AG5 Skills management software for frontline workers

How to connect workers, skills, and machines in modern manufacturing

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Introduction

Faced with widening skills gaps, disconnected systems, and underused machines, the manufacturing industry could by 2033 need as many as **3.8 million new employees** – and as many as 1.9 million of those roles may remain unfilled if these challenges persist, according to research from The Manufacturing Institute.[1]

At the same time, factories are **investing heavily in AI-driven technologies** that often sit apart from workforce planning and skills management systems. This disconnect is not just technical, it's strategic.

> ***Manufacturers risk building smarter machines without building smarter workforces.***

The opportunity, then, lies in connection.

When workers, their skills, and intelligent machines operate as one ecosystem, manufacturing becomes more responsive, efficient, and safe.

This whitepaper explores how **manufacturers can bridge workers, skills, and machines** through digital platforms, skills mapping, and data-driven workforce planning. Together, these dimensions form a practical roadmap for creating connected manufacturing environments that enhance resilience and prepare organizations for future disruption.

In this whitepaper, you'll learn how to:

- **Build** a connected manufacturing ecosystem that links people, skills, and machines
- **Map** and manage workforce capabilities with digital skills matrices
- **Integrate** machine data into workforce systems for smarter planning
- **Strengthen** engagement and resilience through targeted training and collaboration
- **Address** key challenges around technology adoption, data security, and change management

The new manufacturing landscape

Factories are evolving from fixed, process-driven setups into flexible, digital environments.

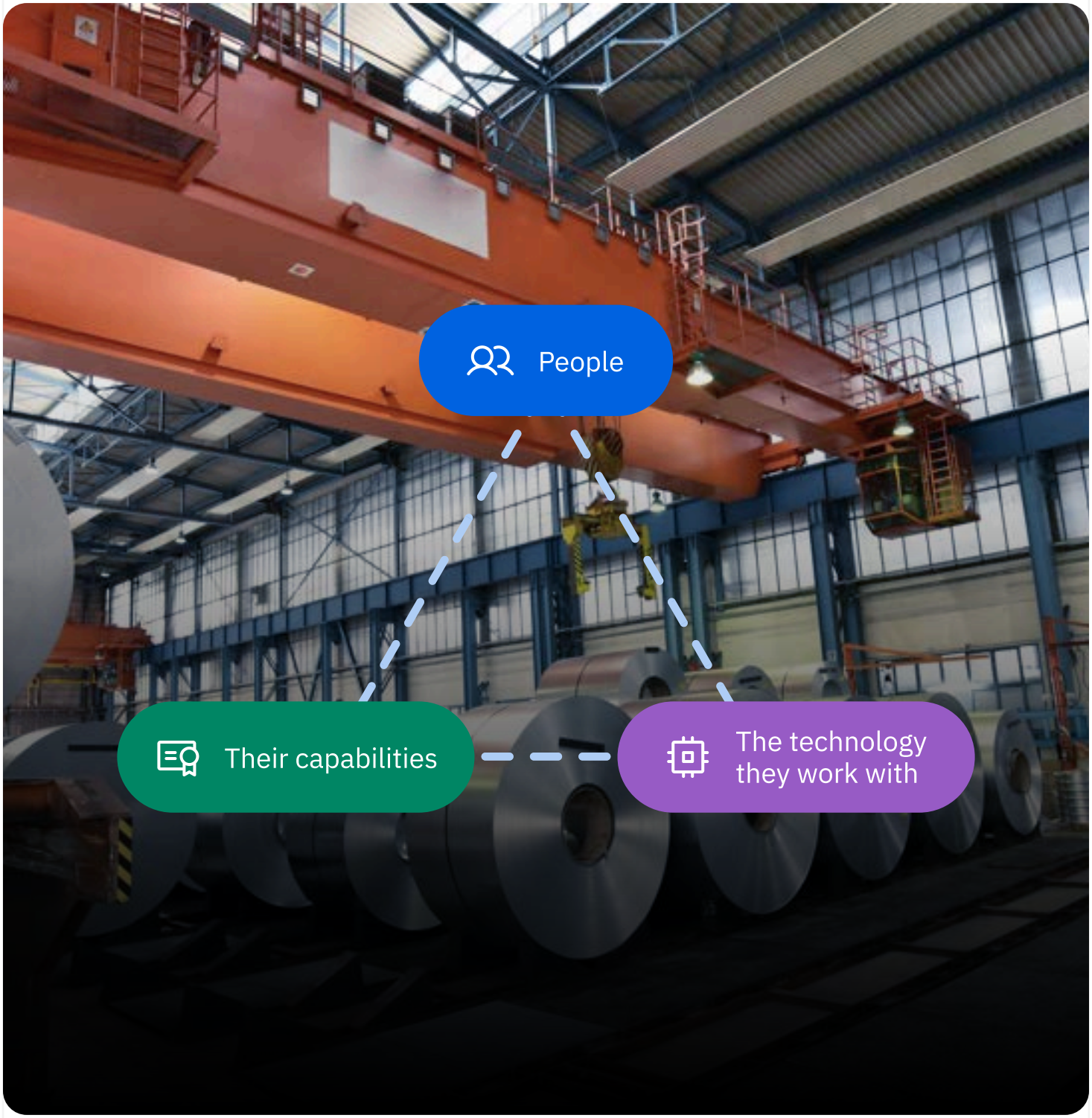
Whereas traditional manufacturing relied on repeatable routines and narrowly defined roles, **adaptability and collaboration between people and machines now define how work gets done.**

