and governed layer of context across systems, it is difficult to deliver a continuously connected customer experience at scale. To do so, manufacturers must blend product performance with customer experience and internal operations—so humans and AI agents can serve customers and protect margins in the most effective way.

Designing the future of agents

Customer Journey in the Agentic ERA



Traditional industrial data lives in rigid silos, where systems such as CRM, ERP, and telematics do not share data. What is new is the ability for AI agents to continuously reason over a “shared context layer” that integrates internal and external data.⁹ Unlike point solutions that generate isolated results, agents can connect machine performance to customer outcomes and operational response.

Four capabilities define the shift that agents bring to the aftermarket:

1. Connecting the silos (context over alerts):

Previously, support often began only after a customer called about a failure. Even then, representatives might see contract details but miss technical signals such as telemetry trends. Agents can bridge this gap by connecting symptoms, error codes, customer history, and site context—supporting proactive outreach and faster resolution.

2. Unlocking “dark data”:

You don’t need perfect sensing or fully structured data to be “agentic.” Agents can ingest unstructured “dark data”—from PDF manuals, historical repair logs, service tickets, and email threads—to improve service performance immediately, even when live machine connections are limited.

3. Operationalizing risk:

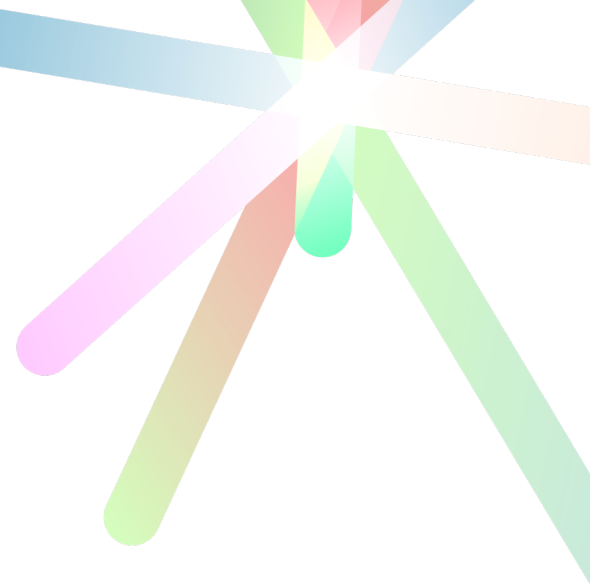
Agents can help manufacturers selectively assume financial risks by turning early signals into mechanized response—detecting and forecasting issues, triaging and triggering playbooks, coordinating parts, labor, and field actions, and proactively communicating with customers to deliver on commitments. They don’t just alert; they act—initiating outreach, scheduling service, preparing quotes or entitlements, and capturing the resolution and commercial outcome so each event improves the next. This closed loop makes the shift from selling hardware to delivering outcomes (including product-as-a-service models) more achievable at scale—supported by a data foundation that strengthens over time.

4. Enabling secure access:

As AI agents operate across systems, applications, and data environments, managing access can quickly become complex, fragmented, and difficult to govern. However, with the right cybersecurity strategy, these challenges can be transformed into enablers of agentification rather than barriers to scale. By intentionally embedding identity and access management, privileged access controls, and continuous monitoring into the agent architecture, organizations can support secure, governed, and resilient agent deployment while reducing cyber risk.

Rewiring the customer journey

Rewiring the customer journey requires moving from a fragmented, reactive chain of events to a continuous, intelligent loop. The table illustrates how specialized agents can intervene at critical friction points—from the initial signal to the final sale—to reduce downtime and improve customer value. By deploying these solutions, organizations can transform isolated break-fix moments into a cohesive perpetual machine, where every stage of the lifecycle contributes to better availability and stronger economics.



