

# The Implementation Paradox

a comprehensive study on the  
real applications of AI in the  
manufacturing supply chain.

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This article aims to describe the current level of AI adoption in the production environment and to perceive the sentiment of industry leaders who are facing those challenges. After a complete review of the cultural and structural reasons of historical barriers to innovative solutions, the paper tries to adapt and interpret them to the revolution AI is currently proposing, especially to the manufacturing sector.

## Introduction

Recent industry analyses highlight that global supply chains are increasingly exposed to cost volatility, trade disruptions, and energy price fluctuations, forcing firms to rethink their operational structures to maintain **profitability** (Deloitte, 2024; McKinsey, 2024). In particular, geopolitical tensions, industrial policy shifts, and rising transportation and energy costs have significantly altered the cost base of manufacturing firms, increasing the urgency to improve efficiency and productivity across supply-chain operations (McKinsey, 2026). For example, the war in Ukraine has generated a sharp increase in energy prices and significant volatility in energy markets up to 180% in the first two weeks of war in 2022 (European Central Bank, 2022). Events like this can not be considered as unique or non-repeatable: from 02 April 2025 (the Liberation day), it is not only necessary to manage an energy crisis, but also to operate in a global fragmented market full of obstacles (Ignatenko, 2025). This systemic fragmentation was entrenched in November 2025 with the imposition of 100% tariffs on Chinese imports, a move that effectively deconstructed the 'low-cost sourcing' model for European manufacturers. This trade wall was further compounded by the early 2026 U.S. Supreme Court decision to unwind the International Emergency Economic Powers Act (PwC, 2026). By stripping the executive branch of its broad discretionary power to manage economic emergencies, the ruling introduced a period of **unprecedented legal volatility**, leaving firms without a predictable framework for cross-border capital flows and sanctions compliance.

In many manufacturing industries characterized by tight cost structures and global competition, even small fluctuations in input costs or logistics expenses can significantly erode operating margins, making productivity-enhancing technologies a strategic priority.

Under sustained margin pressure, firms systematically adopt technologies that enhance factor productivity. Driven by the need to offset rising fiscal burdens and navigate evolving regulatory landscapes, enterprises are increasingly investing in AI solutions specifically also to mitigate labor cost growth, associated with the mandatory reshoring of production lines. (ISM, 2026). As both theoretical and empirical research suggests, **automation** and **complementary digital innovations** increase total factor productivity, while fundamentally reshaping task allocation and labor demand (Acemoglu & Restrepo, 2019).



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# AI as powerful tool in supply chain



March 11  
2026

Blue Yonder launched its 'Cognitive Solutions' suite, a fully agentic stack capable of autonomous re-planning

≈10%

level up to which long-term national demand forecasts were improved

20%

level up to which regional forecasts for popular products were improved

Beyond aggregate productivity estimates, AI creates value in supply chains through several specific technological applications. With **Machine Learning** models, firms are able to forecast demand more accurately and optimize their inventory by reducing both stockouts and excess inventory, while improving working-capital efficiency. **Generative AI systems** can automate analytical tasks, such as demand planning, procurement analysis, and scenario simulation, allowing planners to evaluate complex supply-chain trade-offs more rapidly. More recently, **agentic AI** systems capable of autonomous decision-making are being deployed to coordinate procurement, logistics, and replenishment decisions across multiple nodes of the supply chain. All these different instruments improve service levels, while simultaneously reducing operational costs ([McKinsey, 2024](#); [BCG, 2024](#)). This transition was cemented by a synchronized wave of software releases from the world's leading SCM vendors. For example, on March 11, 2026, Blue Yonder launched its 'Cognitive Solutions' suite, a fully agentic stack capable of autonomous re-planning. Similarly, leaders such as o9, Kinaxis, SAP IBP (Integrated Business Planning), and Oracle Fusion have completely rewritten their architectures to incorporate autonomous agents ([Workwise, 2026](#)).

