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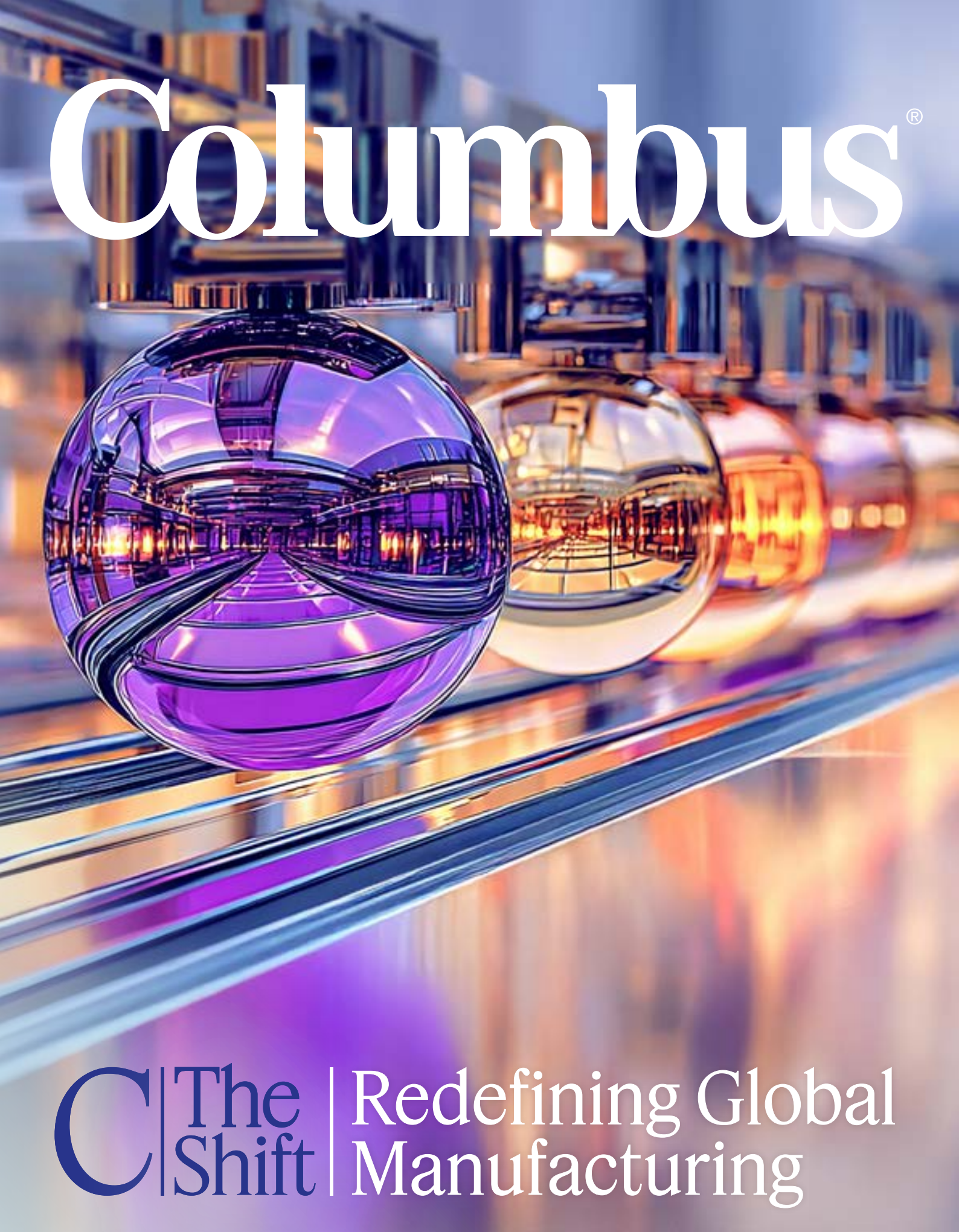

The Shift | Redefining Global Manufacturing

PREFACE

The Future of Manufacturing

Manufacturing is entering a period of profound change. Across every region and sector, the same forces are reshaping how products are designed, how they are made and delivered: data, AI, sustainability, skills and connected value chains. This insightful report brings together some excellent experts from industry, academia and technology to explore what these shifts mean in practice.

The message is clear, specially stated in Chapter 2 Five Shifts in Manufacturing, where five different experts talk about the importance of being data driven, how to work smarter with AI, why security is important, how to upskill talent and why sustainability no longer is just a soft value. Manufacturers that invest in clean data, agile processes and empowered people will move faster, innovate sooner and build more resilient operations. AI will amplify human capability, not replace it. Sustainability will become a driver of productivity, not a cost. And the most competitive organisations will be those that treat transformation as a continuous discipline, not a one-off project.

The future is already taking shape. This report is a guide to acting on it.

Søren Krogh Knudsen
Chief Executive Officer & President, Columbus

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Introducing the Experts

Thank you to the team of subject matter experts from across the globe who have contributed to this report.

Andy Juarez

Andy Juarez, based in the United States, is Vice President of Operations at Litehouse Foods. He leads major ERP and data-transformation programmes across high-volume production, bringing a front-line view of data-driven manufacturing.