Automation of course continues to expand, but its strength comes from how it supports human judgment. Skilled operators, for example, can use data from connected machines to make small adjustments that prevent downtime and improve output. Such a combination of digital tools and human insight gives manufacturers the agility to respond quickly when demand shifts or supply chains tighten.

As systems become more advanced, the skills needed to manage them are harder to track. Many organizations don’t have a clear view of who can operate which machines or troubleshoot specific issues. Valuable knowledge often stays locked in individual experience, and data generated by equipment rarely reaches the people making staffing or training decisions.

> Insights from a leading European plant:
>
> ***30% of maintenance downtime came from undocumented know-how, not mechanical failure.***

The goal is to bring three dimensions together in one coordinated system:



When these remain separate, efficiency and safety suffer.

But when they connect, the factory becomes a learning environment – able to anticipate issues, deploy skills where they're needed, and keep production running smoothly.

The role of workers in smart manufacturing

Even with more automation, people remain central to production, especially in manufacturing environments. Machines can collect and analyze data, but they still depend on human judgment. Smart factories still need smarter people.

For example:

- Operators notice subtle changes that sensors miss
- Technicians combine diagnostic skills with experience to prevent failures
- Supervisors balance priorities and guide teams through daily changes

These roles now demand both technical and interpersonal strength. Workers must understand connected systems, interpret data dashboards, and program parameters while also communicating clearly and solving problems together. Deloitte provides evidence of this, with research showing a 75% increase in demand for simulation and software skills, but soft skills like critical thinking remaining just as important.[2]

> ***However, many manufacturers struggle with uneven skill distribution. Knowledge often sits with a few experts, leaving teams vulnerable when those individuals move on.***

Declining engagement compounds the problem; a global 2024 Gallup survey showed falling motivation and knowledge sharing, especially among managers.[3] When workers are unmotivated, they are less likely to share knowledge or pursue training. Disengagement is both a morale issue and a data problem. Skills that aren't visible aren't valued.

Organizations can counter this by recognizing skills, offering visible growth paths, and linking development to technology use. When employees see how their work contributes to business goals and have tools to grow, they stay engaged and help the company adapt faster.

Key actions for manufacturers include:

- Mapping current skills and identify hidden expertise
- Creating clear development pathways connected to operations
- Giving workers access to systems that show how their skills matter

Mapping and managing skills

Managing skills effectively means **moving beyond training records** to a live, searchable view of what people can actually do. Without this, assignments are often based on assumptions, increasing safety risks and slowing production.