Early implementations illustrate the magnitude of these potential gains. **Amazon**, for instance, has recently introduced several AI-driven innovations across its logistics network aimed at improving delivery accuracy, demand forecasting, and warehouse automation. One of these is *Wellspring*, a generative AI mapping system that integrates satellite imagery, delivery history, street-level images, and other geographic data to improve the precision of delivery locations, helping drivers navigate complex environments such as multi-building apartment complexes. In parallel, Amazon has developed a new AI-powered demand forecasting foundation model capable of predicting what products customers will want, where they will want them, and when, across hundreds of millions of items daily. By incorporating additional contextual data, such as weather patterns and seasonal events, the system has improved long-term national demand forecasts by approximately 10% and regional forecasts for popular products by up to 20%. The company is also advancing agentic AI capabilities within its robotics systems, enabling warehouse robots to interpret natural-language instructions and autonomously execute operational tasks ([Amazon, 2025](#)).



**Implementation paradox**

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**its dimensions and causes**

# 8–20%

"Intentional adoption" rate of AI in manufacturing and core industrial sectors (varying by geographic region)

# 55.03%

AI adoption rate within large enterprises

# 17%

AI adoption rate within small-to-medium enterprises (SMEs)

# +80%

AI projects that fail to reach full operational deployment, falling into the so-called "Death Valley" of AI because they are technology-driven rather than problem-centric

Despite this substantial economic potential, empirical evidence reveals a persistent gap between AI's demonstrated benefits and its widespread operational adoption. In August 2025 MIT published a powerful research paper: 95% of pilot GenAI projects did not have any measurable impact on P&L, despite enterprises investing \$30–40B ([MIT, 2025](#)). As of 2025, then, the global industrial landscape is defined by an "Implementation Paradox." While high-level reporting suggests a revolution, with 78% to 88% of organizations claiming to use AI in at least one business function ([McKinsey, 2025](#); [Stanford HAI, 2025](#)), the operational reality is far more fragmented.

Research suggests that most of this "usage" is confined to non-core tasks, such as marketing copy generation or basic IT automation. When looking at systemic integration, only 33% of firms have managed to scale AI across their entire enterprise ([McKinsey, 2025](#)). In the manufacturing and core sectors, "intentional adoption" remains low, estimated at 8% to 20% depending on the region ([World Bank, 2025](#); [Eurostat, 2025](#)). Besides, this growth masks a deep divide between large enterprises, with 55.03% adoption, and small-to-medium enterprises (SMEs) at just 17%.

This gap is often termed the "Death Valley" of AI, where 80% or more of projects fail to reach full deployment because **they are technology-driven rather than problem-centric** ([Hajkowicz/CSIRO, 2025](#)).

The present research seeks to explain the persistent gap between AI's demonstrated benefits and its limited adoption in strategic **supply-chain processes**. The central research question guiding this study is therefore:

## "What organizational, cognitive, and structural barriers prevent the adoption of AI in the supply chain, despite evident margin pressure and proven productivity gains?"

By addressing this question, the research aims to clarify a persistent managerial puzzle. While AI's operational benefits in supply chains are widely recognized and margin pressure continues to intensify, the scaling of AI initiatives remains constrained because successful adoption ultimately represents an organizational transformation challenge, rather than merely a technological implementation problem.



# Implementation paradox: identifying its dimensions

99%

of surveyed leaders reported productivity improvements from applying AI to supply-chain activities

only 23%

reported having a formal supply-chain AI strategy

≈ 3/4

of companies are planning, blueprinting, or piloting AI use cases

only 27%

of firms have integrated AI into their supply-chain processes

59%

of supply-chain and operations leaders stated that their organizations are adopting AI too slowly

West Monroe's Q3 2025 Supply Chain Poll illustrates the **first dimension** of the Implementation paradox: 99% of surveyed leaders reported productivity improvements from applying AI to supply-chain activities, including efficiency gains, faster cycle times, cost reductions, and service-level improvements. Yet **return on investment** (ROI) remains the most frequently cited challenge (36%), indicating a disconnect between operational improvements and finance-grade value capture ([West Monroe, 2025](#)).

