LNS Research

The Knowledge Management and Industrial AI Imperative:

Bridging the Skills Gap with AI, Connected Workers, and Virtual Operations Centers

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Chief Operations Officers will keep feeling intense pressure to meet employee expectations as the frontline workforce continues to evolve. Many manufacturers report over a 75% reduction in average tenure and time in position for frontline workers, along with a dramatic increase in hiring churn and green-on-green training.

These challenges are resulting in negative trends in safety, quality, and productivity. Meanwhile, new employees shun existing onboarding practices and oppose antiquated training methods. It is imperative that industrial organizations recognize this significant change and develop a strategy that meets both employee and business needs.

Our research shows that Industrial Knowledge Management is critical to building competency, retaining employees, and improving operational performance. Most manufacturers are in the early stages of understanding knowledge management, with 44% currently identifying best practices or piloting a knowledge library (Figure 1). Whether you're early in your journey to maturing knowledge management across the organization or currently have processes in place, this Research Spotlight will provide the latest insights into the innovative new approaches Leaders are deploying.

44%
of manufacturers are currently identifying best practices or piloting a knowledge library.
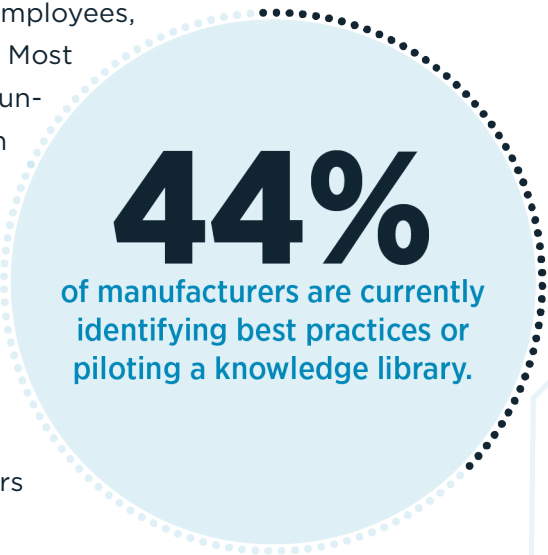
What Plans Are in Place to Capture Knowledge in Experienced People Before They Retire and Transfer it to New Employees?

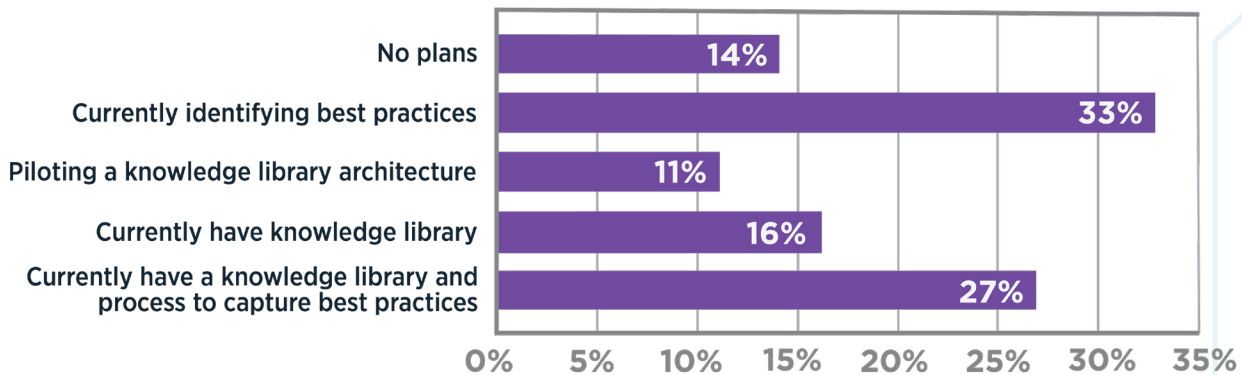|	
No plans	14%
Currently identifying best practices	33%
Piloting a knowledge library architecture	11%
Currently have knowledge library	16%
Currently have a knowledge library and process to capture best practices	27%

FIGURE 1 - Knowledge Management Activity Level

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The Strategic Agenda of COOs

Global manufacturing executives must recognize the need to prioritize workforce development efforts at the top of their strategic agenda. Bridging the growing skills gap will improve productivity, future-proof operations, and ensure competitiveness in the rapidly changing business landscape.

