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MANUFACTURING AT THE CROSSROADS

Real-World Lessons from Industrial Leaders

2025 EDITION

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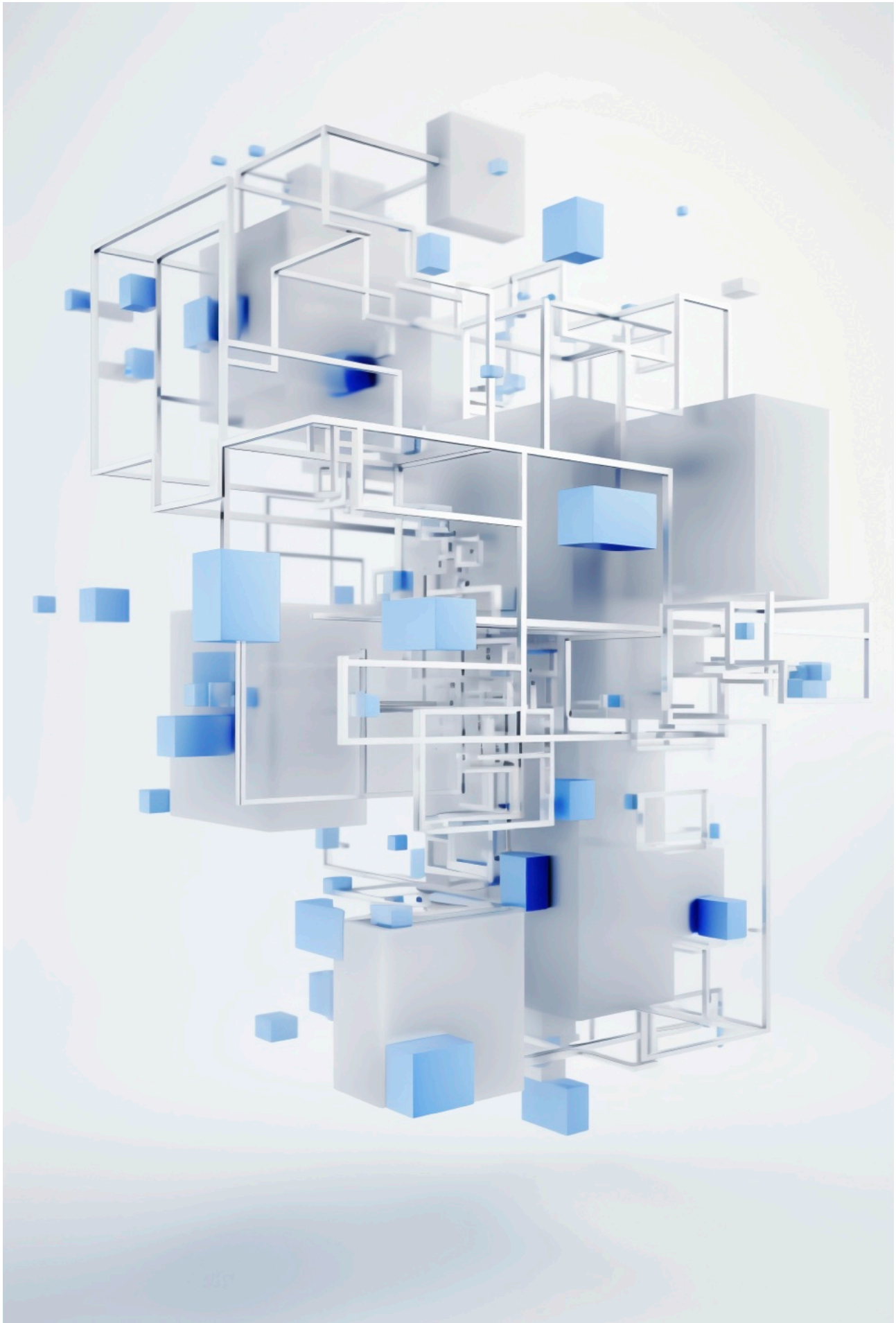
Critical manufacturing



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INTRODUCTION

At Hannover Messe 2025, the conversation around industrial digital transformation reached a new level of clarity—and urgency. From AI and agentic automation to modular MES platforms and resilient supply chains, one thing became clear across every conversation: transformation is no longer a long-term aspiration.
It's a present-day imperative.

In this digital booklet, IIoT World brings together a selection of interviews with leaders shaping the future of manufacturing, supply chain, and industrial operations. While we conducted many more insightful conversations at the event, this edition highlights a cross-section of perspectives that share a common urgency and vision for the road ahead.

Each featured voice offers a distinct lens—from operational data and AI to MES modernization and workforce transformation. But across these diverse conversations, unmistakable patterns emerged. Regardless of industry segment or company size, certain priorities, technologies, and principles were repeatedly echoed.