Additional surveys highlight the **second dimension** of the problem: **limited scaling and weak strategic governance**. In a June 2025 Gartner survey of 120 supply-chain leaders, who had implemented AI within the preceding year, only 23% reported having a formal supply-chain AI strategy. Gartner attributes this gap partly to the pressure to demonstrate rapid ROI, which often pushes organizations to pursue isolated "quick wins" rather than structured transformation programs capable of scaling across operations ([Gartner, 2025](#)).

Similarly, McKinsey's 2025 Supply Chain Risk Survey reports that although approximately three-quarters of companies are planning, blueprinting, or piloting AI use cases, only 19% have deployed AI tools at scale, a figure essentially unchanged from the previous year. The persistence of this "pilot-to-scale" bottleneck suggests that the problem is structural rather than temporary: experimentation with AI is expanding, yet large-scale operational integration remains limited ([McKinsey, 2025](#)).

Independent industry reports reinforce this pattern at the process level. The 2025 State of Supply Chain Report finds that only 27% of firms have integrated AI into their supply-chain processes, while the remaining 73% report no operational integration. Among organizations not using AI, the most frequently cited barriers (the **third dimension** of the paradox) include the **absence of suitable AI tools** and concerns related to **data security and IT governance** ([Inspectorio, 2025](#)). Even firms pursuing digital transformation often encounter organizational barriers, such as reliance on established spreadsheet-based workflows, fear of job displacement, and uncertainty about the financial return of AI investments. Leadership sentiment itself reflects frustration with this slow progress: in a global survey by Heidrick & Struggles, 59% of supply-chain and operations leaders stated that their organizations are adopting AI too slowly, despite



recognizing its potential for productivity improvement and cost reduction ([Heidrick & Struggles, 2025](#)). Beyond software, **physical constraints** in data center infrastructure have created a "Timeline Paradox": while AI model architectures evolve every six months, constructing the necessary facilities takes 18 to 24 months. Modern AI workloads require extreme energy densities, often exceeding 50 kW per rack, necessitating liquid cooling because water absorbs heat 3,000 times more efficiently than air. Furthermore, local opposition and grid saturation led to a fourfold increase in data center project cancellations in 2025, threatening the reliability of mission-critical AI.

Taken together, these findings suggest the existence of a real and persistent AI adoption paradox: leaders widely recognize AI's operational benefits and the urgency of margin protection, yet large-scale deployment in core supply-chain processes remains limited. Understanding this theme requires moving beyond purely technological explanations and examining the organizational mechanisms that shape technology adoption.

## Implementation paradox: its causes (and where to act to minimize the gap)

If the dimensions describe the visible symptoms of this stalemate, an analysis of the underlying **causes** reveals that it is not a simple technological delay, but a rational response to structural and psychological constraints. Going deeper, it's possible to identify three complementary theoretical and historical perspectives that help explain this gap. In fact, physical constraints are mirrored by internal structural barriers.

**First, organizational inertia** highlights the structural resistance that large organizations face when attempting to alter established processes and decision structures. In their seminal work on structural inertia, Hannan and Freeman argue that organizational arrangements tend to resist change because reliability and accountability often depend on stable routines and formalized structures ([Hannan & Freeman, 1984](#)). In supply-chain environments, where planning cycles are tightly interdependent, adopting AI implies not merely introducing a new tool but potentially redesigning decision rights, governance mechanisms, and operational workflows.