Effective Industrial Knowledge Management is essential for exchanging knowledge and information quickly and efficiently for better, faster decisions; it should be at the heart of any frontline workforce development initiatives.
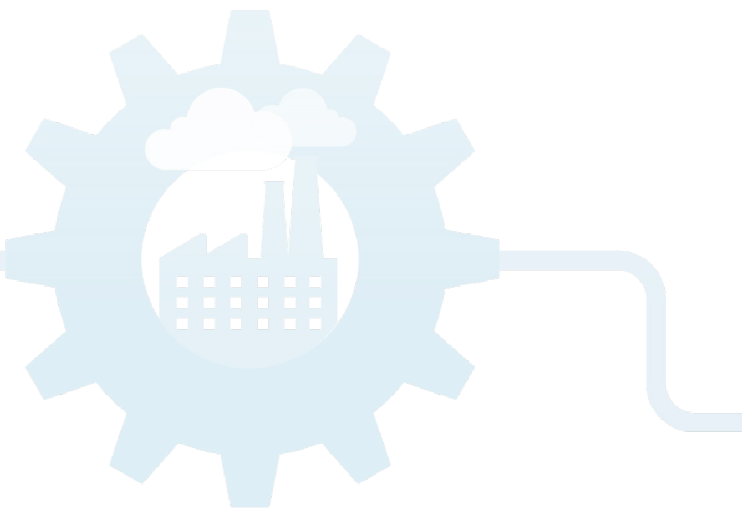
This report reveals the knowledge management best practices industrial organizations need to proactively adopt to:

1. **Create a culture where employees are engaged** in continuously using and improving workforce learning.

2. **Build the organizational learning and development capabilities** necessary to improve the total employee experience.

3. **Empower new frontline workers,** allowing them to understand the context of their work effectively, focus on what matters, ignore what doesn't, and make better, safer decisions.

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>   Research Analyst

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Defining Industrial Knowledge Management

Industrial organizations have historically relied on job shadowing, varying levels of documented practices, and traditional learning management systems to train new employees. Over the last few years, manufacturing leaders have found the loss of experienced personnel has been detrimental to institutional knowledge, best practices, and lessons learned. Our research shows that 84% of manufacturers report the loss of experienced personnel has negatively impacted the organization and operational performance.

Manufacturers see capturing and transferring knowledge from experienced workers as a top challenge to meeting frontline workforce business objectives. Our research shows that nearly half of respondents have not yet invested in knowledge management capabilities, and 14% have no plans to invest in ways to capture knowledge. Consequently, significant challenges are related to insufficient workforce skills and competencies.

To overcome both short and long-term challenges, it is first crucial for manufacturers to understand Industrial Knowledge Management. In fact, the first question we often get during conversations around this topic is, "How do you define knowledge management?" LNS Research defines Industrial Knowledge Management (knowledge management) as the processes and technology for generating, capturing, evaluating, organizing, transferring, and reusing information and knowledge throughout the organization. Documented knowledge management processes can significantly scale existing best practices across the corporation and avoid reinventing the wheel or relearning what you once knew.

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Second, manufacturers must recognize and account for the multiple types of knowledge needed to support the organization (Figure 2) and improve the ways of working across the enterprise, including:

- **Explicit knowledge:** Formally documented knowledge and information (e.g., stored in documents and databases). Policies, procedures, training materials, and performance data are examples of explicit knowledge.

- **Implicit knowledge:** Accumulated information gained from experience and not easily captured (e.g., knowledge networks, internships, apprenticeships, conversations, and collaboration). This can be best represented as the body of knowledge gained by a subject matter expert (SME).