Common Ground: What Manufacturing Leaders Agree On

1. DATA IS THE NEW INFRASTRUCTURE

Whether from Schneider Electric, AWS, HighByte, or InfluxData, every leader emphasized that operational success increasingly depends on data—not just its volume but its structure, context, and availability. Without high-quality, real-time, contextualized data, AI fails, traceability breaks down, and agility stalls. Manufacturers who treat data as a product—not an afterthought—are those best positioned to scale intelligence across their operations.

2. AI IS REAL—BUT IT STARTS WITH ARCHITECTURE

Generative and agentic AI are gaining traction not as futuristic visions but as real-time value drivers—especially in simulation, predictive analytics, and multi-agent coordination across supply chains. But AI maturity is stratified. Leaders like AWS and HighByte stress that successful AI deployment demands modern, unified data architectures spanning cloud and edge, with strong leadership mandates and cultural alignment.

3. FROM PILOTS TO PRODUCTION

Almost every expert we spoke with pushed back against the trend of proof-of-concept purgatory. The winners in this industrial era are those moving beyond pilots to scaled, repeatable deployments. That means rethinking ROI not in siloed savings but in strategic value: flexibility, time-to-market, resilience, and sustainable performance.

4. HUMAN-MACHINE SYMBIOSIS

A recurring theme: the operator role is evolving. As automation deepens, shop floor teams are becoming information workers—interpreting dashboards, making decisions, and managing systems. Interfaces need to keep pace. Several leaders pointed to voice interaction, agentic collaboration, and low-code tools as keys to empowering the next generation of industrial workers.

5. RESILIENCE DEMANDS ORCHESTRATION

From modular MES to data lakes and time-series platforms, one consistent insight was that resilient systems must be orchestrated, not just digitized. Fragmented tools and disconnected analytics won't survive global volatility. The future belongs to manufacturers who can sense, decide, and act in real-time across assets, departments, and supply chains.

6. AGENTIC AI IS THE NEXT FRONTIER

Several leaders, including Francisco Lobo, Evan Kaplan, and John Harrington, see agentic AI as the most transformative development on the horizon. Unlike traditional AI, agentic systems break down complex tasks, operate semi-autonomously, and collaborate with each other and humans. But this vision depends on robust data models and cross-platform interoperability—areas where many are just beginning the journey.

NEIL SMITH

Segment President,
Consumer Packaged Goods

Schneider Electric

Adapting to Complexity: CPG Manufacturing in the Age of Constraints and Customization

As the Consumer-Packaged Goods (CPG) sector enters a new era of complexity, manufacturers are under pressure to deliver more—more SKUs, more personalization, faster market entry—without increasing their physical footprint or energy usage.

In an interview with IIoT World at Hannover Messe 2025, Neil Smith, Segment President of Consumer Packaged Goods at Schneider Electric, shared how today's CPG manufacturers are navigating a trifecta of transformation: evolving consumer demand, regulatory pressure, and physical and energy constraints in legacy plants.

Constraints Are the Catalyst for Innovation

Many CPG producers operate in urban locations where expanding the plant or increasing the energy drawn from the grid is no longer feasible. Grid upgrades in some regions can take 5–6 years, leaving companies with one option: **get smarter, not bigger.**

As consumer preferences shift toward organic, sugar-free, and functional foods—such as high-protein, low-fat, or fortified products—flexibility in production becomes non-negotiable.

Smarter Footprints and Adaptive Machines

One major trend Neil Smith highlights is the shrinking physical footprint of machines to accommodate more production lines within the same square footage. At the same time, manufacturers invest in equipment that adjusts on the fly to produce different formats or recipes without human intervention.

A live demo at Schneider's Hannover Messe booth illustrated the point: a single oat milk line could seamlessly produce multiple variations—extra creamy for baristas, protein-enriched, or low-sugar options—based on adaptive control, inline analyzers, and AI-driven automation.

A key lever to achieve this is open, software-defined automation, which is integrated into this oat milk machine and supports the customer with flexibility and agility of modular production lines that can be easily parameterized without reprogramming the entire line and incurring costly downtime.

It goes beyond just avoiding reprogramming—there's no need to define or select a new recipe; instead, operators simply describe the key attributes of the product they wish to manufacture.
In this system, EcoStruxure Automation Expert is used to manage varying raw materials to ensure optimal yield and quality integrating seamlessly with higher-level systems like MES and ERP to run AI applications at the Edge level to optimize production.

This shift isn't just about customization; it's about making infrastructure multipurpose.

Traceability: From Compliance to Competitive Advantage

Transparency is no longer optional. Whether it's for food safety, sustainability, or brand integrity, consumers increasingly demand to know what's in their product, where it came from, how it was transported, and whether it met ethical and environmental standards.