Kasper Lynge Jacobsen

From Denmark, Kasper Lynge Jacobsen heads AI and Data at the Danish Chamber of Commerce. With experience across healthcare, consulting and automation, he offers a cross-sector perspective on how AI will reshape modern manufacturing.

Christine Akselsen

Christine Akselsen, based in Norway, is CEO of Kezzler, a global leader in product traceability. Her work on digital identities, secure value chains and scalable data infrastructures positions her at the forefront of secure manufacturing.

Toby Mankertz

Based in the United Kingdom, Toby Mankertz leads manufacturing strategy at Columbus. He works with global industrial firms on digital transformation and future-ready operations, connecting the report's themes to practical execution.

Kevin Bull

Based in the United Kingdom, Kevin Bull is Product Strategy Director at Columbus. With deep experience in manufacturing and supply chain, he guides organisations in selecting and implementing business-critical digital solutions.

Magnus Oxenwaldt

From Sweden, Magnus Oxenwaldt is the AI and Digital Transformation Director at Columbus. With deep enterprise architecture expertise, he helps organisations turn emerging technologies into practical value and hosts the podcast Future Bytes.

Greta Braun

With a German-Swedish background, Greta Braun researches skill gaps at Chalmers University of Technology. She also advises the European Commission on Industry 5.0 and leads the Young Manufacturing Leaders Gothenburg hub.

Professor Steve Evans

From the United Kingdom, Professor Steve Evans is a global authority on industrial sustainability at the University of Cambridge. His decades of research into resource efficiency and lean innovation frame manufacturing's next evolution.

Professor Miying Yang

Originally from China and now based in the United Kingdom, Professor Miying Yang is a leading sustainability expert at Cranfield University. Her research focuses on circular economy innovation and uncovering uncaptured value in manufacturing.

CHAPTER 1

The New Industrial Baseline

Understanding the forces shaping global industry.

Manufacturing has entered an era where uncertainty is the only constant. Supply chains have stretched, customer expectations have sharpened and technology is accelerating faster than many organisations can absorb. What was once considered “future thinking” is now becoming the minimum requirement for competitiveness.

Different regions are moving at different speeds, but the direction of travel is unmistakable; manufacturers must adapt faster than at any point in recent memory. To understand where the sector is headed, we need a clear-eyed view of what’s changing, what’s not and what manufacturers can realistically do next.

Shared operational truths emerging worldwide

Manufacturing may look different in Michigan, Munich and Malaysia, but the underlying pressures are strikingly consistent. Leaders everywhere are being asked to modernise operations, reduce risk and deliver more value with fewer resources. The noise around AI, automation and data is loud, but beneath it manufacturers share the same two questions: ***What actually matters? And what should we do first?***

This is where Columbus offers a distinctive perspective. Working across industries as varied as industrial equipment, food and beverage, pharmaceuticals and life sciences gives us visibility of how organisations are adapting in real time, from highly automated producers to labour-intensive assemblers.

Beyond that, Columbus specialises in transformation, not theory. Running a factory and transforming one are very different disciplines. The former requires operational expertise; the latter demands new structures, new behaviours, solid data foundations and a willingness to dismantle legacy processes before better ones can be built.

It's this combination of breadth, depth and pragmatism that manufacturers trust us for and why Columbus has become a recognised partner for meaningful change, not superficial modernisation.

Toby Mankertz

Based in the United Kingdom, Toby Mankertz leads manufacturing strategy at Columbus. He works with global industrial firms on digital transformation and future-ready operations, connecting the report's themes to practical execution.

Why this report, and why now

Manufacturing is facing one of the most consequential periods in its history. The next three to five years will reward organisations that build strong data foundations, re-examine their processes, invest in their people and adopt technology with clear purpose. Not because it is fashionable, but because it solves real operational constraints.

This report captures what we see every day across the sector: the pressures, the possibilities and the actions that separate resilience from fragility.

Chapter 2 outlines five major shifts already reshaping the sector, drawing on conversations with leaders at the front line of modern manufacturing, from operations executives in the US to AI specialists in Denmark, security innovators in Norway, skills advocates in Sweden and sustainability researchers in the UK. Their perspectives reveal where competitive advantage will emerge next.

CHAPTER 2

Five Shifts In Manufacturing

Manufacturing is entering a decisive transition, driven not by a single breakthrough but by the convergence of data, AI, sustainability, connectivity and workforce capability. Digital systems are surfacing inefficiencies that were previously invisible; sustainability has become an operational and financial imperative; and value chains are becoming deeply connected, traceable and increasingly automated.

Over the next five years, factories will be redesigned to be smarter, processes re-engineered to be more efficient and roles reshaped around AI and automation as industry confronts new pressures and possibilities.

This chapter examines the five shifts that will define how products are made, powered and managed through this transitional era.