- **Tacit knowledge:** Skills gained through personal experiences and individual context learned through routine experiences (e.g., values, perceptions, and assumptions). Examples include tactics picked up along the way to troubleshoot equipment regularly used.

Last, healthy knowledge management processes can retain organizational expertise, improve learning, drive innovation and continuous improvement, support decision-making, and increase productivity. While each of these knowledge types is necessary to support organizational success and make positive changes, manufacturers should first focus on creating an environment where employees are actively engaged in continuously using and improving workforce learning.

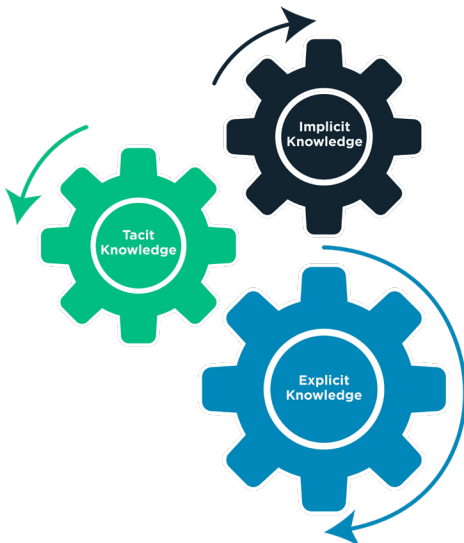### Different Types of Knowledge Require Different Approaches

FIGURE 2 - Types of Knowledge

> "
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3 Ways Manufacturers Are Doing it Wrong

Transforming the frontline employee experience, closing the skills gap, and empowering frontline workers with knowledge management capabilities is no small undertaking. With 84% of manufacturers experiencing an impact on operations because of personnel issues and 86% of manufacturers currently investing in knowledge management, these issues are not being ignored.

However, across our experiences working with manufacturers, we see three common and repeating mistakes being made:

Only
12%
of Followers are currently engaged in succession planning to identify the critical roles needed for the future and adequately prepare.

1. **No initiative, no leader, no organizational support.** LNS Research has never had a member client express to us that they over-invested in change management. Much of our research shows that a leading employee experience for the frontlines looks a lot like what a leading employee experience looks like for the corporate office, which, of course, has benefited from Future of Work initiatives and intense focus from Chief People Officers.

   COOs have to do the same for their organizations: Create a Future of Industrial Work (FOIW) Initiative; create new hybrid leadership roles between operations and human resources to lead these initiatives; then support these new efforts with a learning and development organization focused on operations, including both corporate and plant-level leaders.

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2. **An ad hoc approach with command and control frontline supervisors at the site level.** Top-down training and knowledge management programs have a history of not meeting expectations and becoming bureaucratic and compliance-focused. That doesn't mean every site should be left to its own devices. Insights and learning need to be shared across the entire manufacturing network to achieve the desired ROI, and those frontline individuals doing the sharing need to be recognized and elevated as subject matter experts.

   This enterprise approach can only be achieved if the frontlines are empowered and work with a common set of technology solutions delivered through an intuitive and simple user experience. Further, the frontlines will only be open to these new ways of working if they are trusted and respected, first and foremost, by a direct supervisor but also all the way up the organizational chain of command. Often, this can only be achieved by dedicated servant leadership training and, in some cases, coupled with personnel changes.

3. **New technology but the same old processes.** At LNS Research, we commonly refer to this as digital insanity, and it is the quickest way to ensure status quo performance. IIoT, Vision Systems, NLP, Augmented Reality, and many more technologies are already battle-tested and ready for prime time. Generative AI is, perhaps, over-hyped but is also beginning to deliver value in many different frontline knowledge scenarios. If your company is deploying these solutions but not investing heavily to innovate new approaches to managing learning and development, the payoff will be limited.

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How Leaders Approach Industrial Knowledge Management

It's true that the manufacturing recession and the recent influx of migrants seeking asylum have reduced the workforce issues facing manufacturers. Therefore, it isn't completely unreasonable for manufacturers to consider putting a pause on or reducing workforce initiatives. However, manufacturers that see these unexpected improvements as an opportunity to divert resources will pay steeply in the future.