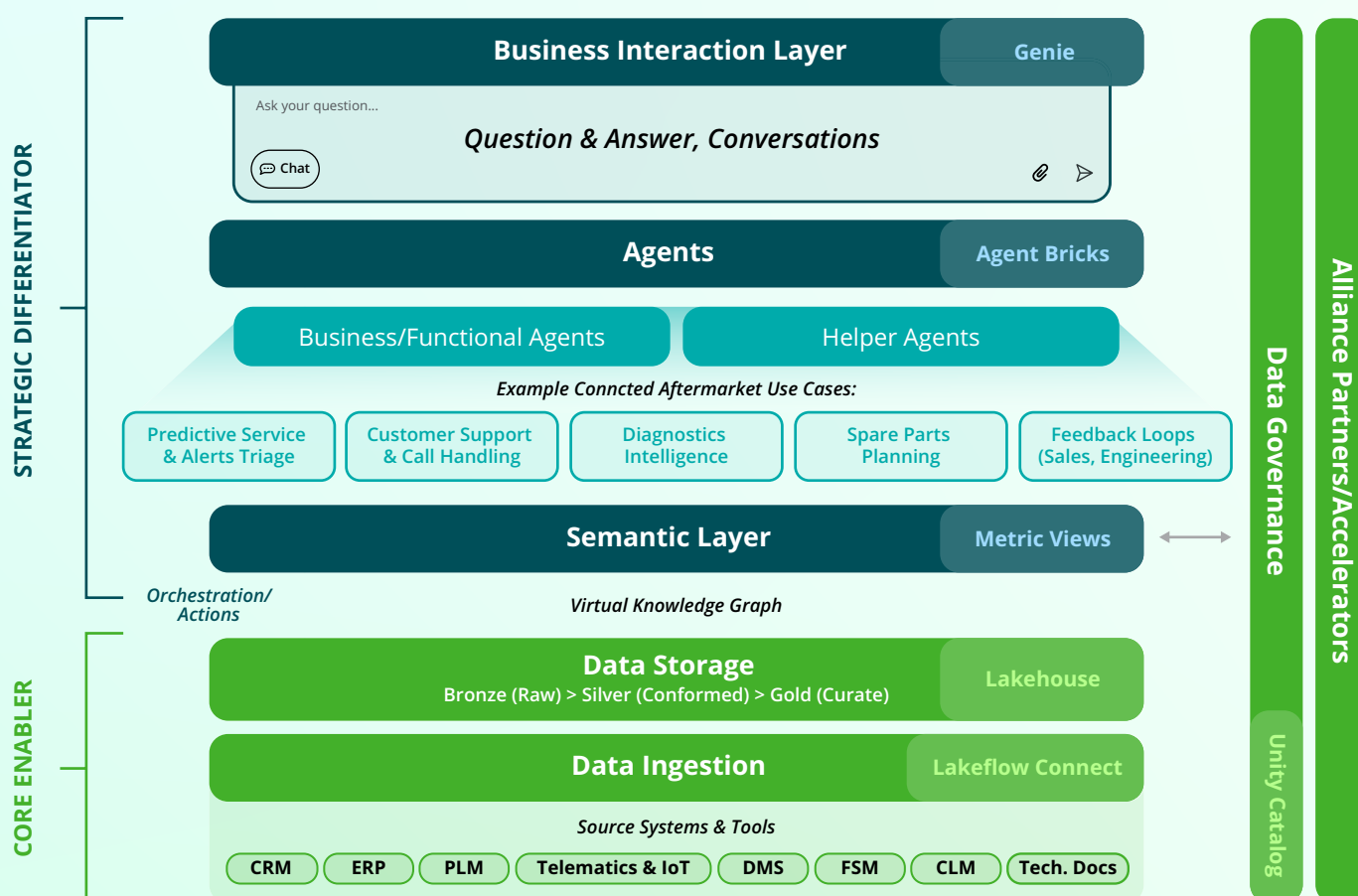
LIFECYCLE STAGE (Typical today)	CURRENT STATE (The problem)	AGENTIC SOLUTION (The North Star)
Alerts triage: Customer notices a failure	Telematics and asset health are often disconnected from customer data; telemetry may show an issue, but support does not act	Predictive service agent: Monitors available telemetry and service/ parts history to detect early signals, prioritize likely failures, and reduce preventable maintenance costs
Customer call: Customer contacts support, often limited to specific windows	CRM and call logs contain customer sentiment, contracts, and history but lack technical context and live equipment status	Customer support agent: Acts as the first line of defense, blending customer/contract data (CRM) with symptoms and asset history to accelerate triage and resolution
Diagnostics: Unclear context for technicians/ engineers	PDF manuals and field notes: Critical knowledge is locked in “dark data” such as static PDFs and unstructured technician notes	Diagnostic intelligence agent: Ingests unstructured data to provide role-specific guidance, likely causes, and next steps tailored to the asset and context
Parts and Logistics 1 in 3 field visits fail due to missing parts	ERP and inventory data are often siloed from field service work orders and service context	Supply chain agent: Analyzes demand patterns and spare parts history to improve planning and help ensure the right part is available before dispatch
Sales Relationship goes dormant post-repair	Sales and marketing systems are disconnected from service events; upgrade and outcome offers are not timed to usage and need	Sales and engineering agents: Closes the loop by feeding service insights into product improvement and enabling outcome-based offers aligned to customer usage