One of the most significant barriers, in fact, is not technical, but psychological. **Employee resistance** remains a high hurdle for 45% to 49% of professionals ([AI & Data Analytics Network, 2025](#)). A 2025 case study utilizing the Organizational Change Recipients' Belief Scale (OCRBS) identified "discrepancy" as the leading driver of resistance ([Frank, 2025](#)). Discrepancy refers to the employee's belief that a change is not actually necessary for their specific role or that the current status quo is sufficient. When AI is introduced without clearly demonstrating how it solves a legitimate "pain point" for the worker, resistance spikes.

**45-49%**

share of professionals identifying employee resistance as a primary or significant hurdle

**72%**

impacted employees successfully integrated through a combination of upskilling (52%) and reskilling (20%)

**52%**

organizations for which the underlying data infrastructure represents the primary technical obstacle

Siemens' *#NextWork* program, for example, serves as a benchmark, utilizing a granular analysis of tasks to avoid mass restructuring. In one German unit, Siemens successfully integrated 72% of impacted employees by upskilling 52% and reskilling 20%, transforming an employment risk into an operational opportunity. ([Siemens, 2026](#)).

**Second**, the concept of **absorptive capacity** emphasizes the importance of organizational knowledge in the adoption of new technologies. Cohen and Levinthal define absorptive capacity as a firm's ability to recognize the value of new external knowledge, assimilate it, and apply it commercially ([Cohen & Levinthal, 1990](#)). In the context of Artificial Intelligence, this capacity is not merely an abstraction, but is concretized through high-quality data and cross-functional expertise: quality data represents the 'prior knowledge' necessary to train and validate models, while cross-functional expertise serves as the connective tissue required to translate algorithmic outputs into business value. Organizations with fragmented data infrastructures or narrow technical silos often struggle to move beyond pilot projects. In these contexts, isolated experiments may generate promising results but fail to scale because the organization lacks the institutional and structural capabilities required for industrialization. This interpretation aligns with the OECD's 2025 synthesis on AI adoption, which identifies skills shortages, uncertain ROI, and data-maturity constraints as key barriers preventing firms from fully realizing AI's potential ([OECD/BCG/INSEAD, 2025](#)). The path to productive AI is blocked by significant structural barriers, particularly for Small and Medium Enterprises (SMEs). For 52% of organizations, the primary technical obstacle is not the AI model itself, but the underlying data infrastructure. Fragmented data silos and poor data quality make the "Scaling Play" nearly impossible for many firms ([WEF, 2025](#)).



**Third**, real options theory offers a decision-theoretic explanation for delayed adoption under **conditions of uncertainty**. Dixit and Pindyck argue that when investments are irreversible and uncertainty is high, firms may rationally postpone investment to preserve the option **value of waiting** (Dixit & Pindyck, 1994). Many supply-chain AI projects involve irreversible components, including data-architecture redesign, integration with core planning systems, vendor lock-in, and the reconfiguration of decision processes. In volatile environments, characterized by fluctuating demand, geopolitical uncertainty, and ambiguous ROI measurement, managers may therefore favor limited pilot programs over large-scale deployment, preserving strategic flexibility, while reducing exposure to technological and organizational risk.

**Financial uncertainty** is one of the major deterrents, with 66% of organizations struggling to establish a clear ROI (BCG, 2024). Traditional valuation methods like Discounted Cash Flow (DCF) often fail because they treat AI as a static investment with predictable outcomes. In reality, AI projects require flexibility to account for high technological and market uncertainty. To solve this, firms are increasingly turning to Real Options Theory (ROT) (Bell et al., 2025).

## ROT allows firms to view AI initiatives as a series of interconnected options:

- ↳ **The Option to Defer:**  
waiting for more mature technology or clearer regulations.
- ↳ **The Option to Expand/Scale:**  
committing more capital only after a successful pilot.
- ↳ **The Option to Switch:**  
pivoting the AI model or application as results emerge.

ROT treats an initial AI pilot as a premium paid to keep the right to expand, defer, or pivot the project as uncertainty decreases.