LNS Research has found that manufacturers focused on building organizational learning and development capabilities perform significantly better in safety, quality, and productivity than those who do not. As an added bonus, employee satisfaction, engagement, and retention are often improved due to the company's focus on providing the total employee experience. This next generation of workers demands meaningful work with the opportunity to gain valuable, transferable skills, such as digital skills.
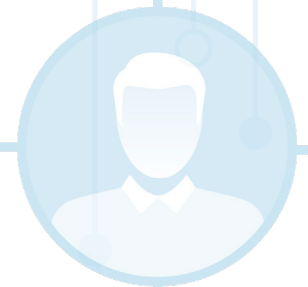
New Processes and Empowered People

Leaders are nearly two times more likely than followers to consistently communicate meaningful work with the opportunity to gain valuable, transferable skills to attract and recruit frontline employees. More importantly, these manufacturers are taking action to deliver on these promises. Forty-six percent of Leaders currently base roles and training on competency, skills, and future trends at the organization, team, and individual level compared to only twenty-eight percent of Followers.

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The approach to knowledge management across the frontline also widely varies between Leaders and Followers (Figure 3). FOIW Leaders are two times more likely to take a multi-faceted approach to knowledge management. When asked to describe the knowledge management culture, more than 50% of Leaders see the following as critical to the business:

1. Implementing strong governance to ensure training meets the desired operational outcome

2. Developing processes and systems to create, track, forecast, and navigate training needs and material (e.g., digitally triggered training material reviews)

3. Adopting innovative new training methods and practices to improve training material (e.g., CFW solutions, AI, AR/VR)

4. Seeking employee feedback, working teams, and assessments typically improve training (e.g., training evaluations, job observations)

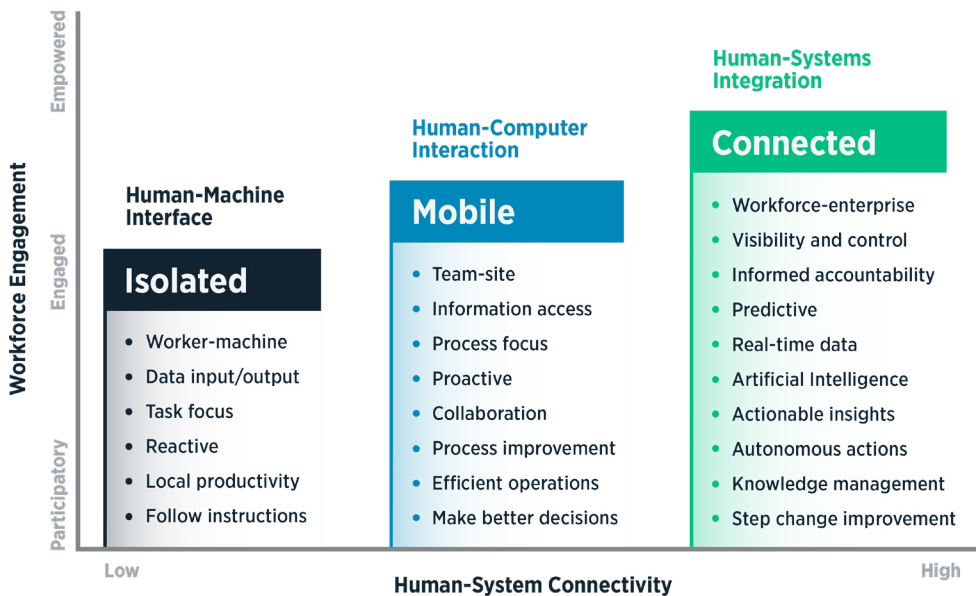## Evolution of Frontline Connectivity and Workforce Engagement

FIGURE 3 - Knowledge Management is Key to Empowering the Workforce

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AI, CFW Apps, and Virtual Operations Centers