Workers live in HR tools

But those systems don't say if someone is trained to operate a specific machine.

Skills live in spreadsheets

Which are hard to maintain, hard to trust, and never up to date.

Machines are linked to people

So you can't quickly see who's certified to run what, or where gaps exist.

Skills matrices gives leaders real-time insight into workforce capabilities. They track qualifications, certifications, cross-training progress, and specialized experience – visibility that lets managers quickly find the right person for a task, confirm compliance, and reduce downtime.

How this looks in practice

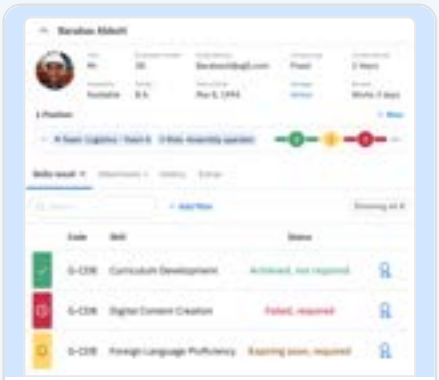
A machine fails during a production run. Instead of guessing who's available, the system:

- Identifies three qualified technicians
- Highlights who handled a similar issue last month
- Shows who's on shift

The repair happens faster, and the factory keeps its schedule.

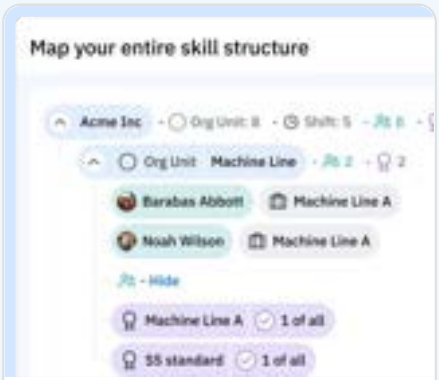
This approach turns skills management from an administrative exercise into ...

[an administrative exercise into] ... a performance driver. When organizations know exactly which capabilities they have, they can deploy people confidently and keep production moving safely. Platforms like AG5 make these insights live, connecting skills data directly to production.



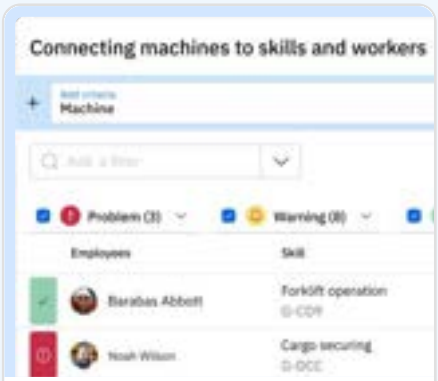
Workers

Who's trained, who's qualified, who's available



Skills

What's required for each role, machine, or line



Machines

Critical operations depend on the right people with the right certifications

The role of machines and technology

Equipped with sensors, IoT connectivity, and embedded analytics, modern machines can deliver real-time data on performance, efficiency, and maintenance needs.
The potential of such machines has not gone unnoticed. For example, McKinsey research reveals that predictive maintenance systems could become one of the most valuable AI applications in manufacturing, **growing from $40 billion in 2020 to as much as $460 billion by 2030.**[4]

Additionally, machines can now generate detailed information on: production quality, cycle times, and energy consumption. When used properly, this data reveals optimization opportunities, validates process improvements, and supports smarter planning. Machine data can also inform workforce development by pinpointing where new training is needed, or when additional staffing will be required to meet demand.

The risk lies in disconnection. Too often, machine data remains locked in technical systems that operators or planners can't access. Engineers monitor performance in one platform, while workforce managers use another. Workers who understand the machines may not see the analytics, and managers who track staffing may not see the machine data.