Neil Smith emphasizes the growing importance of full supply chain traceability—from farm to factory to shelf. Manufacturers can now provide genealogy-level traceability with tools like QR-code-enabled product IDs and edge-to-cloud historian systems. This data can also be selectively shared with partners, enabling faster root-cause diagnostics, remote maintenance, or even customer-facing transparency. For example, a facility processing both traditional milk and specialty products like organic or 'hay milk' can trace the milk's origin and document cleaning procedures between batches to meet certification requirements for organic labeling.

Redefining ROI: Capital Efficiency over Uptime

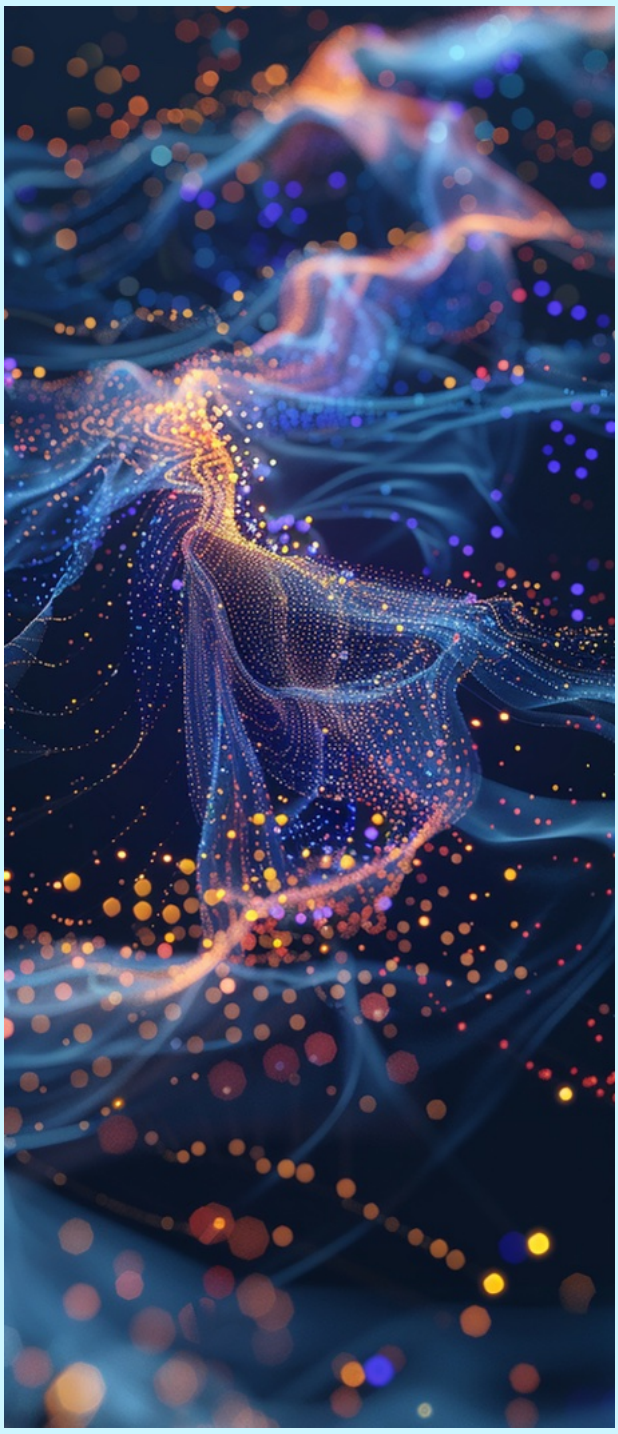
Another shift Neil Smith outlines is in how ROI is measured. It's no longer just about uptime or overall equipment effectiveness (OEE)—it's about capital efficiency. How many products can you generate per unit of investment? Per kilowatt hour? Per liter of water? Ultimately, it's about maximizing output from your capital assets while minimizing inputs like ingredients, energy, and time.

Reducing waste is a key part of this equation. Through better process control and real-time monitoring, manufacturers prevent defective batches before they form—rather than correcting or disposing of them after the fact.

> **We need to stop waste at the source, not recycle it after,**
> **Neil Smith says.**

The Cost of Inaction

The competitive gap is widening fast for companies still hesitating to adopt AI, software-defined automation, or digital twins. “The world is getting faster and more personalized,” Neil Smith adds.



> **“If you want to be in business in 2031, you need to be seriously looking at how AI helps you.”**

The message is clear:

Digital transformation—and a new approach to automation—are no longer differentiators; they’re survival strategies.

Those who act now, with intelligence and purpose, will lead the next decade of industrial performance.

This article is based on a video interview conducted at Hannover Messe 2025 between Neil Smith, Segment President, Consumer Packaged Goods at Schneider Electric, and Lucian Fogoros, Co-founder of IIoT World.