Across multiple LNS Research surveys, we have seen Leaders more likely to deploy AI and Connected Frontline Workforce (CFW) Applications, as well as Virtual Operations Centers, enabled by these technologies. Together, these can form the basis of a company's ability to both transform the employee experience and move to a model of autonomous operations. These elements can also form the foundation of an Industrial Knowledge Management initiative:

- **Artifical Intelligence (AI),** especially vision systems, natural language processing, anomaly detection, generative AI, and causal AI, can be used to capture and catalog knowledge from the frontline and form the backbone of a closed-loop learning system. These AI offerings will likely come from a number of sources, including major cloud providers, industrial data platform providers, and application providers.

- **Connected Frontline Workforce (CFW) Applications** are quickly becoming the preferred software for engaging industrial workers in their day-to-day duties. CFW apps both capture and deliver insights to workers in context and often offer their own AI offerings or partner with third parties.

  These applications can offer skills matrices and assessments, micro and in-context training, SOPs and work instructions (including 3D with AR/VR), collaboration, and operational excellence offerings.

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- **A Virtual Operations Center (VOC)** digitally connects employees to a network of knowledge, expertise, and resources to augment manufacturing, troubleshooting, collaboration, and improvement capabilities. This enables proactive, real-time, on-demand, and flexible process support from virtually anywhere to achieve safer, more productive, and reliable operations (Figure 4).

  A VOC can be housed in a physical offsite location or be entirely virtual. They typically centralize hard-to-find expertise and Centers of Excellence (CoE) that support sites; examples include data science, operational excellence, OT, IT, and engineering disciplines.

  Virtual Operations Centers can also house and use other critical supporting technologies beyond pure AI or cloud offerings, like Digital Twins, Industrial Data Platforms, other non-AI industrial analytics, and AI/ML Ops.
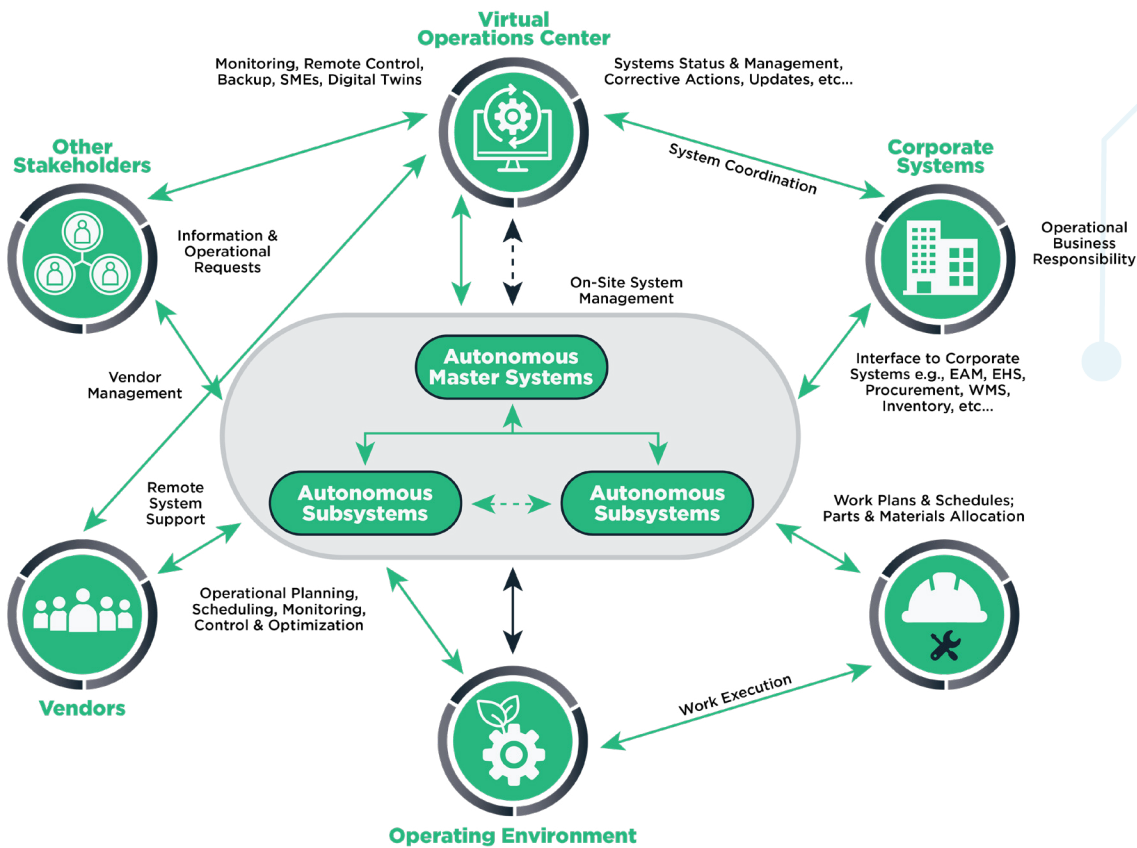