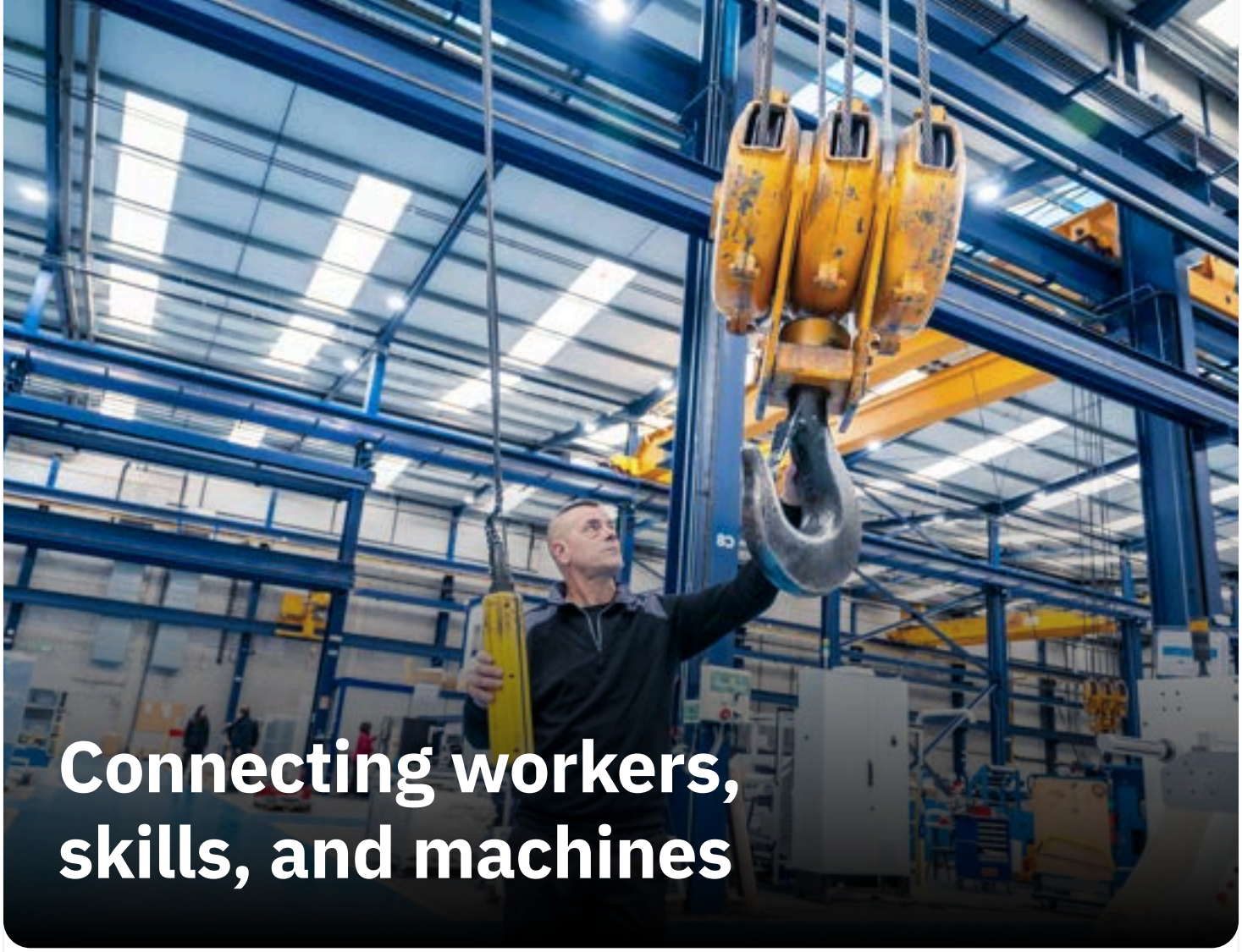
Common failure modes include:

- Siloed data across systems and teams
- Multiple spreadsheets tracking similar information
- Maintenance records not linked to operator skills
- Delayed or incomplete data updates
- Limited visibility for non-technical staff

To bridge this gap:

- Integrate machine intelligence with workforce systems
- Use standardized data formats across departments
- Design interfaces that make technical data easy to understand

This integration ensures machine insights reach the people who can act on them, improving decision speed and reducing downtime.