This framework prevents the premature cancellation of high-potential projects that do not show immediate, deterministic profitability. Without these flexible financial frameworks, many high-potential projects are prematurely killed because they do not show "immediate" profitability.

Taken together, these both theoretical and concrete perspectives suggest that the gap between AI's potential and its widespread adoption is not only driven by skepticism about the **technology's effectiveness**. Rather, it reflects a combination of **organizational inertia, limited absorptive capacity, structural barrier, and strategic and financial deferral under uncertainty**.

Here you can find the relation between **dimensions** and **causes** described:

Dimension of the Paradox	Corresponding Cause	Brief Description	Source
The ROI/ Efficiency Gap	Real Options Theory (ROT)	99% report productivity gains, yet 36% cite ROI as the top hurdle, favoring "deferment" options under uncertainty.	West Monroe (2025)
The Scaling Bottleneck	Organizational Inertia	Only 23% have a formal AI strategy; most firms pursue "quick wins" rather than systemic structural transformation.	Gartner (2025)
The "Death Valley" (SME vs. Large Ent.)	Absorptive Capacity	55% adoption in large firms vs. 17% in SMEs; caused by lack of data infrastructure to "assimilate" new tech.	Hajkowicz/CSIRO (2025)
Psychological Resistance	Cognitive/ Behavioral Barrier	Resistance from 45-49% of workers due to "discrepancy"—the belief that the current status quo is sufficient.	AI Data & Analytics Network; Frank (2025)
The Timeline Paradox	Structural/ Physical Constraints	4x increase in project cancellations due to 18–24 month facility lead times vs. 6-month AI model cycles.	Gizmodo (2025)
The "Pilot-to-Scale" Plateau	Absorptive Capacity & Inertia	Only 19% have deployed AI at scale, showing that experimentation does not naturally lead to industrialization.	McKinsey (2025)



# **Business cases**

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**a perspective from  
manufacturing  
and supply chain sector**

Empirical case evidence further illustrates this dynamic. Significant supply-chain value from AI is achievable, but it often depends on complex organizational and technological transformations.

The adoption gap is particularly pronounced in **manufacturing environments**. Generative-AI applications have proliferated in administrative and analytical processes, but adoption in core production systems remains significantly lower. One explanation lies in the fundamental mismatch between the **probabilistic nature of Gen AI** and the **deterministic requirements** of physical manufacturing systems. Traditional industrial automation relies on rule-based control systems capable of producing perfectly repeatable outputs, often in safety-critical environments with near-zero tolerance for error. Gen AI systems, by contrast, rely on statistical inference and generate probabilistic outputs. Managers therefore perceive residual risk especially when inaccurate predictions could trigger costly downtime, quality failures, or safety incidents. In response, many organizations adopt hybrid models in which AI provides decision support while human operators retain ultimate control. While this approach mitigates risk, it can also limit the degree of automation and slow the transition from pilot projects to enterprise-wide deployment.

There are also effective examples.

One early example is **Otto Group's** AI-driven replenishment system, where deep-learning models enabled a 20% reduction in inventory levels while predicting customer demand with approximately 90% accuracy, allowing automated purchasing decisions across hundreds of thousands of items ([McKinsey, 2017](#); [European Parliament, 2020](#); [The Economist, 2017](#)).

Similarly, **BMW Group's** SORDI.ai platform, which integrates digital twins with generative AI for industrial planning and supply-chain simulation, improved real-time data access by 80%, eliminated manual reporting cycles, increased delivery effectiveness by 15%, and accelerated scenario simulations by up to 30 times ([Google, 2025](#)).

In logistics and retail, comparable results have been documented. **UPS's** ORION routing system has generated \$300 - 400 million in annual savings while eliminating more than 100 million miles of driving, and Walmart's AI-driven demand-forecasting systems have significantly improved working-capital efficiency and reduced stock-outs ([Forbes, 2019](#); [Power Commerce, n.d.](#)).