EVAN KAPLAN

CEO

influxdata®

From Monitoring to Intelligence: How Time-Series Data Will Power the Next Industrial Revolution

For Evan Kaplan, CEO of InfluxData, the future of manufacturing isn't about digital twins — it's about physical twins driven by data. In his words,

> **We're moving from a world that digitizes physical processes to one where physical systems are expressions of underlying data models.**

And if that sounds radical, it should — because it changes everything.

Time-Series Data Is the Backbone of Industrial Autonomy

Manufacturers can't talk about predictive maintenance, autonomous systems, or real-time control without first mastering time-series data — the constant stream of sensor data that tells us "what happened, what's happening, and what will happen next."

"Manufacturers often treat time series as just another data stream," Evan Kaplan says, "but it's foundational. If you want smarter factories, you need to understand that your most valuable insights are locked in time-based telemetry."

Beyond Monitoring: Toward Actionable Intelligence

Historically, time-series data has powered dashboards — simple monitoring systems to tell operators what's going wrong. But Evan Kaplan sees a bigger opportunity: control.

At Hannover Messe, he described the shift: "We're entering a new phase where that same data is used not just to observe systems but to drive them. That means real-time feedback loops, predictive optimization, and adaptive decision-making — all built on high-resolution sensor data."

This is the intelligence layer that will turn today's factories into **autonomous, adaptive operations.**

Data Isn't the Problem — Context Is

Most manufacturers have already started collecting massive amounts of data. The problem? It's unusable. "You've got to add context — where did this come from? Which machine? What product line? What asset? Without that, it's just a data swamp."

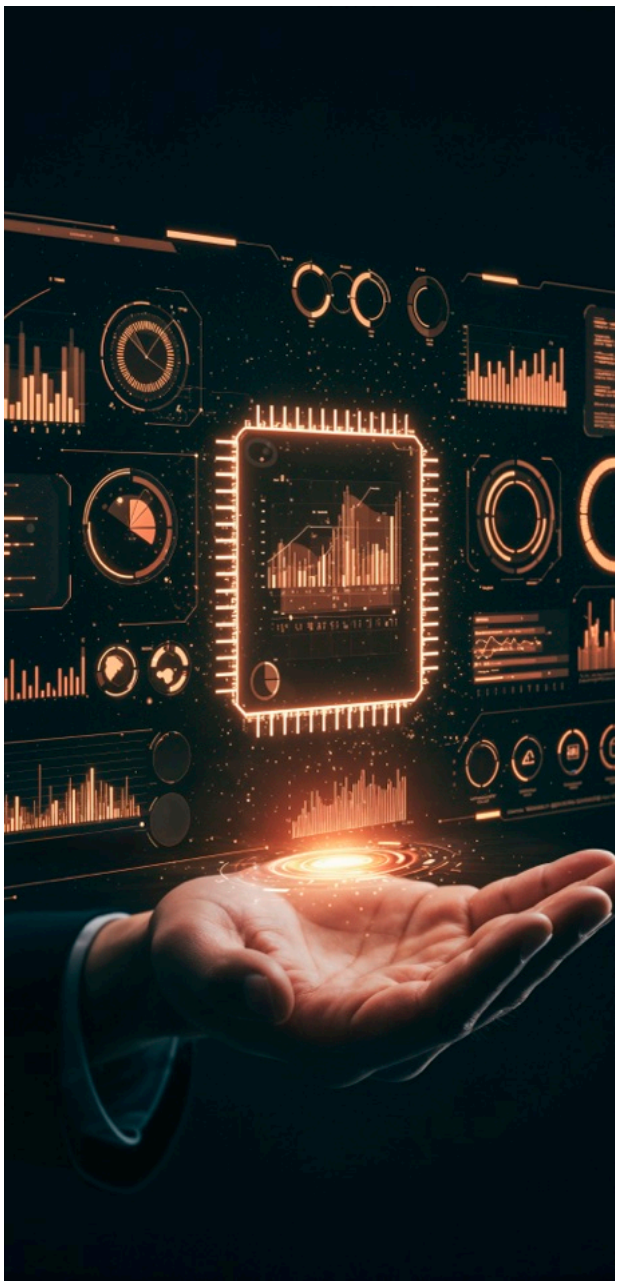
That's why InfluxData's focus isn't just storage but structure: making data findable, trustworthy, and usable for advanced analytics and AI models.

> **"Now you can refine raw industrial data like you'd refine crude oil — and turn it into real-time, actionable insights."**

Hybrid Architectures Are the Future

Evan Kaplan is realistic about where computing should happen.
"The edge wins when you need instant decisions — sub-second anomaly detection, vision-based quality inspection, energy load balancing. But cloud wins when you need to compare plants, identify patterns, or benchmark performance globally."

He envisions a **hybrid architecture** with edge-first processing for latency-sensitive workloads and cloud-scale analytics for learning, modeling, and optimization.
"It's not one or the other.
It's both — working together."



What Makes It All Work? Clean, Structured, Shared Data

The most successful manufacturers are those who treat data as a shared product — something that can be reused, enriched, and federated across systems.