FIGURE 4 - Virtual Operations Center

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Industrial Knowledge Management Maturity

Investing in new initiatives without having a quantitative under-standing of the benefits or a qualitative understanding of enhanced capabilities can often lead to stalled progress and second-guessing. A knowledge framework is usually a good solution, and leaders fre-quently use one to manage the deployment of both the previously mentioned technologies and knowledge management. An effective knowledge management framework must be worker-centric and focused on rapidly enabling workers to not only understand what they have to do but, more importantly, why they are doing it (Figure 5). Most importantly, workers need to know what not to do and what not to ignore, with the penultimate stage being mastery and the ability to teach others.

Realized Value

Shares Knowledge — **Improves knowledge and teaches others** (e.g., adds innovative new approaches)

Knows Prioritization — **Can apply gained knowledge** (e.g., added insight)

Know Why — **Understands the connections** (e.g., added meaning)

Know When — **Able to perform** (e.g., added context)

Know How — **Knows there is a connection** (e.g., added information)

Know What — **Recognize something happened or needs to happen** (e.g., data)

Empowered Employees

FIGURE 5 - Knowledge Management Value Curve

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An Aligned and Comprehensive Industrial Operations Strategy

COOs have the ultimate responsibility for the strategy and performance of the manufacturing network. Decisions regarding workforce initiatives should be carefully considered in the context of broader business goals and objectives rather than considering just the immediate circumstances.

As such, COOs should ensure that their operations strategy aligns with the broader business strategy. This includes having a strategy pillar, and a leader focused on workforce issues. Moreover, COOs need to ensure knowledge management is foundational to the strategy (Figure 6) and that clear measures and goals for performance are put in place.