**20%**

reduction in inventory levels achieved by Otto Group's AI-driven replenishment system.

**90%**

accuracy rate reached in predicting customer demand, enabling automated purchasing decisions across hundreds of thousands of items for Otto Group

**80%**

improvement in real-time data access delivered by BMW Group

**\$ 300 - 400 M**

AI projects that fail to reach full operational deployment, falling into the so-called "Death Valley" of AI because they are technology-driven rather than problem-centric.



## Case Study I: Amazon Scaling through Autonomy [[Klover AI, 2025](#)]

Amazon has transitioned from experimental AI to a profit-driven "Agentic" model. By late 2025, the company realized over \$2 billion in cost savings through its AgentZ platform, which deployed over 21,000 autonomous agents.

### ↳ **Operational Impact:**

a single "Delivery Address Agent" reduced first-delivery failures by 74.4%, saving 2,500 manual work hours.

### ↳ **Strategic Pivot:**

after recognizing the scalability limits of its "Just Walk Out" camera-based systems in large stores, Amazon pivoted to "Dash Carts." These smart shopping carts demonstrate that operational efficiency often requires a hybrid approach between total automation and scalable practicality.

### ↳ **Infrastructure Bet:**

Amazon announced a massive \$200 billion capital expenditure plan for 2026 to build the data centers and proprietary chips required to sustain this autonomous ecosystem.

## Case Study II: Siemens The Industrial Metaverse [[Siemens, 2026](#)]

Siemens focuses on the convergence of physical and digital worlds to optimize heavy manufacturing. At CES 2026, the company launched the Digital Twin Composer, which fuses real-time engineering data with physics-based simulations.

### ↳ **PepsiCo Collaboration:**

PepsiCo used this technology to simulate U.S. manufacturing facilities with physics-level accuracy. The digital twin identified 90% of potential issues before physical modification, leading to a 20% increase in throughput and a 10-15% reduction in capital expenditure (Capex).

### ↳ **Workforce Integration:**

by deploying nine "Industrial Copilots," Siemens is democratizing expertise, allowing shop-floor operators to access institutional knowledge via natural language interfaces.



Yet even with such documented successes, large-scale AI adoption remains limited. Recent McKinsey Global Surveys report that 88% of organizations now use AI in at least one business function, and most executives observe productivity gains at the use-case level. However, only 6% of firms attribute more than 5% of enterprise EBIT to AI, and just 39% report measurable EBIT impact at scale. Gartner data reinforce this picture: only 23% of supply-chain organizations have a formal AI strategy, and adoption in core production and planning processes remains below 30% for most firms ([McKinsey, 2025](#); [Gartner, 2025](#)).

only **6%**

of firms attributing more than 5% of their enterprise EBIT to AI

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Also **Physical AI** deserves to be cited in this scenario since it allows to mitigate the current problems due to the probabilistic nature of GenAI ([NVIDIA](#)). While standard automation is deterministic and rigid, Physical AI introduces a learning-based approach that enables machines to operate in unstructured environments.

below **30%**

AI adoption level in core production and planning processes for most companies

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The scale of this transition is evidenced by the commercial deployment of **Agility Robotics' Digit**, which is currently being integrated into the operations of Amazon, GXO, and Schaeffler ([Amazon, 2023](#)). Similarly, the automotive sector is moving beyond traditional robotics: **Appronik's Apollo** is now in use at Mercedes-Benz production lines, providing a direct answer to the labor-cost trap in high-wage regions ([Manus, 2026](#)).

**80 hours**

video training required for an advanced robot to learn and perform complex manual tasks

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This evolution effectively bridges the tension between deterministic execution and probabilistic reasoning.