> **Think of your data infrastructure as a refinery. The quality of what comes out depends entirely on how well you refine what goes in.**

This shift, Evan Kaplan believes, will lead to more collaboration between data engineers, operations leaders, and domain experts. Eventually, it will enable **agentic AI systems** — digital agents that perform tasks, respond to issues, and make decisions — not in isolation but as orchestrated components in a larger system.

A Flip in Perspective: From Digital Twins to Physical Expressions

In closing, Evan Kaplan offered a provocative thought: "We keep talking about building digital twins of the physical world. But maybe it's the other way around. Maybe the digital thread — the data — is the real thing.
And the factory, the robot, the machine? That's just its physical expression."

It's a fundamental reframe of what it means to be a modern industrial company:

Don't build machines and then add data — build data infrastructure, then express it through machines.

That's the new blueprint for intelligent manufacturing.

This article was developed based on interviews conducted by IIoT World with Evan Kaplan, CEO of InfluxData, during Hannover Messe 2025.

JOHN HARRINGTON

Co-Founder and Chief Product Officer

HighByte

Laying the Data Groundwork for Industrial AI and Agentic Systems

In a conversation at Hannover Messe 2025, John Harrington, Co-Founder and Chief Product Officer at HighByte, moves past the usual AI buzzwords and goes straight to the real bottleneck holding back industrial transformation: bad data. The kind that's inconsistent, unstructured, or stripped of context.

In today's manufacturing environment, where decisions are time-sensitive and mistakes are expensive, data isn't just an input — it's the oxygen for AI.

AI Can't Breathe in Dirty Data

"AI suffocates on polluted data," Harrington says — and he means it literally. Industrial environments generate massive volumes of time series and machine-level data, but that data often comes from dozens of disconnected systems — SCADA, PLCs, MES, historians — with inconsistent tags, missing context, and time gaps.

"Most companies don't know what their data means or where it comes from. And if your AI can't trust the data, it's useless," he emphasizes.

Context and Consistency: The Two Non-Negotiables

John Harrington defines high-quality industrial data by two key attributes:

Context:

Knowing which machine, line, or product a tag refers to

Consistency:

Maintaining a continuous, structured time-series collection with no surprises

> **If there's a five-minute gap in your data, your predictive maintenance system might fail. If you don't know what a value refers to, your analytics won't either.**

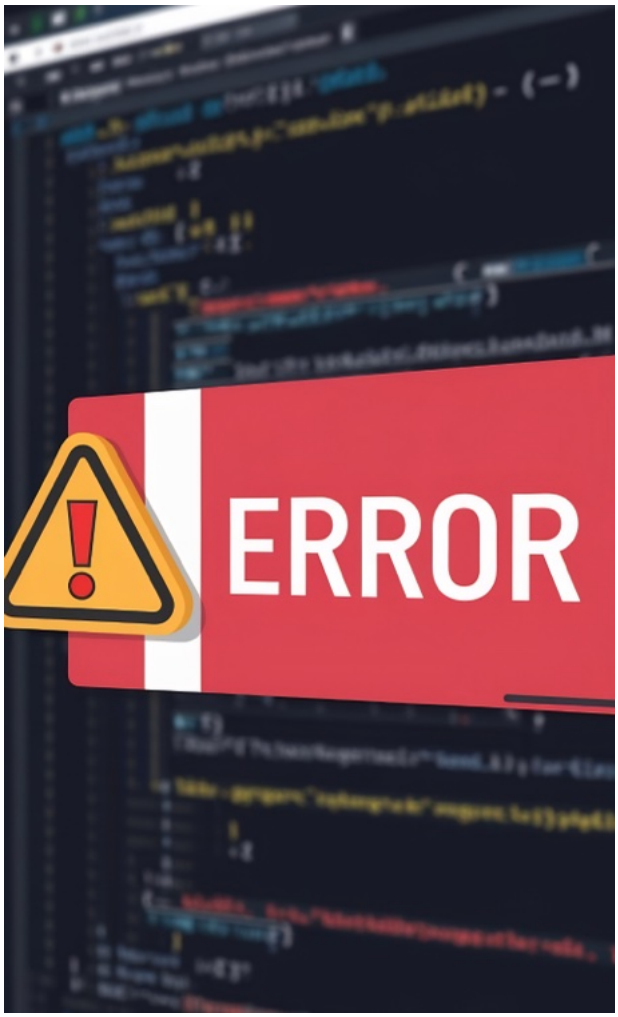
That's why industrial DataOps plays such a crucial role — turning raw operational data into structured, contextualized, and reliable information right at the source.

Edge-First Thinking: Data Where It's Created

John Harrington stresses that the edge — not the cloud — is the first ideal place to clean and contextualize data.