SHIFT 1

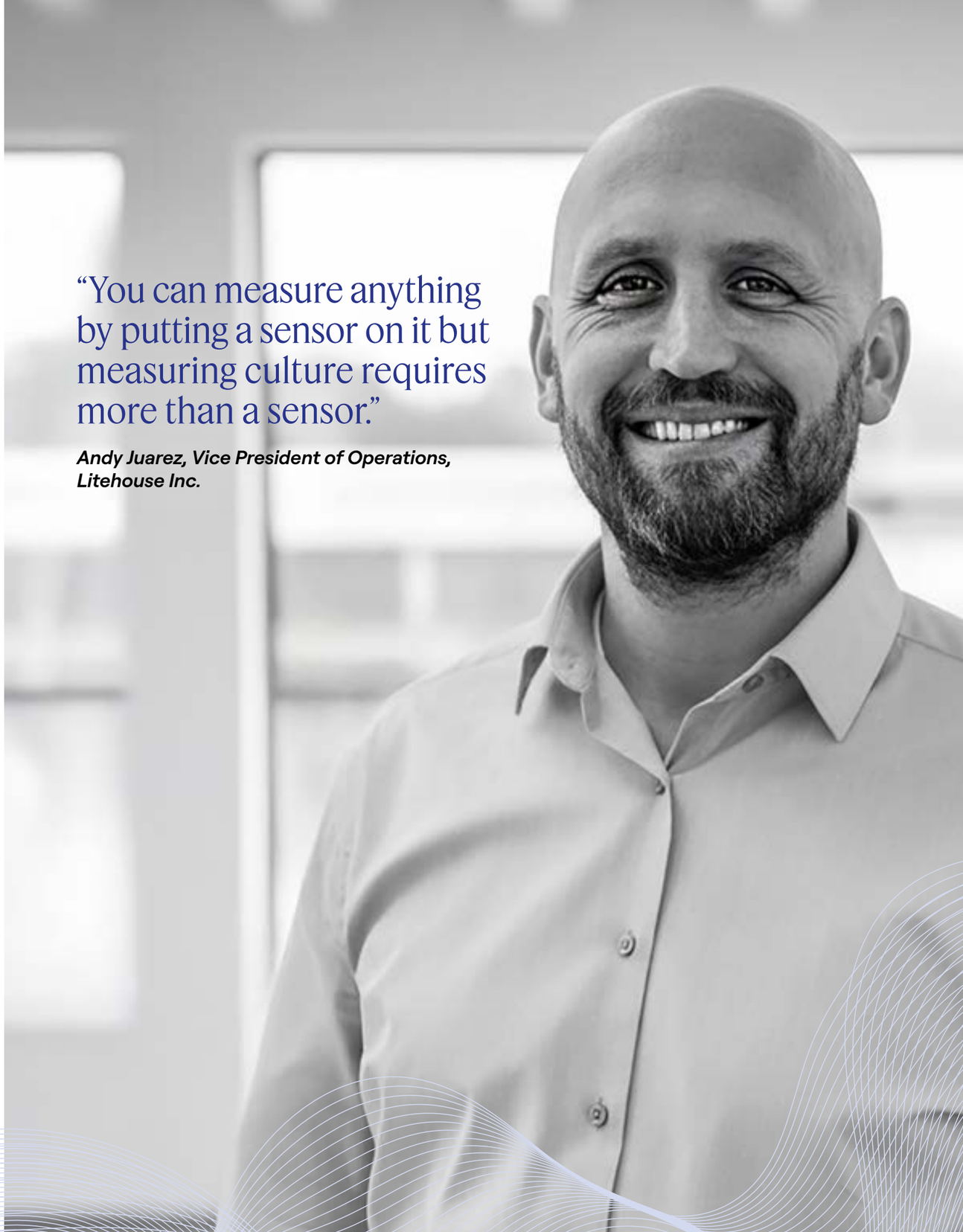
Data-Driven Manufacturing: From Throughput to Insight

Litehouse Foods is halfway through a major ERP deployment, and for Andy Juarez the goal is clear: build a manufacturing operation that runs on real-time, reliable and actionable data. The company is investing heavily in clean, meaningful information because it reduces errors, reveals what actually happens during downtime events and prepares the organisation for AI, machine learning and IIoT. As Andy notes; "Clean data is essential for future tools."

The need for stability becomes obvious whenever data stops flowing. The first area affected is product formulation. Production can still run manually if the team knows the recipes, but Litehouse immediately activates a crisis-management process to maintain control. For Andy, this illustrates the difference between falling back on manual knowledge and building a system that allows the business to pivot quickly and confidently under pressure.

That confidence starts with knowing the data is right. Litehouse has created a new data governance committee to ensure company-wide consistency across item, supplier and product data. Different leaders want different reports, and no single person can validate every request. The committee's job is to establish reliability and make sure data drives action rather than confusion. The work is "tedious rather than painful," but it is foundational to everything that follows.

Accurate data is only part of the transformation. Litehouse is also engaged in extensive business process modelling to ensure each step reflects how work is actually done on the shop floor. Every process must make sense, avoid extra work and ultimately make people's jobs easier. Andy compares the ambition to self-checkout: a tool designed to remove friction, not add it. With better-designed processes and more reliable data, Litehouse expects to move away from a reactionary operating model and toward one where planning, inventory control and cost-to-serve are far more precise.



