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The Best Manufacturers Build AI with Workers, Not for Them

Factories succeed with AI when workers help shape it, learn it on the job, and are measured by real performance. *by Tracey Countryman, Inge Oosterhuis, Jeff Wheless, and Rushda Afzal*

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HBR Staff; Westend61/Getty Images

Executives are optimistic about AI's potential to transform manufacturing. Workers, on the other hand, are more skeptical. In a seven-week internal unpublished study of video diaries from 85 frontline workers across six industries in Australia, the UK and the United States, we asked workers to describe how emerging technologies, including AI, are being introduced into their jobs, what training they

receive, and how they see their future. Across industries, distrust ran deep, of both the tools and the organizations deploying them. More than three-quarters of participants said they were dissatisfied with their training. Many were uncertain about how their roles would change or whether they would have a place in the future factory.

But some manufacturers are getting this right. They are closing the gap between executive optimism and workers' lived experience. Their approach—and our internal research—point to three key principles that shape how the smartest manufacturers approach this kind of working environment. They reduce uncertainty about how roles will shift with input from the shop floor. They train people in the context of real work. And they measure performance based on how humans and AI operate together, not on training hours logged.

They Reduce Uncertainty

Today's factory workers lack a clear line of sight into how their work will change and where (and whether) they fit in the future of their organization. They hear talk of "dark factories" and fully autonomous operations. They know that as AI tools and agentic teams advance, new jobs will emerge even as others are no longer needed. But they're worried that the more they work with AI, the more likely their own positions will be targeted for elimination. They want to know how best to prepare to do well in the future, whatever it may hold.

Trust and confidence hang in the balance, along with the ability to continue to perform at a high level. When expectations are unclear, workers hesitate to rely on new systems, question their own accountability, and struggle to know when to intervene or escalate. It's not easy for leaders to give workers what they want and need.

Executives can't offer employees a clear line of sight into the future of factory work because they don't have one themselves. They are still learning what AI will realistically change on the floor. A significant majority (61%) of the COOs we surveyed said that AI is fundamentally going to change the organization's core business model. In an internal 2025 global survey, 72% of 552 factory leaders said that helping workers adapt to emerging manufacturing technologies needs to be a priority for the next five to seven years.

That makes it hard to confidently define how work will change, what decisions will remain human, where escalation should happen, and what new roles will look like in practice right now. When leaders are uncertain, the uncertainty travels downstream, and workers are left to interpret signals and rumors instead of clear expectations.

Executives are also worried about the cost of training. In that same study, almost half (49%) said that reskilling workers requires excessive effort, even given the dearth of people with the skills currently needed. What's more, nearly half (46%) agreed that employees' fear of job loss is a serious concern. They worry that fear will keep employees from fully embracing the technologies, hindering workforce transformation over the next five to seven years. The study also found that meeting integration requirements, handling compatibility problems with legacy systems and managing uncertainty around governance and data quality also complicate matters, making it more difficult to integrate AI, and delaying outcomes. Rockwell Automation Chairman and CEO Blake Moret has said he thinks complexity "is the primary deterrent to more rapid incorporation of technology in automation."

All these concerns at the leadership level translate into fear and frustration across the workforce. One line worker put it this way: "As more tasks become automated, it's not always clear what decisions

we're still responsible for and when we're supposed to step in." Another noted: "Being able to put my trust in something that I don't know is something that I really struggle with. Sometimes these systems are not the most reliable." An operations manager summed it up, saying that when AI tools don't meet expectations on the floor, "We feel like we're the problem."

To bring factory workers along, manufacturing organizations need to engage them in creating what's ahead. Taking that approach will not only help efforts to integrate AI, but also, critically, tap the best source of information about the potential of AI to foster innovation and growth on the shop floor. In the AI era, viable possibilities open as soon as someone says, "If only we could do 'X,' we could . . ."

Here's what we recommend: Start by breaking manufacturing roles into the tasks workers complete and the judgment calls they make as they perform a job. This process, known as dynamic skill and task mapping, makes tacit knowledge about what a job really entails explicit. Done thoroughly, with worker input plus AI-generated insights, mapping reveals the workarounds, shortcuts, and "common sense" insights. As a result, it gives managers a view of how skills and training needs will need to evolve as they delegate to AI and spend more time on oversight, orchestration and handling exceptions. Plus, when employees see their own expertise and judgment shape the intelligence of the system, trust rises. People can see clearly how new ways of working overcome old challenges and raise the quality of output—and why their input matters.

Take planners who, today, work reactively across silos to try to plug gaps in workflows. (For example, if a customer requires a design change, the planner has to recalibrate the workstreams, so the whole fulfillment process stays coordinated.) Mapping can help planners work with their leaders to anticipate and plan for a time when agentic teams are a

part of the mix. It can illuminate things the planner has been doing that add value all along but have previously escaped notice. It can also surface activities (existing or emerging) that require human judgment or creativity and need to be recognized and rewarded.