Connecting workers, skills, and machines

A connected manufacturing system unites people, their skills, and machine intelligence into one environment – and relies on data and analytics to make informed, proactive decisions regarding business operations. Machines alert when issues arise, systems match available technicians, and managers view both operational and workforce readiness in real time.

These platforms serve as operational hubs, combining training data, scheduling, and live equipment monitoring. If a machine flags a potential failure, the system identifies available technicians with the right certification, recent experience, and current workload. The right person is deployed faster, reducing delays and rework.

The benefits of integrated manufacturing systems include:

- ✓ Quicker response to production disruptions
- ✓ Better alignment between skills and operational needs
- ✓ Clearer visibility into overall capacity and readiness

The shift to data and analytics-centered operations is a key indicator of financial performance. Gartner research shows that 70% of companies that outperform their competitors now place a focus on data-driven decision-making.[5]

How this looks in practice

A production line sensor detects an anomaly in a welding process. The system analyzes the fault, identifies a certified welding technician who handled a similar issue last month, and sends an alert with the machine's diagnostic data to their device. The technician responds immediately, locates the problem, and completes the repair. Downtime drops, and the event is logged for training.

This seamless link between machine intelligence and human expertise defines the future of manufacturing efficiency. This is no longer hypothetical. Leading manufacturers are already using connected systems.

ADIENT Motor Vehicle Manufacturing

$70k / year

Saved in employee training

910 hrs

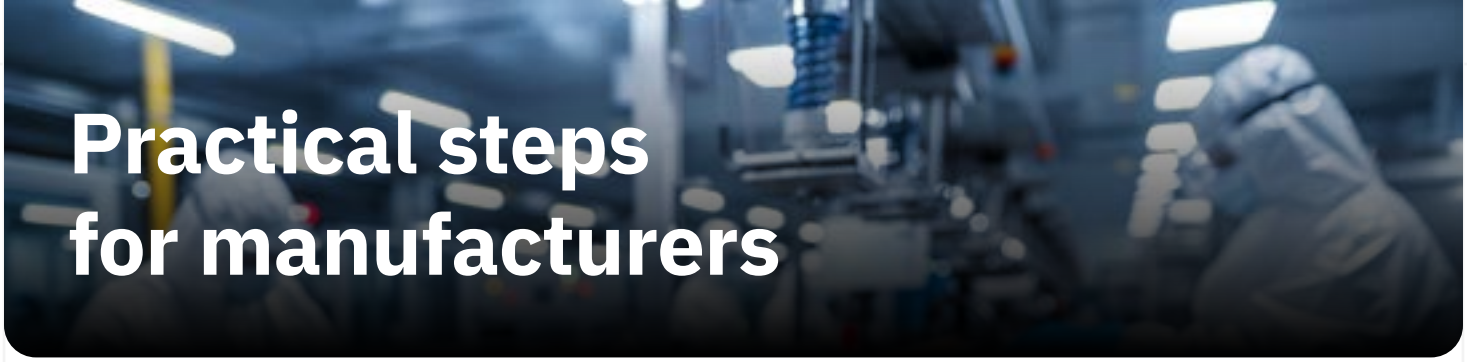
Saved per trainer annually

$20k / year

Saved in paper & printing costs

800 Excel files

Replaced with one centralized system



Practical steps for manufacturers

Start with a comprehensive skills audit

Integration requires structure and intent. Start with a comprehensive skills audit that maps existing capabilities against what's needed for future operations. Go beyond formal training records by gathering input from workers and supervisors to capture specialized knowledge that often goes undocumented.

Pilot test data connections

Run pilot projects on key production lines to test data connections and workflow improvements. Use these pilots to learn what information is most valuable and how teams interact with it.

Connect machine data to workforce tools

Next, connect machine data to workforce planning tools. Identify equipment that produces meaningful insights – maintenance alerts, throughput rates, or energy patterns – and link that data to scheduling systems.