Manufacturers that choose to delay making the fundamental changes required will find themselves at a significant disadvantage when demand rebounds in the near future.
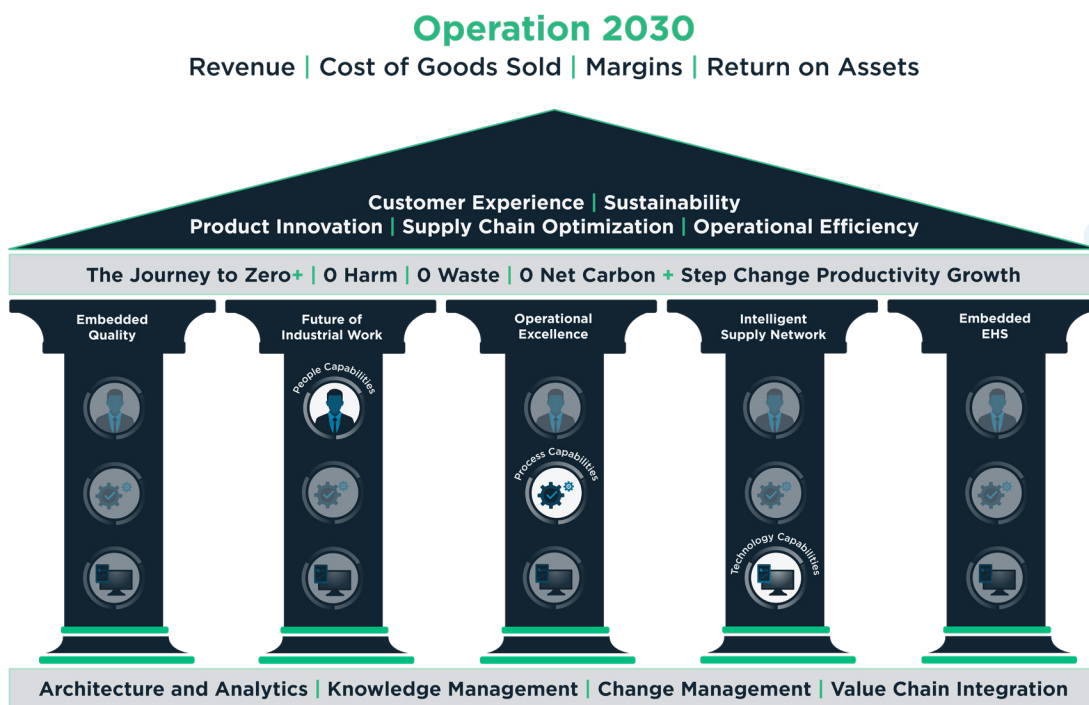

Operation 2030
Revenue | Cost of Goods Sold | Margins | Return on Assets

Customer Experience | Sustainability
Product Innovation | Supply Chain Optimization | Operational Efficiency

The Journey to Zero+ | 0 Harm | 0 Waste | 0 Net Carbon + Step Change Productivity Growth

Embedded Quality | Future of Industrial Work | Operational Excellence | Intelligent Supply Network | Embedded EHS

People Capabilities

Process Capabilities

Technology Capabilities

Architecture and Analytics | Knowledge Management | Change Management | Value Chain Integration

FIGURE 6 - Knowledge Management Creates the Foundation for Long-term Success

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Recommendations: Upskilling the Workforce to Achieve Step Change Improvement

Ultimately, the decision to pause, proceed with, or even intensify existing workforce initiatives should be carefully considered. LNS Research believes there is a strong need to focus investments on better onboarding, training, and developing employees to succeed. Manufacturers should take the following steps to future-proof the frontlines to create more agile and sustainable operations:

1. **Invest in employee lifecycle improvements that align with the business's strategic direction and priorities.** Leaders recognize the importance of investing in improvements during times of lower demand. These investments deliver significant dividends and contribute to the business's bottom line in the long term.

2. **Update the organizational model with an executive leader focused on workforce development and empowerment.** A newer role is beginning to emerge across manufacturing. Manufacturing leaders recognize that the frontline has been long forgotten and will be a critical enabler of future success. This role will play a key part in executing the Chief Operations Officer's long-term strategy.

3. **Create workforce Centers of Excellence with cross-functional teams committed to improving the current ways of working.** Innovative new approaches are required to not only improve but also preserve safety, quality, and productivity performance. It's not just about value creation anymore—it's about value preservation, and cross-functional teams enable the organization to deploy innovative new approaches across the value chain.

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4. **Leverage AI, CFW Apps, and Virtual Operations Centers in conjunction with data and analytics to measure training effectiveness and achieve operational outcomes (Figure 7).** It's most important for organizations to start somewhere rather than try and find the best way to assess the success of learning and development programs. Ensure employee feedback is continuously sought to understand workforce needs, preferences, and ideas to better empower and elevate the frontlines.

25%
of manufacturers are currently piloting Connected Frontline Workforce (CFW) applications, with **23%** budgeted to implement within their plants in the next three years.