Manufacturers shouldn't send raw data upstream into a cloud swamp. Instead, transformation should first happen at the edge, so only high-value, usable datasets make it to the cloud, dashboards, or AI models.

This edge-first approach reduces noise, strengthens trust in the data pipeline, and supports scaling AI use cases well beyond initial pilots.



Agentic AI Starts with Structured Intelligence

Agentic systems — AI-powered agents that autonomously break down workflows into modular tasks — hold tremendous promise. But they're brittle without the right foundation.

Without reliable, well-modeled data, agentic AI can't operate effectively — let alone improve itself.

> **"Agents only work if they have the right data, at the right time, with the right structure," Harrington explains. "You can't stack intelligence on chaos."**

Empowering a New Kind of Operator

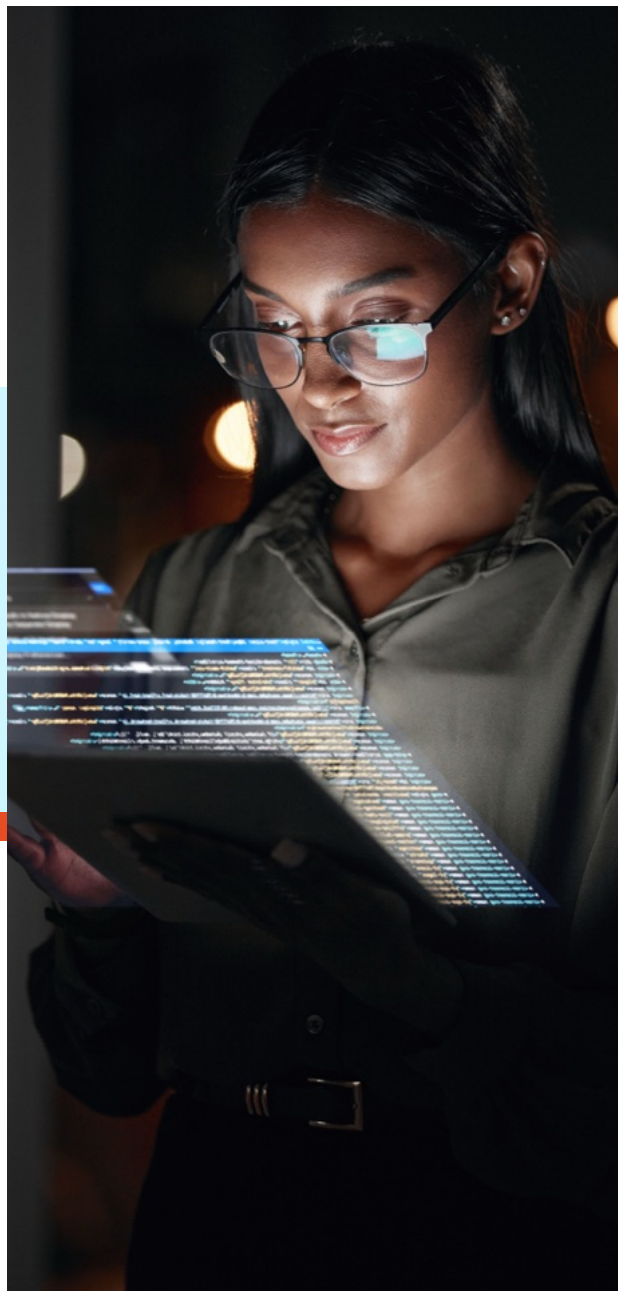
Modern factories increasingly rely on information workers — not just machine operators. As manufacturing becomes more digitized and autonomous, floor-level staff are managing multiple cells, monitoring real-time dashboards, and responding to system-level insights.

John envisions human-machine interfaces that surface contextual alerts, insights, and even conversational prompts. "We're not far from the day when an operator can ask, 'What's wrong with Line 2?' — and get a clear, accurate answer," he says.

From Reactive to Orchestrated

Ultimately, John outlines a shift from reactive operations to orchestrated, intelligent systems. But none of that happens without getting the data right.

"Data can no longer be an afterthought. It's the foundation for AI, predictive analytics, and long-term resilience," he says.



The manufacturers investing in structured DataOps today are the ones best positioned to lead in the era of agentic intelligence tomorrow.

This article is based on insights shared by John Harrington, Co-founder and Chief Product Officer at HighByte, during several interviews with IIoT World at Hannover Messe 2025.

OZGUR TOHUMCU

General Manager of Automotive & Manufacturing

aws

AI at Scale: From Workforce Gaps to Agentic Supply Chains

At Hannover Messe 2025, AWS's Ozgur Tohumcu offered one of the most actionable and grounded perspectives on the evolution of AI in manufacturing.

His message is clear: the convergence of workforce shortages, fragile supply chains, and rapidly advancing generative AI is not something to brace for — it's already here, and it's reshaping how industrial organizations operate.