"You can measure anything by putting a sensor on it but measuring culture requires more than a sensor."

Andy Juarez, Vice President of Operations, Litehouse Inc.

Fixing processes before scaling technology

As the ERP programme advances, the hardest work is happening in day-to-day operations. Process modelling has uncovered years of workarounds and inconsistencies - the kind of legacy thinking that becomes risky when scaled through automation. Andy is clear that every step must be logical and efficient before technology is applied. If a process creates unnecessary work, automating it only accelerates the inefficiency.

Improving these workflows also reduces event errors, where the system records one outcome but the factory knows another. Better data and cleaner processes give Litehouse clearer visibility of what is really happening on the shop floor and where changes should be made.

This supports the wider goal of standardising how different plants and machines produce the same product. “Every step must make sense and not cause extra work,” Andy says, because transformation should always make work easier, not harder.

What data misses and why people still matter

Andy is clear about what data cannot capture. The biggest blind spot is people. “How’s the work going? Are the wages competitive? Is staff turnover up or down?” These signals rarely sit neatly inside a system. As he puts it, “You can measure anything by putting a sensor on it but measuring culture requires more than a sensor.”

Seasonality adds more complexity. Consumption drops after the New Year, holidays disrupt patterns and sporting events reshape demand in ways no algorithm can fully anticipate. These gaps reinforce the need for modernisation. With accurate data and aligned processes, ERP becomes an engine for better decisions.

Andy’s advice is straightforward: do your research, involve experts, plan properly and treat ERP as a journey without an end point. Litehouse is preparing for smart factories built on clean data, standardisation and technology that amplifies human judgement.

SHIFT 2

Smart Manufacturing: The Rise of Software and AI

In most industries, AI is discussed as an abstract future. For Kasper Lynge Jacobsen, it is already reshaping how organisations work. His experience across healthcare, consulting and now the Danish Chamber of Commerce gives him a broad view: the first wave of impact will not be in science-fiction factories, but in the administrative backbone of every business. "HR, finance and IT could all be done much smarter," he notes. Many AI projects will fail; "95% of experiments don't succeed" but the ones that do will quickly become a hygiene factor for staying competitive.

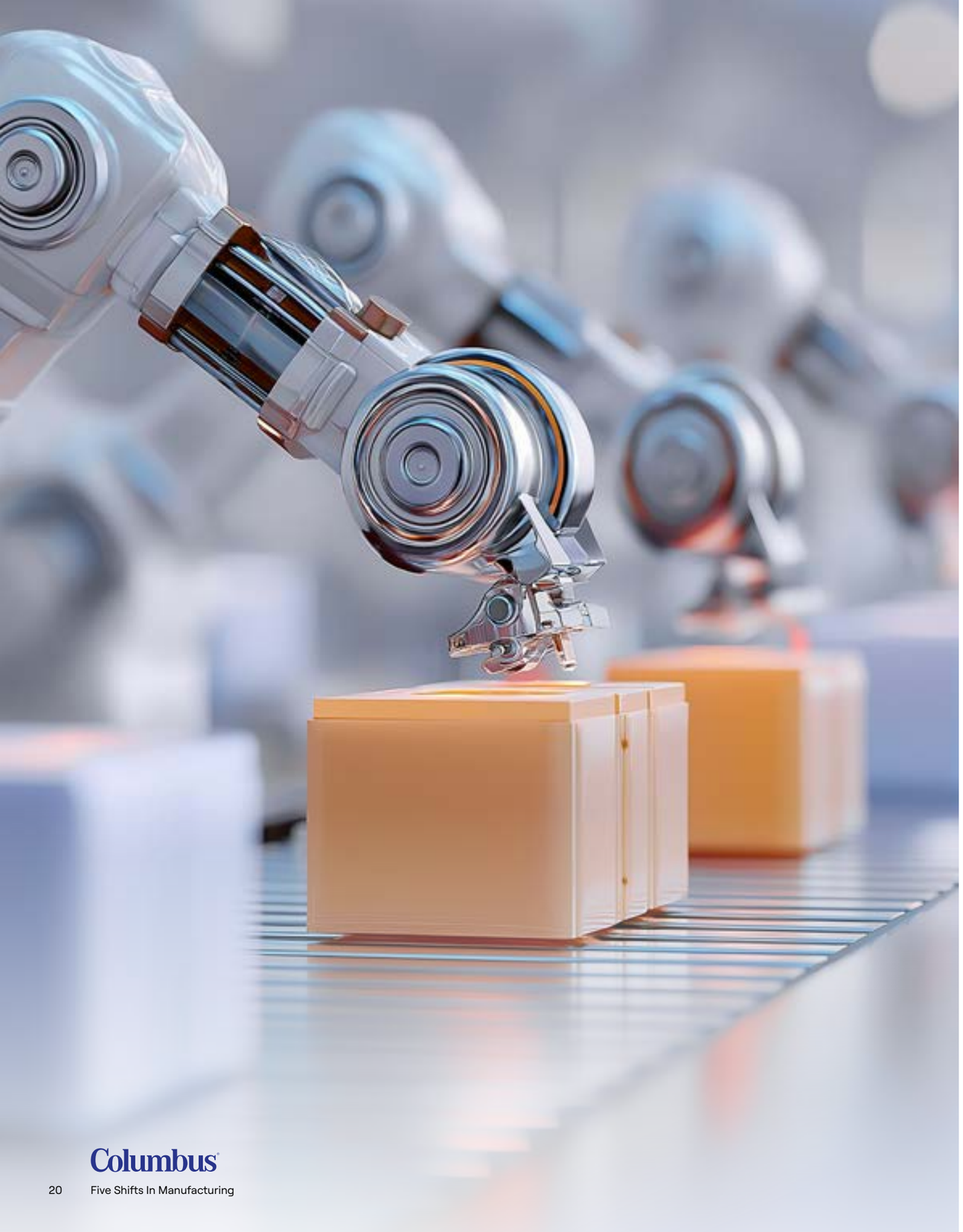
In manufacturing, however, the story goes further. Many plants, especially in countries like Denmark, are already highly automated and robotic, able to run 24 hours. The short-term opportunity is to add intelligence to what already exists. Kasper points to computer vision as a clear example: instead of people watching the line for faults, cameras and AI can spot defects at speed, just as systems already do when sorting waste or grading fruit.