Joint solution blueprint

In an era where the old operating model is no longer acceptable, the transition from reactive aftermarket services to proactive, perpetual machine performance has become a demonstrated competitive mandate. However, harmonizing service activities that add value to both the OEM and customer's business requires more than just a change in mindset and approach, it requires a fusion of precise strategic orchestration and data engineering.

Deloitte brings the deep industry domain experience, process re-engineering, full stack architects, change management, cyber capabilities, and unrivaled deployment scale along with organizational change and transformation rigor to redefine and reimagine the aftermarket lifecycle, while Databricks provides its unified and secure Data Intelligence Platform necessary to ingest, process, and enable the full agentic workflow across a global installed base in real time. Together, we enable OEMs to move beyond the break-fix cycle, turning machines in the field into self-sensing assets that never stop working for the customer.

Realizing the vision of perpetual machinery requires moving beyond conceptual roadmaps to a concrete data foundation. To achieve this, Deloitte and Databricks have created a unified framework designed to dissolve legacy data silos and synchronize the aftermarket ecosystem. The following Joint Solution Blueprint outlines how we integrate high-velocity telemetry with core enterprise systems, creating a single source of truth that transforms raw signals into immediate, autonomous service actions.





Elephant in the room: Telematics or bust?

Here is a practical reality: What if your machines aren't fully connected?

Many manufacturers feel paralyzed because their installed base isn't beaming back live data. They assume they can't participate in the shift until every asset is "smart." This is a common misconception.

You don't need perfect telemetry to start building a perpetual machine. You need to start unlocking the data you already have. Even without full connectivity, most manufacturers can still find high value in unconnected data such as:



Field service notes:

Decades of technician observations on what breaks and why



Call logs and emails:

Customer symptoms, complaints, and recurring issues



Spare parts history:

A clear record of demand patterns that can inform forecasting and likely failure modes



Sales and customer interactions:

Implicit asset definitions and usage context, even if not properly structured



Crucially, agentic workflows don't require live sensor data to be useful on day one. They can ingest and reason over unstructured "dark data"—PDF manuals, historical repair logs, and email threads—to improve service speed and quality immediately. The following case studies illustrate what "good" can look like in a perpetual machine model.

Evidence from the front lines



A global agritech OEM turns service into an engine of growth



Challenge:

New equipment sales delivered slim margins of 5%, while aftermarket services promised gross margins exceeding 40%. However, a fragmented data landscape and reactive service model limited the OEM's ability to capture lifecycle value. Distributors and channels captured a significant share of the available aftermarket revenue, and during harvest season, downtime costs of \$2,000 per hour made service performance a critical differentiator. Technicians often arrived without the context or parts, undermining uptime expectations.

Solution:

The OEM built a shared context layer to unify streaming data and deployed three agents across the service lifecycle.