> **"Customers are looking for more resilient, data-driven, AI-powered supply chains that can adapt in real time. It's not just about automation anymore — it's about intelligence built into the system."**

Workforce Shortage: A Crisis Turning Point

With a projected shortfall of 2 million manufacturing workers in the U.S. by 2030 (IDC), many manufacturers are rethinking how work gets done. This isn't just a capacity problem—it's a transformation trigger. The labor crunch is accelerating the adoption of AI, automation, and cloud-native infrastructure, not just among digital-first companies but deep within legacy manufacturers.

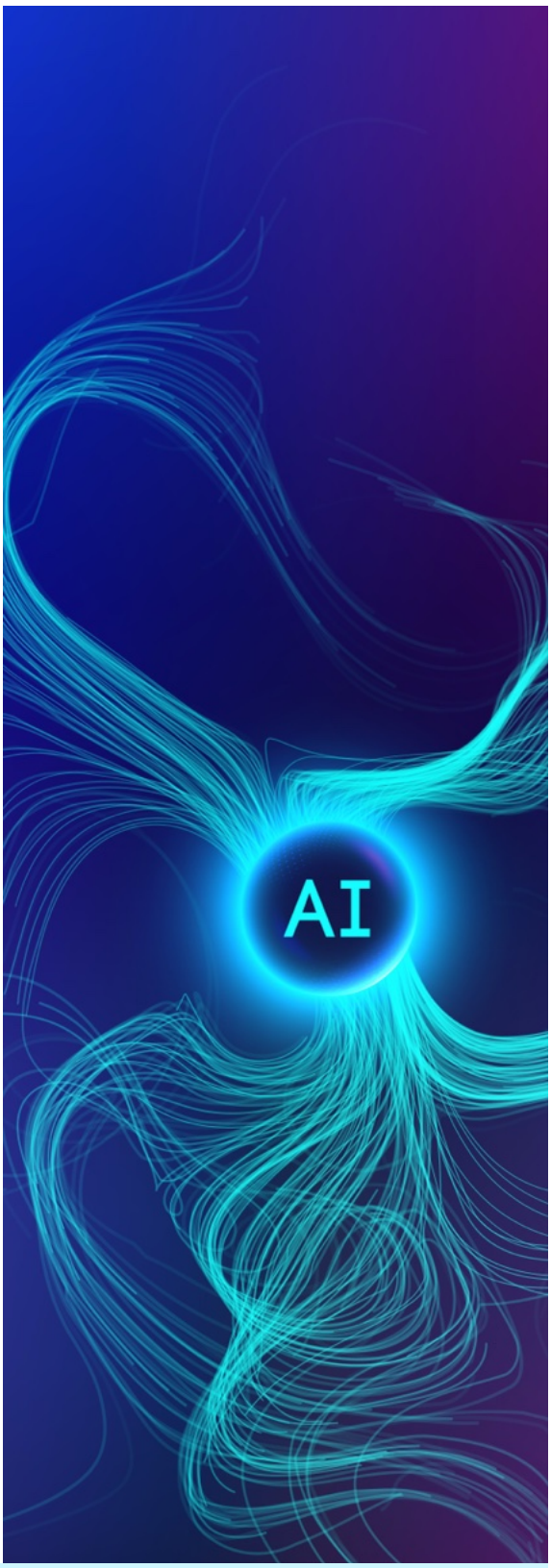
He cites companies like BMW and Siemens as examples of organizations that took transformation out of R&D and into the C-suite. Each launched board-level mandates to become data-driven enterprises — collapsing internal silos, modernizing infrastructure, and scaling AI not just for pilots but for production-grade use cases.

Fast Decisions Win: The 70% Rule

Ozgur's advice to decision-makers: stop chasing perfection. "Most manufacturers wait until they have 90–95% of the data before making a decision," he says.

> **The real innovators act at 70% certainty — and course-correct along the way.**

This kind of agile, iterative thinking is no longer optional in a world of increasingly complex supply chains and shrinking innovation cycles. It's what separates the disruptors from the disrupted.



Generative AI's Real-World Impact

While many still equate generative AI with content generation, Ozgur highlights its current and very real impact on engineering and product development.

That leap improves engineering productivity and changes how quickly companies can bring new products to market.

One global automaker recently reduced simulation time from two days to two seconds using AWS's generative AI technology paired with high-performance computing.

Laying the Groundwork for Scalable AI

Ozgur is equally clear on what it takes to avoid AI becoming another buzzword: **a modern, cloud-based data architecture that spans edge and enterprise.**

Everyone can access foundation models — what differentiates the leaders is how they train and fine-tune them using proprietary, **context-rich industrial data.**

Manufacturers that invest now in modernizing their data infrastructure — integrating machine, process, and business data into unified layers — are building the only foundation that can support scalable, differentiated AI solutions.

From Smart Factories to Agentic Supply Chains

Looking three years ahead, Ozgur predicts a dramatic evolution in the way work is orchestrated — both within factories and across supply networks.