The longer-term shift is more radical: putting intelligence into the machinery that builds everything else. Kasper references Tesla's factories, designed not around a fixed, linear assembly line, but for "whatever comes next". The real advantage will lie with manufacturers whose facilities can be reconfigured to produce new products, from cars to humanoid robots to things we have not yet imagined, without rebuilding from scratch. Factories become platforms, not just plants.

That vision brings risk as well as opportunity. The same agentic systems that can optimise a line can also be misused. Kasper points to sophisticated ransomware attacks orchestrated by AI agents that probed for vulnerabilities and executed intrusions with minimal human oversight. Combine that with autonomous robots and the stakes become clear. We have to give computers more intelligence, but also make sure it does not become a liability.

"Factories will become platforms, not just plants"

Kasper Lynge Jacobsen, Head of AI and Data, The Danish Chamber of Commerce



Rethinking manufacturing processes for AI

For Kasper, the big risk in AI adoption is not technical failure but a lack of imagination. Many organisations simply "put AI on top" of existing ways of working, hoping for faster versions of the same outcome. That creates experiments, not transformation. The real opportunity lies in re-engineering whole processes around what software and AI make possible, rather than digitising yesterday's logic.

He uses HR as a simple illustration. Instead of employees searching policy libraries or waiting for an expert, a language model could answer questions about holiday rules or reimbursements and escalate only when needed. The same mindset applies to manufacturing. The assembly line was not discovered in nature; it was invented and then refined. With AI, new "normals" are possible if manufacturers are willing to redesign how things are made, not just bolt new tools onto old workflows.

Data, energy and the next competitive edge

Kasper's data background makes him wary of shortcuts. Badly collected data will undermine any model. But he also sees new advantage in video, image and sensor data. Cameras over production lines can generate many examples for training models that spot anomalies long before a human would. Smaller sensors and "sniffers" will add real-time signals that can be acted on quickly.

Processing power is less of a barrier now. With modern GPUs, manufacturers can process visual data that previously sat unused. Those who get this right, Kasper argues, will move faster and with confidence compared to competitors still guessing from partial information.

He is also optimistic about AI's role in energy. He describes electricity as "a self-driving car – it goes where it's needed". AI-controlled smart grids can route power and balance loads in real-time, something "nobody can do in a spreadsheet". For manufacturers, that promises lower emissions and more stable energy use.

SHIFT 3

Secure Manufacturing: Navigating Digital Risk

For Christine Charlotte Akselsen, the next major wake-up call for manufacturers is already forming: data volume. As supply and value chains become fully connected, every product, batch and shipment will generate data that must be collected, structured, understood and shared securely across suppliers, logistics partners, regulators and consumers. Traditional enterprise systems were never built for this scale. “Scalability becomes the new definition of security,” she notes, because billions of data points will need to move reliably and in real time.

In this future, physical goods behave like digital assets. Every item may carry a digital identity that follows it from raw materials to end-of-life reuse, enabling deeper insight and new business models. But that requires interoperability; systems that speak the same data language using global standards like GS1. Without this, value chains remain fragmented and difficult to trust.

AI will intensify these demands. It only delivers value when the underlying data is reliable, contextual and structured. Many manufacturers already have plenty of information, but little of it is ready for AI because systems produce data in inconsistent ways. Once the foundation is right, however, opportunities expand: predictive value chains, self-optimising inventories, real-time risk maps and products that effectively “tell their own stories”.

Transparency is no longer abstract; it is operational. Traceability reduces counterfeiting, diversion and costly recalls while improving compliance and reducing waste. As Christine says, “Structure once, reuse everywhere”: trusted data can support sustainability, operations and regulatory readiness simultaneously.