A breakthrough example is **Figure 03**, which learned to perform complex manual tasks, such as folding laundry, from only 80 hours of video training, demonstrating an observational learning capability that traditional systems lack. This hardware revolution is supported by a standardized software infrastructure: NVIDIA's GROOT N1.7 (released with a commercial license) and the N2 preview at the March 2026 GTC have provided the foundational 'brain' for these general-purpose robots, allowing manufacturers to scale reshoring efforts despite the 100% tariff regime ([Robotics Society of Singapore, 2026](#)).

Therefore, Physical AI represents more than just a technological evolution; it can be the 'Next Step' for global supply chains. While widespread adoption remains on the horizon, these frontrunners have provided the roadmap for reconciling the probabilistic nature of AI with the deterministic demands of the shop floor.



# **Interviews**

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**a perspective from  
Scientific Committee  
“Digital Operational Excellence”  
H-FARM Business School**

To better understand the gap between theoretical potential and operational reality, here is an integration of the perspectives of the **Digital Operational Excellence Scientific Committee** of **H-FARM Business School**. They confirm that the "*Implementation Paradox*" is a lived reality.

The dialogue with the Scientific Committee reveals a general enthusiasm and interest in new technologies, but not a direct implementation consequence.

For many leaders, the current state of AI adoption in the supply chain is minimal, despite the successful use of individual productivity tools. The primary bottleneck identified is not the AI technology itself, but lateral considerations. It is useful to also note that the "*Implementation Paradox*" is not necessarily to be seen as a misunderstanding of technology, but as a **calculated strategic pause**. It can also be interpreted not as a problem, but as the **natural set up** of an environment where in many cases, a well-managed traditional process remains more reliable and cost-effective than a probabilistic Gen AI that the current industrial infrastructure isn't yet ready to protect.

Key insights from the committee highlight some critical dimensions of the adoption challenge:

#### ↳ **The "Embedded" vs. "Add-on" Dilemma:**

current AI usage often requires a "cognitive copy-paste," where data must be extracted from ERP systems to be processed in external tools.

The committee argues that real value will only be unlocked when AI becomes the invisible motor native to management software, moving from direct prompting to automated action by exception.

#### ↳ **The Data Maturity Gap:**

a significant hurdle remains the lack of structured data and historical depth required for predictive analysis. For instance, while the human eye easily recognizes objects' similarities, internal data architectures are often not yet "AI-ready" to perform automated sales forecasting or cost-saving classifications. It is essential to act on data companies rely on before applying AI tools to avoid deploying AI unnecessarily and in a non coherent way. AI is simply a tool, the managers are the ones responsible for how to implement it and to critically evaluate its output.



## ↳ **The Governance and Scale Risk:**

there is a growing concern that fragmented, department-level pilots are creating "silos of efficiency" without a clear End-to-End (E2E) mandate. Without strong strategic leadership and a unified roadmap, AI risks being seen as a "costly toy" rather than a driver of new marginality. **Cybersecurity and IT barriers need to be cited as actual obstacles.**

## ↳ **Lack of Business Cases:**

in the current scenario, there are not many business cases to consider. And companies prefer to wait for sure data and ROI rather than act as "guinea pigs" for software houses, preferring to wait for mature, integrated products that demonstrate a clear economic benefit before committing resources in an era of intense cost pressure.

In such a context, the challenge is not only addressed to large companies with big budgets to invest. A big opportunity is for SMEs. They typically have easier procedures, smoother processes and they can gain competitive advantage since they can elaborate quick POCs and validate their effectiveness through an agile approach. This is more than a feeling. While US Hyperscalers are closing the gap between their massive \$700B Capex and \$51B revenue through 'Agentic Autonomy,' and large European players are building 'Sovereign Stacks' under the strict enforcement of the AI Act (August 2026), SMEs are winning by being pragmatic consumers. Instead of building expensive proprietary models, SMEs are waiting for AI to become the 'invisible engine' native to their trusted vendors ([Goldman Sachs, 2024](#); [Gartner, 2025](#)).