Today's automation operates in silos. But tomorrow's value will come from agentic supply chains — intelligent, adaptive systems where AI agents collaborate across departments, systems, and partners to make decisions, resolve issues, and optimize flows in real-time.

This shift will demand new thinking in systems design, data transparency, and trust. While most organizations aren't there yet, **those who start preparing now will be the ones to benefit when agentic coordination becomes the new industrial standard.**

This article is based on an interview conducted at Hannover Messe 2025 between Lucian Fogoros, Co-founder of IIoT World, and Ozgur Tohumcu, General Manager of Automotive & Manufacturing at Amazon Web Services.

FRANCISCO LOBO

CEO

Critical manufacturing

Rethinking MES: The Strategic Core of Digital Manufacturing

Francisco Lobo, CEO of Critical Manufacturing, cuts through the AI hype with a powerful reminder:
Digital transformation doesn't start with algorithms—it starts with architecture. For manufacturers looking to stay resilient, traceable, and competitive in volatile global markets, the manufacturing execution system (MES) must evolve from back-office software to strategic infrastructure.

> **Digital transformation doesn't start with algorithms—it starts with architecture.**

From Fragmented Tools to Foundational Systems

In Francisco Lobo's view, the traditional IT stack — ERP for orders, PLM for product lifecycle, and MES for execution — no longer holds up in today's manufacturing environments. Modern shop floors are hybrid ecosystems with sensors, automation layers, and fast-emerging data platforms.

"It's no longer just an MES. It's a convergence of systems — connectivity, execution, and contextual analytics. If you're not rethinking how these parts interact, you're missing the opportunity," Lobo says.

Starting with Control and Visibility

For companies overwhelmed by where to begin, Francisco Lobo's advice is clear: start by establishing **control, traceability, and visibility.** That means:

• A connected execution layer that integrates seamlessly with machines and people

• A robust automation stack that feeds real-time data into decision-making

• A flexible data model that provides full genealogy and process transparency

"Quality, compliance, and responsiveness all begin here," he says. "You can't build transformative systems without these anchor points."

Digitizing Inefficiencies = Missed Potential

One of Francisco Lobo's strongest messages is a warning:
digitizing inefficiencies doesn't deliver transformation.

Too many companies automate flawed processes and call it progress. True gains come when manufacturers use the MES project itself to challenge assumptions and streamline operations.

"We've had customers that began seeing ROI before the software was even installed — just from the process cleanup during MES prep," Francisco Lobo says, pointing to a major U.S. semiconductor firm as an example.

Accessible for the Mid-Market, Too

MES has often been perceived as a luxury for large enterprises. But Lobo says that's no longer the case.

Through subscription-based models and industry-specific use cases, Critical Manufacturing and other vendors make MES **scalable and affordable** for small and midsize manufacturers.

> **Sometimes not having a modern MES is far more expensive, he emphasizes.**

The 2030 Vision: Intelligent Orchestration

Looking ahead, Francisco Lobo outlines a clear roadmap:

Automation layer:

Get the most out of equipment, assets, and connected controls

Execution engine:

Ensure compliance, traceability, and flexible workflows

Data platform:

Surface insights for both operational and strategic decisions

Agentic layer:

Bring in AI agents to interpret data and act semi-autonomously

“We’re going to see factories where agents handle complex tasks — troubleshooting, rescheduling, quality corrections — all in real-time,” Lobo says.

“But that only happens if you’ve got a solid backbone.”

The future, as he sees it, won’t be about building smarter tools in silos — it will be about **orchestrating intelligence across every layer of manufacturing.** MES is where that begins.

This article is based on insights shared by Francisco Lobo, CEO of Critical Manufacturing, during Hannover Messe 2025 in a conversation with Lucian Fogoros, Co-founder of IIoT World.

CONCLUSION: FROM ALIGNMENT TO ACTION

The conversations featured in this digital booklet offer more than thought leadership—they form a call to action. While each expert came from a different company, role, and angle, their messages converge on one truth: industrial transformation is no longer about if or when but how fast and how well.

It’s not about adopting AI or digital tools in isolation—it’s about building the architectures, strategies, and cultures that make those tools meaningful. It’s not about chasing pilots—it’s about scaling outcomes. It’s not about replacing people—it’s about enabling them with better systems, better data, and better decisions.

Whether you're operating a single facility or managing global operations, the path forward is the same: treat data as infrastructure, empower your workforce as decision-makers, build flexible systems that scale, and prepare for a future where intelligence is distributed—across machines, people, and AI agents alike.

The industrial leaders shaping this future aren’t just experimenting—they’re executing. And their results are already redefining what competitive advantage looks like.

Now it’s your move.

THANK YOU

We're grateful to these forward-thinking leaders for contributing their vision and expertise to this edition.

NEIL SMITH

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