The cultural challenge is just as significant. Many still treat data trust and security as an IT issue rather than a shared responsibility. Connected value chains demand openness; governed, controlled and role-based, but open nonetheless. Manufacturers that thrive will be those building flexible, scalable systems designed for trust from day one, not added as an afterthought.

“Scalability becomes the new definition of security.”

Christine Charlotte Akselsen, Chief Executive Officer, Kezzler

Building value chains that can adapt

As products become digital assets, the ability to adapt quickly becomes essential. Christine emphasises that interoperability is now a defining capability. Manufacturers need systems that “speak the same data language”, using global standards like GS1 so information can move securely across suppliers, logistics partners and regulators. Without this, even well-structured data becomes trapped in silos.

Flexibility is equally important. Regulations and stakeholder expectations will continue to evolve. The most future-ready manufacturers are those building infrastructures that can scale and change with them. Quick fixes age fast; adaptable systems endure. With trusted data flowing through the value chain, manufacturers can respond faster, collaborate more effectively and unlock new business models rooted in transparency and shared insight.

Managing manufacturing data at scale

For Christine, the challenge ahead for manufacturers will not be collecting data, but managing it intelligently. “Expect data overload,” she says. As connected value chains scale, businesses relying on rigid or outdated IT architectures will struggle with compliance, efficiency, and trust.

At the same time, traceability data will open up new opportunities. Circular and AI-driven business models will make reuse, repair and optimisation standard practice. But this potential requires accountability, with clear governance and transparency about who can access what, and why.

“Trust will not be something to bolt on later, it is not a feature. It has to be part of the architecture from day one,” Christine says. The manufacturers that succeed will be those with secure, trusted data flowing from source, through production, to consumer transparency and end-of-life reuse.

SHIFT 4

Skilled Manufacturing: Closing the Talent Divide

Greta Braun considers the skills gap in manufacturing to be more than a question of missing competencies; it is a structural problem shaped by demographics, culture and who feels welcome in industry. As a researcher, European Commission adviser and Young Manufacturing Leaders hub coordinator, she sees three forces colliding: an ageing workforce, too few young people entering and too many women and under-represented groups leaving.

In Sweden, where she is based, there are roughly half as many 20–25-year-olds as 30–35-year-olds. Similar patterns appear across Europe, North America and parts of Asia. “We have a big bunch of people that will soon retire,” she notes, “and fewer people entering.” At the same time, research shows that 41% of women in tech leave within ten years, compared with 17% of men. Every departure represents lost investment, lost experience and a wider skills gap.

For Greta, this is not mainly a pipeline problem. She is “a little allergic” to the idea that the solution is simply to push more girls into STEM. If the workplace culture does not change, they will not stay. In her own career she has been assumed to be “the secretary or the marketing person” rather than an engineer, ignored in technical discussions and treated as an exception. Sweden is ahead of many countries, she says, but even there women still encounter subtle and not-so-subtle barriers.

Retaining talent, not just recruiting it, becomes a strategic imperative. The more inclusive and human-centred the environment, the better it is for everyone, not only women. Leaders who ask “How do you feel?” and create space for honest conversation send a powerful signal that people matter. When manufacturing is seen as a place where diverse talent can grow, the skills gap shrinks and the sector becomes more resilient.

Supporting workers with continuous learning

Greta's research into Industry 5.0 companies shows a clear divide in how manufacturers respond. Large enterprises often have the resources to build internal academies, offer free learning and create individual learning paths. Upskilling and reskilling are built into careers rather than one-off projects.

At the other end, small, agile firms can adapt quickly and stay close to new policies and technologies. The real struggle sits in the middle. Mid-cap manufacturers are too complex to pivot easily but lack the capacity to design learning at scale. "They are the ones who will have the hardest journeys," she says.

For her, skilled manufacturing is not just about technical courses. It is about helping workers see new paths and connect experience to future roles. When learning is accessible and recognised, people are likely to stay and grow rather than leave the sector.

Sharing responsibility for closing the gap

Greta identifies three groups that must act together to close the talent divide: policy-makers, companies and education providers. Governments have a direct stake in productivity and, in her view, must take a more active role in lifelong learning. She points to initiatives such as Singapore's SkillsFuture, which gives citizens learning credits and Canada's Upskill Canada, a national talent platform. She also importantly notes that individuals have a responsibility to adopt a growth mindset and keep learning.

These models treat continuous learning as public infrastructure and recognise that manufacturing competes with other sectors for the same shrinking pool of workers.

Education providers must "step up and collaborate with industry", updating curricula and designing learning that reflects real shop-floor needs. For Greta, skilled manufacturing in the 2030s will be defined less by job titles and more by how fast people can learn and apply their capabilities across changing roles.

SHIFT 5

Sustainable Manufacturing: Beyond Carbon Offsets

From cost, quality, time to sustainability
For Steve Evans, sustainability is not a rival to productivity. It is the next evolution of how manufacturers create value. He draws a direct line from the quality revolution of the 1970s to lean and now to sustainability. Once, a 10% failure rate and armies of inspectors felt normal. Today, that looks insane. The same mental shift, he argues, is now underway for environmental performance.