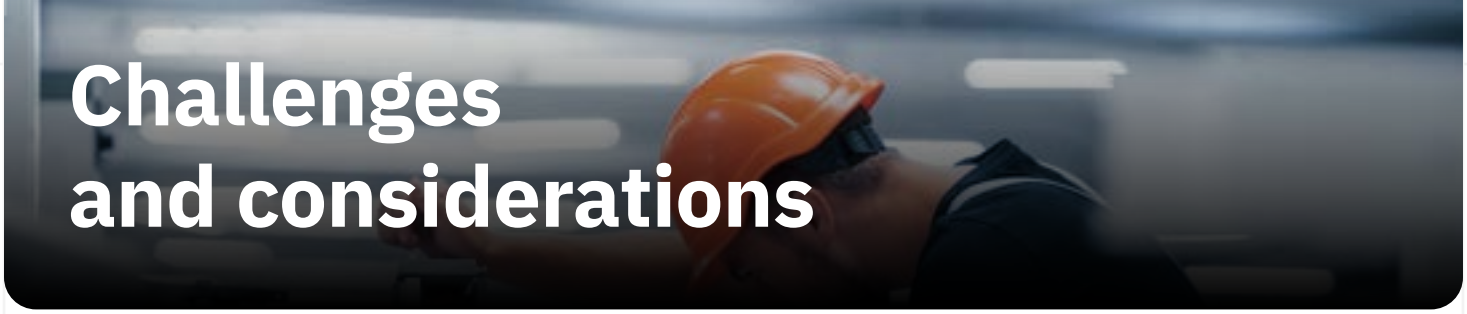
Target training to close skill gaps

Targeted training programs should then close the gaps identified in the audit. Focus on competencies that directly impact output, such as machine operation, troubleshooting, or data interpretation. Digital platforms can automatically update skills matrices as training is completed, keeping qualifications current.

To build long-term success:

- Quicker response to production disruptions
- Better alignment between skills and operational needs
- Clearer visibility into overall capacity and readiness

Change is easier when workers understand the purpose and see results that make their work easier and safer.



Challenges and considerations

Data privacy and trust

Connecting people, skills, and machines introduces new challenges. Data privacy becomes critical when systems collect information about worker performance and movement. Employees may fear surveillance or worry data will be misused. Clear policies about what is collected, who can see it, and how it's used build trust and support adoption.

Cost of implementation

The cost of integration can also be significant. Software licenses, hardware upgrades, implementation, and training all require investment. Smaller manufacturers can start with a phased approach, focusing on high-impact areas to demonstrate early returns.

Over-automation and engagement risks

Over-automation is another risk. As of 2024, **only 21% of employees are truly engaged in their work**, and low engagement costs the global economy around $9.6 trillion, or 9% of global GDP4. If technology focuses only on output, it can erode engagement further – machines should enhance, not replace, human capabilities.

Inclusivity and digital literacy

Inclusivity matters as well. Not every worker is equally comfortable with digital tools – and only 50% of employers measure digital literacy.[6] Older employees or those with limited exposure to technology may need extra support. Systems should offer clear, accessible interfaces, and organizations should provide continuous training.

Key considerations:

- Protect data privacy and be transparent about its use
- Manage costs through phased implementation
- Ensure automation enhances human roles rather than replacing them

Even in connected systems, human judgment remains essential. Data supports decision-making, but shouldn't override experience and context.

Conclusion

Integrating workers, skills, and machines is essential for resilience and performance in modern manufacturing, with more than 80% of manufacturing organizations – especially those with hourly workers – investing in AI-driven, "advanced workforce management software solutions", which are seen as a "core capability", according to Deloitte.[7]

Such connected systems help reverse this trend by giving workers visibility into their impact, aligning skills with goals, and using machine data to enhance, not replace, human expertise.