As a final consideration, some members of the the Scientific Committee of H-FARM Business School do not reveal fear and lack of information within their organizations nor panic because of the probabilistic nature of the systems (ndr, the probabilistic nature of Gen AI offers a more robust framework for decision-making than the often inconsistent intuition of human bias), whereas other members do. This discrepancy suggests further investigation of this topic, considering different sectors and companies. For sure, in the next few years there will be concrete differences and changes within the supply chain domains.



22

Agentic applications  
launched by Oracle in a  
single software release

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40%

proportion of  
enterprise applications  
projected to feature  
task-specific AI agents  
by 2026

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next 3 years

expected horizon for  
talent reorganization,  
where the probabilistic  
output of GenAI is  
harnessed by critical  
human judgment

Ultimately, the Committee views **AI as a future commodity** much like electricity. In 2026, a convergence of ERP systems happened: SAP has merged Joule with Microsoft Copilot, Microsoft is transforming Copilot Studio into a suite of autonomous agents, and Oracle has launched 22 agentic applications in a single release ([My Business Future](#), 2026). It is not a matter of making it happen, but it is a matter of applying the implementation in the companies ([Gartner](#), 2025): 40% of Enterprise Apps Will Feature Task-Specific AI Agents by 2026. These developments confirm that the era of 'AI-as-a-tool' is ending, replaced by an era of 'AI-as-the-Engine'.

Consequently, the competitive advantage will not come from the software itself, but from the ability of managers to bridge the "language barrier" between data science and operational reality. The next three years will not be about replaced jobs, but about reorganized talent, where the "probabilistic" nature of Gen AI is harnessed by the critical, rational judgment of the human lead, even when the solution is not AI-driven.

**For sure AI is fancy and interesting, but it is not a remedy for every problem, especially in the manufacturing sector.**



# Conclusion

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possible areas to work

From this perspective, AI readiness in the supply chain should be understood as a configuration of prerequisites across three layers.

- ↳ **First, firms need usable *data foundations*: not simply large datasets, but sufficiently reliable, interoperable, and process-linked data that can support operational decisions.**
- ↳ **Second, they need *organizational capabilities*, including cross-functional ownership, analytics literacy, and the capacity to translate model outputs into workflow changes.**
- ↳ **Third, they need *process conditions compatible with AI deployment*, especially in contexts where the probabilistic nature of Gen AI must interact with deterministic production systems and low tolerance for failure.**

This last point is especially relevant for manufacturing-oriented supply chains and offers a more original interpretation of adoption barriers. In office or analytical processes, imperfect AI outputs can often be tolerated and corrected ex post; in production, logistics execution, or quality-sensitive environments, even small prediction errors may generate downtime, service failures, or safety risks. For this reason, firms often rationally prefer **human-in-the-loop** architectures and limited-scope deployments, not because they reject AI's value, but because they are managing operational risk under uncertainty.

Accordingly, the most effective **quick wins** are those that reduce perceived risk while generating measurable economic value. The strongest candidates are decision-support applications in demand forecasting, inventory optimization, supply planning, and adjacent analytical activities, because these use cases improve service and working-capital performance without immediately requiring full

process autonomy. Recent industry evidence also indicates that leaders increasingly prioritize these applications as practical entry points for AI adoption in supply-chain functions.

Finally, **AI investments** in the supply chain should not be framed as a one-shot bet, but as a staged portfolio of options. A progressive ROI logic starts with low-regret use cases focused on efficiency and cost optimization, then expands toward cross-functional orchestration and, only later, toward more transformative and less reversible applications. This approach is consistent with the real-options perspective already embedded in your project and helps explain how firms can move from pilots to scale without overexposing themselves to technological, organizational, and governance risk.



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**Next steps**  
**Acknowledgments**  
**Bibliography**

## Next steps

This research aims to collect data about the state of AI in the supply chain. Please compile the survey to help us analyze the level of AI adoption inside organizations.

[Click the link to the form.](#)

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