Manufacturers already juggle cost, quality and time. Sustainability is becoming the clear fourth priority; not number one, but no longer number seven on the list where "you never get round to it". Climate is only one dimension. Water, biodiversity and pollution are joining the agenda, and the pace of activity is accelerating. "We're on the bend of a classic S-curve," Evans says. "There's no going back."

Brains or wallets: how to pay for change
Too many leaders still assume sustainability means big capital projects and higher costs. Evans' warning is blunt: "If you think sustainability is expensive, you will prove yourself right." He distinguishes between a "wallet-based" approach; swapping technologies without changing behaviour and a "brains-based" approach that starts with waste.

His favourite example is Toyota's Derby plant, which used lean and continuous improvement to cut the energy needed to make a car by around 77% over 14 years. The most expensive item they bought in that programme cost about €4,000. No special sustainability technology was required; just disciplined problem-solving, small changes and smarter future capex decisions.

Evans argues that similar double-digit reductions are available to most factories in their first year of serious effort, whether in energy, water or materials. The real question is not whether sustainability competes with productivity, but whether leaders are willing to treat it as the next productivity revolution – one where digital tools and data help reveal invisible waste, and where better environmental performance and better economics are finally aligned.

Sustainable Manufacturing: Maximising your Resources

From more output to less waste
For Professor Miying Yang, the real frontier of sustainable manufacturing is not making more products with less energy. It is redesigning systems so that value is no longer lost in the first place. Factories are already adding IoT sensors, connecting machines and using AI for predictive maintenance. But if productivity continues to be defined only as “more throughput”, total material and energy use will still climb.

Miying argues that manufacturers need a different lens: stop asking only what value do we create? and start asking what value have we missed or destroyed? That reframing opens up opportunities in longer product lifetimes, repair, reuse and remanufacturing – areas that often save more emissions and cost than simple recycling, but are still underused.

Digital tools for circular value
Digital technologies are central to that shift. Sensors, cameras and connected devices can track condition and usage, feeding “circularity triage” systems that decide whether an item should be repaired, remanufactured, resold or finally recycled. Most importantly, these tools can help companies visualise waste—seeing value losses faster and more precisely. Business model innovation then does the rest. When companies move from selling equipment to selling performance – renting gas generators instead of selling them, or offering cutting tools as a service – they suddenly have a financial incentive to extend life, recover components and design for disassembly.

The biggest near-term gains, Miying suggests, will come from using data manufacturers already have to improve energy and resource efficiency. Many plants are rich in spreadsheets, reports and maintenance logs but poor at linking them. Internal AI assistants trained on a company’s own data could act as a “brain for the business”, surfacing uncaptured value that human eyes miss.

Her message to leaders over the next three to five years is simple: you do not need sci-fi technology to make progress. Start by connecting your data, questioning where value leaks out of your system and experimenting with models that reward you for using fewer resources, not more.

CHAPTER 3

Smarter Factories, Human Futures

Manufacturing leaders are making decisions in a fog. Technology is moving faster than investment cycles, AI is over-hyped yet unavoidable, supply chains are fragile, energy costs are volatile, skills are harder to attract and customers expect better service at lower cost. The only certainty is that the next disruption will not look like the last one.

From Columbus' vantage point across factories in food, pharma, industrial equipment and beyond, the pattern is clear. The winners are not those who can predict the future most accurately, but those who design their operations to adapt when it arrives. Smart factories – where humans, data and automation work together – are becoming the most realistic answer to an uncertain decade.

Foundations of smarter manufacturing

Behind the headlines on AI and automation, most of the hard work of future-proofing happens in less glamorous places: data structures, process maps and performance metrics. As Toby Mankertz of Columbus notes, running a manufacturing business and transforming one are two very different skills. Many plants still rely on local spreadsheets, undocumented workarounds and KPIs that measure activity rather than progress.

Strategic uncertainty becomes manageable when organisations understand the shift beneath the surface. Columbus sees this across clients from agriculture to apparel to forestry, where uncertainty reduces once systems, people and intelligence are aligned.

Quality decisions depend on accurate, timely and consistent data. As Kevin Bull points out, item records must reflect a single source of truth, reinforced by processes that protect data integrity. Columbus' projects with organisations like Origin Enterprises and Biometria demonstrate how structured business objects stabilise operations. With this foundation, scenario planning becomes practical: digital twins for machine downtime, supply-chain risk modelling or rapid quality-failure escalation. These tools let leaders test consequences quickly rather than rely on instinct.

Designing for resilience and agility

Process design remains critical. Automation applied to weak workflows locks in the wrong behaviour and limits agility. Continuous improvement must run alongside automation to maintain flexibility. In Toby Mankertz's experience, many organisations rely on metrics that reward speed over quality, causing rework and reducing resilience. When metrics align with purpose, he notes, automation becomes an enabler rather than a constraint.

Uncertainty also demands rapid impact assessment. Leaders need tools that answer urgent questions: Which orders are at risk? What is the effect on capacity, utilisation or revenue? How would a supply disruption or cyber event reshape operations? Scenario engines allow organisations to explore these shocks in advance.