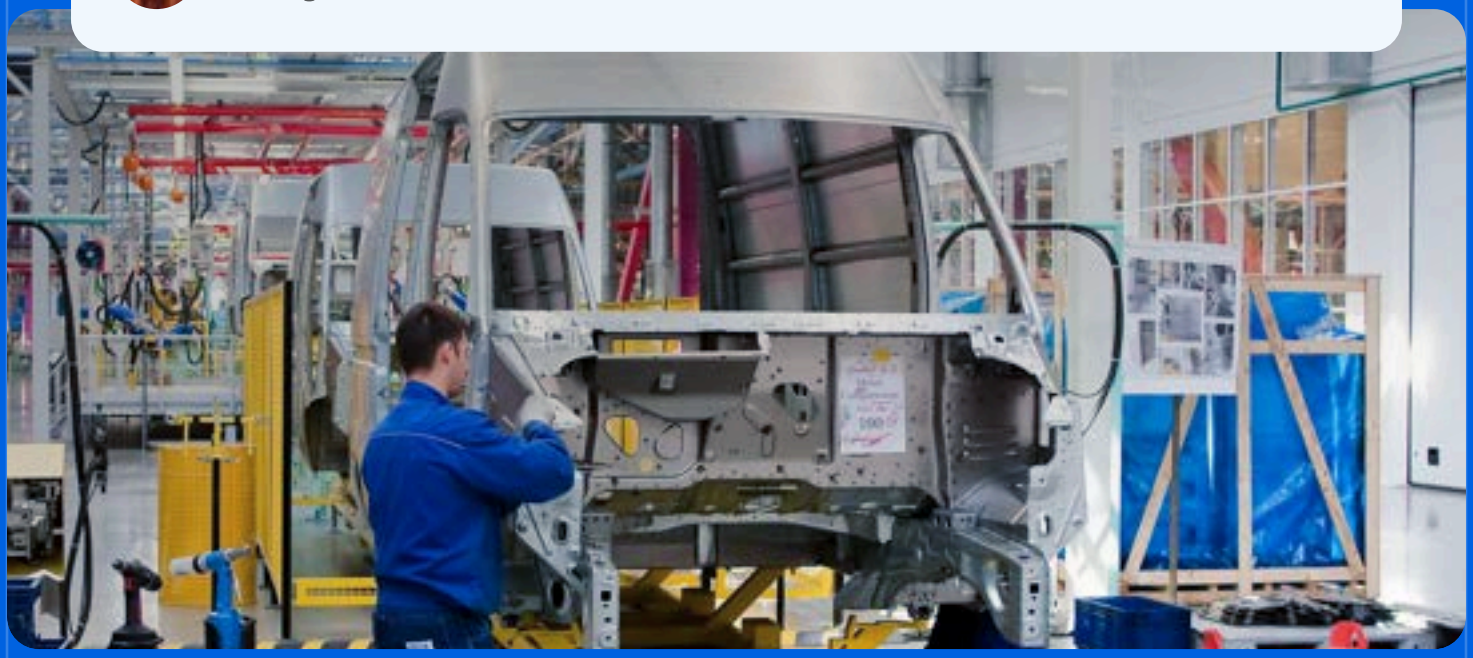
The benefits go beyond efficiency. Integration improves safety by ensuring only qualified workers handle hazardous tasks. It strengthens quality through better skill alignment and accelerates innovation by freeing people from repetitive troubleshooting.

The next generation of manufacturers won't compete on machines alone. They'll compete on the connected intelligence of their people.

Connected manufacturing is what comes next – an ongoing process of linking people, technology, and data to build smarter, safer, and more adaptive operations.

> *"AG5 helped us eliminate 800 documents, save $90,000 a year, and free up an entire FTE in training capacity. It's not just more efficient—it's a smarter way to run our factory."*

Tim Clansey
Training Coordinator at Adient



Ready to connect your people, skills, and machines for smarter manufacturing?

Get a 15-minute demo of what AG5 can do for your organization.

Book a demo now

37% time savings every week on administrative work and reporting

Francois van Baal
EHS Training & Compliance Coordinator

$20,000 annual savings per factory through time saving and paper elimination

Tim Clansey
Training coordinator at Adient

8 days time savings per month by replacing Excel spreadsheets

Gert Mijnders
Compliance manager at KLM Cargo

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