- 1** A predictive service agent processed millions of daily sensor records to contextualize alerts and pre-position parts, shifting from reactive repair to proactive prevention.
- 2** A supply chain agent analyzed usage patterns across millions of part locations to improve inventory readiness and reduce delays.
- 3** A diagnostic agent used GenAI to unlock “dark data” from PDF manuals and history logs—supporting faster diagnosis and more consistent estimating and quoting for standard repair jobs.

Impact:

The agentic workflow unlocked **\$500 million in incremental parts sales**, while repair cycles dropped from four hours to “within the hour” resolutions. By reducing administrative load and improving parts availability and diagnostic speed, the OEM shifted from reactive break-fix to selling “uptime,” strengthening a high-margin aftermarket revenue stream.



Evidence from the front lines



A North American commercial vehicle OEM embeds analytics into safety operations



Challenge:

Following regulatory action, safety and compliance became a board-level priority, with heightened scrutiny and a need to embed stronger analytics into day-to-day operations. The organization needed to move from episodic triage to continuous lifecycle optimization—improving reliability, reducing rework, and minimizing disruption for customers and service networks—while operating across high-volume structured and unstructured data.

Solution:

The OEM built a Safety Data and Analytics Infrastructure (SDAI)—an integrated set of data sources, analytical tools, and standardized processes designed to identify, analyze, and diagnose potential safety concerns at scale. A Databricks-based processing layer unified high-volume structured and unstructured data so teams could move from fragmented, manual screening to a repeatable “detect prioritize investigate manage” operating rhythm using standardized dashboards, automated case management, monitoring, and sustainment. On top of this foundation, the OEM deployed:

- **A large language model (LLM)**-based text triage capability to interpret complaints and repair narratives
- **Issue prioritization** using machine learning to surface anomalies and emerging trends for focused investigation
- **Telematics pattern detection** using statistical approaches on internet of things (IoT) data to identify patterns earlier

Impact:

On average, **potential safety issues were identified 15-22 months earlier**, investigations accelerated by up to 75%, and personnel efficiency improved through automation—reducing avoidable recall and repair costs by prioritizing potential the highest-risk signals. The OEM also established a feedback loop into product quality to reduce defects upstream and built a durable, data-driven safety capability that supports compliance obligations while improving vehicle field performance.



Orchestrating the journey as a C-suite leader

Transitioning to a perpetual machine model is not merely a technical upgrade; it is a cultural and operating-model shift from ‘making iron’ to ‘managing outcomes.’ To overcome organizational inertia, C-suite leaders should first dismantle a common misconception: that the organization needs perfect connectivity and perfectly clean data before it can start. In practice, waiting for full telematics coverage can create paralysis. Leaders can build momentum by prioritizing high-value use cases and starting with data already available—PDF manuals, call logs, service tickets, and technician notes—unlocking value incrementally while improving data quality, connectivity, and integration over time as benefits are proven.

Next, behavior change requires realigning key performance indicators (KPIs) from transactional metrics to outcome-based goals. In the old model, success is often measured by units sold or hours billed—metrics that can lag customer experience and lifecycle economics. Leaders should introduce incentives aligned to outcomes such as uptime delivered, reduced cost-to-serve, yield, improved first-time-fix rate, and lower TCO. This aligns sales, supply chain, and service teams around a shared promise: sales sets outcome expectations, supply chain and operations prepare to deliver, and service executes reliably—making selective financial commitments operationally feasible.

Finally, adoption hinges on designing a unified human + agent operating loop so agents are seen as augmentations rather than replacements. The objective is to move from a siloed routine—where humans search for information across disparate systems—to a shared context where relevant information and next-best actions are proactively surfaced and executed through to closure.

By embedding agents into day-to-day service operations to reduce administrative burden such as automating quotes, improving parts planning, summarizing case history, and guiding diagnostics, and capturing resolution details automatically—technicians and support teams can spend more time on high-value problem solving and customer care. When the workforce sees agents reducing their administrative drudgery and saving them time, adoption shifts from forced compliance to enthusiastic use.⁷ And because every action is closed and learned from, each service event strengthens the next—turning service operations into a true perpetual “money” machine.



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