AI heightens the need for readiness. A fully automated plant is only as resilient as the intelligence and data that guide it. As Magnus Oxenwaldt argues, the real shift is not towards full replacement, but orchestration. Systems must support rapid intervention, human oversight and mixed-mode workflows where people and software agents collaborate. Manufacturers succeed most in business transformation where governance enables targeted enhancements to specific process steps, rather than wholesale replacement. AI is not a substitute for expertise; it helps teams see more, test faster and act with confidence as conditions change.

CHAPTER 4

Don’t Wait For Certainty

Manufacturing’s future will not be decided by a single technology or policy, but by how fast leaders turn today’s uncertainty into practical progress. The interviews in this report point to the same conclusion: the next decade belongs to manufacturers that treat data, people, sustainability and AI as one integrated agenda, not four separate projects.

There is no universal roadmap. A food producer, a pump maker and a pharma plant will not follow the same path. But the direction of travel is clear. The winners will be those who can see their operations clearly, change them quickly and prove, in numbers, that each change is moving the business forward.

Advice from the Frontline of Change

These insights from Columbus practitioners capture a shared truth: competitiveness now depends on disciplined execution, aligned metrics, resilient supply chains and the ability to adapt faster than uncertainty unfolds.

”To stay competitive, manufacturers must be more data-driven in their decision-making, design highly flexible processes that adapt quickly to always changing needs and conditions, and greatly accelerate speed from insight to execution. Apply these principles across all functions - from planning and production, via marketing and sales, to supply chain and customer service.”

Joakim Lööv, Principal Advisor, Columbus

”One key recommendation for manufacturers is to tightly align their operational metrics with the organisation’s overall business purpose and strategic goals. In practice, this means ensuring every KPI on the factory floor – from yield and downtime to energy usage – directly supports a broader objective like profitability, quality, customer satisfaction or sustainability. Why? When metrics mirror business purpose, inefficiencies become much more visible as obstacles to success. Any gap or anomaly in a KPI immediately flags a potential source of waste or excess cost in production that doesn’t add value to the customer or the company’s mission. This clarity allows teams to pinpoint and eliminate non-value-added activities (for example, unnecessary rework, excess inventory or energy waste) that drain resources and inflate costs.”

Toby Mankertz, Manufacturing Industry Director, Columbus

”The successful manufacturer of the future needs to be able to combine agility and lean practices to be competitive from both operating cost and customer service perspectives. If a company can gear its resources to operate in this fashion and employ a demand driven, rather than a forecast driven planning strategy, then I believe it is best placed to succeed in the volatile and unpredictable world that we will all continue to experience.”

Andy Clarke, Principal SCM Consultant, Columbus

”Stress-test” your supply profile and ensure contingency plans are in place for key resources. Never rely on a single source strategy for critical components & materials. When planning for multi-source alternatives, also consider potential geopolitical risks, ideally spreading across multiple geographies.”

Bjørn Pedersen, Industry Practice Lead, Columbus

”In a world of rapid change and a strong hype related to AI, the winning strategy is to stay grounded in the fundamentals: deeply understand your customers and stakeholders, and consistently create value for them. Align your entire organization through a disciplined, long-term execution framework—such as Hoshin Kanri—that translates long-term strategy into actionable goals and keeps everyone moving in the same direction. Embrace technology wisely: stay informed, know when to leverage it, and ensure it serves a clear, relevant purpose rather than chasing hype. I think, AI will make the strong companies even stronger.”

Peer Klavefors, Lead Solution Architect, Columbus

Summary

Process design remains critical. Automation applied to weak workflows locks in the wrong behaviour and limits agility. Continuous improvement must run alongside automation to maintain flexibility. In Toby Mankertz's experience, many organisations rely on metrics that reward speed over quality, causing rework and reducing resilience. When metrics align with purpose, he notes, automation becomes an enabler rather than a constraint.

Uncertainty also demands rapid impact assessment. Leaders need tools that answer urgent questions: Which orders are at risk? What is the effect on capacity, utilisation or revenue? How would a supply disruption or cyber event reshape operations? Scenario engines allow organisations to explore these shocks in advance.

AI heightens the need for readiness. A fully automated plant is only as resilient as the intelligence and data that guide it. As Magnus Oxenwaldt argues, the real shift is not towards full replacement, but orchestration. Systems must support rapid intervention, human oversight and mixed-mode workflows where people and software agents collaborate. Manufacturers succeed most in business transformation where governance enables targeted enhancements to specific process steps, rather than wholesale replacement. AI is not a substitute for expertise; it helps teams see more, test faster and act with confidence as conditions change.

Here, the value of a transformation partner like Columbus becomes clear. Not simply in delivering technology, but for orchestrating the shift across the human and digital workforce. While implementation details vary by industry and context, successful transformations share common patterns and sequences. This is where Columbus' cross-industry experience makes all the difference.

The future will favour those who experiment early, learn fast and scale what works with discipline. The ones who wait for perfect readiness will find themselves perpetually preparing. If there is a single recommendation from this report, it is this: **don't wait for certainty.**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