

GOAL 1: REDUCE THE RISKS OF AUTOMATED SYSTEMS

[Aspen Digital](#), in consultation with experts from academia, civil society, and industry, developed the following recommendations for how to integrate automation into the manufacturing frontline responsibly.

Issue

Artificial intelligence (AI) tools and data-driven automation are becoming increasingly prevalent across sectors. McKinsey's 2022 Global Survey on AI found that [adoption had more than doubled](#) since 2017. While AI is rapidly providing efficiency gains, it also comes with risks due to the loss of human oversight and managerial decision-making control. These risks could lead to friction between technology capabilities and the needs of teams and individuals, potentially compromising efficiency, safety, and retention.

"Companies that put humans at the center of their transformations are 2½ times more likely to successfully deliver on their transformation objectives."

– [EY \(2023\)](#)

Why this matters

- **Overreliance on technology:** People have a tendency to trust machine output over human judgment even when the machine output is incorrect. This introduces risks, especially in complex, time-critical environments like manufacturing. Algorithmic error may result in increased downtime, and over-emphasis of technological decision-making may result in distrust and resistance to adoption.
- **Vendor lock-in:** The requirements for troubleshooting failures, training operators, and maintenance are fundamentally different with software than with a physical machine. Automated tools are not guaranteed to be interoperable with other vendors' products and a vendor's default contract may not permit you to repair issues in-house.
- **Mismanaged investment:** Emerging technologies are often costly to implement. If systems are not properly evaluated (both pre- and post-deployment) it can lead to wasted resources, inefficiencies, and low uptake.

"Humans have a tendency to disregard or not search for contradictory information in light of a computer-generated solution that is ... exacerbated in time critical domains."

– [M.L. CUMMINGS \(2004\)](#)

Opportunities

- **Buy-in for AI adoption:** Taking a “human-first” approach can help create buy-in for the adoption of emerging technologies and build knowledge and technical know-how for developing additional useful applications.
- **Simplify regulatory compliance:** As global regulators intensify oversight of technical systems, investing in transparency and proactive monitoring now will streamline compliance and yield long-term benefits down the road.

“Only 9% of surveyed manufacturing executives have implemented AI.”

– [PWC \(2020\)](#)

“How do we ensure that workers have a direct voice in co-designing the tech and what we are going to use it for?”

- **Dr. Tom Kochan**, Professor Emeritus at MIT at Aspen Digital’s November 2023 roundtable on impacts of AI in manufacturing

Actions

HUMAN OVERSIGHT

1. **Reinforce to managers that AI tools can (and do) make mistakes.** Make it clear that human design choices shape how these systems operate and how accuracy, efficiency, and success are defined.
 - o AI capabilities do not necessarily surpass human experience. These tools are built for specific settings and may not work appropriately when applied to new contexts.
2. **Maintain managerial decision-making and human oversight** of automated systems. Define clear roles and processes for reviewing decisions, especially for safety-critical systems.
3. **Develop clear internal guidelines** for identifying contexts in which AI should not be used, such as in hiring.

“When it comes to the identification of candidates, there will always be a talent acquisition manager involved in the selection process. ... We are acutely mindful of the inherent bias in certain types of data, and for those areas, we do not deploy AI as an end-all solution.”

– [A. KANIOURA, PEPSICO \(2023\)](#)

Actions

QUANTITATIVE METRICS

4. Evaluate the impacts of deploying automated systems on your workforce by identifying and tracking KPIs that measure employee satisfaction, health, and skill development. Key KPIs to track include:

- Internal promotion rate
- Microcredentials achieved and certifications completed
- Injury rate reduction
- Number of days in advance workers know what days and hours they need to work
- Staff churn and worker absenteeism
- Employee satisfaction index or employee net promoter score (eNPS)
- Employee Assistance Program (EAP) utilization rate

FEEDBACK

5. Ensure that an AI tool was designed to meet your specific needs during the procurement process. Involve workers in the technology procurement process, especially workers who have experience with the pain points the tool is meant to address or those who will use the tool on the factory floor.

6. During and after deployment, set up real-time feedback loops using insights from the frontline. This process will provide insight into where the technology is proving most helpful and where it is not delivering on intended benefits.

- Emphasize multiple pathways for worker feedback, not just reporting to a manager or to HR.
- Keep asking for feedback after deployment on at least a yearly basis.
- Play back a summary of feedback you've received to your workers on a regular basis and explain how you can or can't address that feedback.
- Regularly re-evaluate whether these systems are meeting the needs of the teams and people they serve.
- For more resources, see Strategies for Worker Engagement in the [Cheat Sheet](#).

7. Use a combination of quantitative KPIs and qualitative worker feedback via surveys or managerial check-ins to evaluate physical and mental health impacts of deployed automated systems.

Actions

TRANSPARENCY

8. **Prioritize informed consent prior to data collection.** Explain why you (or a vendor) are collecting data, how that worker-generated data will be used in a new technology, and how to opt-out of data collection, where possible.
9. **Ask technology developers or vendors** specific questions about their products. Consider asking:
 - **Right to repair:** Are you allowed to fix bugs or issues with the tool in-house? Does your vendor require that only they can to address issues?
 - **Prompt troubleshooting:** What options for troubleshooting and timely escalation will your vendor provide? If you have an urgent need for troubleshooting (e.g., a line goes down), how will your vendor quickly troubleshoot and address your issue?
 - **Intended use cases:** Ask your vendor to illustrate correct (and incorrect) application cases of their software. AI tools are often only built for specific use cases and are not guaranteed to generalize well to other uses.
 - **Interoperability:** Will your vendor commit to making sure their tools interface properly with other vendors' tools you may use?
 - **Operator training:** How will your vendor address training your workers to use their tool? How will they answer workers' questions? How long will they provide onboarding support?
 - **Data rights:** Who "owns" the data collected from your operations and equipment before, during, and after deployment of their tool? Can the vendor use that data to improve their products? Can the vendor sell that data to third parties?

Acknowledgments

This work was made possible with the support of PepsiCo, Inc. We're grateful to Dr. Athina Kanioura and her team who supported our research. Thanks also to Eleanor Tursman, Morgan McMurray, Elizabeth Miller, Anahita Sahu, Devon Regal, Haley Glover, B Cavello, and our other Aspen Institute colleagues for their contributions to this work.