A global consumer goods company that we observed offers an example. The organization captured the tacit adjustments operators made in its powder agglomeration process and embedded that know-how into a real-time analytics stack that predicts quality and recommends optimal setpoints. In this way, teams can apply expert-level judgment more consistently, and roles shift naturally from manual tuning toward monitoring, validation, and exception management.

Leaders can also send a clear message that the AI journey isn't something they're simply imposing on others, by showing workers that they, too, are figuring out where AI can take them. Connection, curiosity and courage are at a premium during turbulent times. The more leaders can connect with workers directly, demonstrating empathy, sharing their own learning experiences, the better able they will be to address the emotional strain of change.

They Train People in the Context of Real Work

More specifically, they train for the flow of work *in* the flow of work. Most training programs still focus on broad concepts and take workers out of their environments to study. What they need, instead, are details, in context. Learning in the flow of work. If operators now use AI tools to diagnose production issues and generate daily reports, adjacent training that only covers these tasks in broad strokes isn't helpful. Same with schedulers learning to manage alongside reoptimizing systems and quality engineers validating algorithmic recommendations instead of searching manually for defects.

Moreover, learning in the flow of work, supported by real-time analytics, allows supervisors to see where work stalls, errors rise or confidence drops. They can then intervene as needed, to great effect.

Here, an example from a food-processing plant we observed illuminates the point. Waste at this plant had been running nearly twice the industry average. Using operational-twin data and simple machine-learning insights, supervisors saw how small changes in line speed and seasoning equipment affected over-feeding and product loss.

Operators helped them develop a "next-best-action" dashboard and began using it to anticipate when to adjust before waste occurred. Within weeks, yield improved and acceptance rose. Workers trusted the system because they had a hand in shaping the logic behind its guidance and because training took place in real time, on the line, where it was immediately relevant.

Finally, learning in the flow of work doesn't only benefit workers; it also benefits the AI they're working with, as people respond to the tools with questions, or build on what they've learned and begin to ask the tool to support more advanced work, in a continuous cycle of what we call "co-learning."

They Measure Real-World Performance

Measure what workers do, not what you think they do. Traditional training metrics, such as courses completed or hours logged, say little about whether people are ready to work effectively alongside AI. They capture exposure, not capability. The real test is whether workers are using new tools confidently and consistently, and whether outcomes on the factory floor are changing as a result.

That is why a growing number of manufacturers are shifting away from participation-based measures and toward performance indicators that reflect how work gets done. Instead of asking who has been trained, they are tracking signals such as the speed and accuracy of human-AI handoffs, the time it takes to resolve exceptions, and the frequency and quality of successful interventions when systems flag issues. These measures reveal how well people and machines are learning together in real operating conditions.

The most telling signals of progress do not come from learning dashboards, but from how work unfolds once AI is embedded in daily operations. Ford Motor Company offers a useful example of what this shift looks like in practice. The company embedded lightweight, AI-assisted inspection tools directly into production routines, using cameras and mobile devices to support operators as they identified defects in real time. Rather than treating adoption as a one-time training milestone, supervisors focused on operational signals that showed whether people and systems were learning together. They paid attention to how quickly issues were detected and addressed, how often operators validated or corrected the system's recommendations, and how consistently teams acted on what the tools surfaced.

Those measures made it possible to see where confidence was building, where judgment was strong and where friction still slowed the flow of work. Crucially, they also created a feedback loop for leaders. Dashboards and analytics helped identify early adopters, pinpoint where workflows broke down and guide targeted coaching before performance slipped. Over time, effective practices could be shared across sites, while persistent friction points signaled where workflows or system design needed to change. Adoption is not a one-time milestone; it is a continuous measure of how humans and AI co-evolve.

As AI use proliferates, particularly with the rise of agentic AI systems, the economics of work are shifting.

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A wide range of AI-powered tools are emerging, and converging, to support people who work in manufacturing environments. This progress has been made possible due to advances in connectivity, cost, and edge computing. As this happens, it's becoming clear that the factory of the future will depend on reliability engineers who maintain fleets of autonomous agents and mobile robots, model-based technicians who supervise digital twins and anomaly detection systems, and supervisors of agent swarms who monitor quality across planning, maintenance, and logistics. These are software-defined factory roles: technical, human-centered, human-led, and vital.

Showing workers that the future of manufacturing will be AI-enabled, not AI-run, is important. Leaders who include people in redesigning roles, train them in the flow of work and make it clear who is accountable for outcomes (and how to escalate problems) when work includes AI will not merely help their workforces keep pace with the learning curve. They will help them to define it.

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