32%
are evaluating CFW applications as an alternative to Manufacturing Execution Systems (MES)

What is the Status of Adopting Artificial Intelligence and Machine Learning as a Part of Your Industrial Transformation Program?
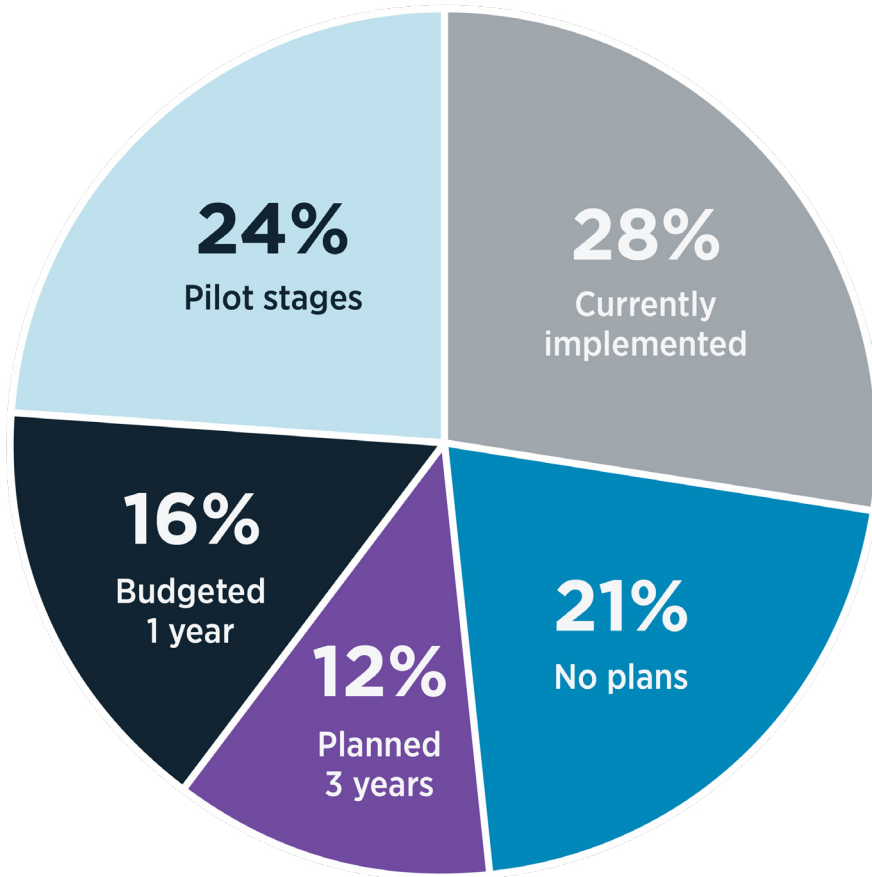
24%
Pilot stages

28%
Currently implemented

16%
Budgeted 1 year

12%
Planned 3 years

21%
No plans

FIGURE 7 - AI/ML Usage in IX Programs

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Related Research on Industrial Transformation (IX)

RESEARCH | Pivot to Value for Industrial Transformation Success ➜

RESEARCH | Advanced Industrial Analytics: Four Proven Strategies to Scale Transformation During
Uncertain Times ➜

RESEARCH | People in Industrial Transformation (IX): Leadership, Culture, and Organizational Best Practices ➜

RESEARCH | Taking Control of Quality Transformation: Strategic & Cultural Imperatives for the Quality
Executive ➜

EBOOK | Future of Industrial Work: Develop a Sustainable Workforce Strategy ➜

RESEARCH | Connected Workforce: Enable a Competent, Agile Industrial Workforce ➜

RESEARCH | Future of Industrial Work: Future-proofing Your Operations ➜

EBOOK | Leaders' Guide to Unified Performance Excellence ➜

RESEARCH | Artificial Ingredients: How Generative AI Transforms Six Key Value Streams in Manufacturing ➜

EBOOK | Enable Operational Agility with a Digitally Connected Workforce ➜

BLOG | Introducing the Industrial Transformation (IX) Reference Architecture ➜

BLOG | Understanding Industrial Transformation: Definition and Framework for Success ➜

RESEARCH | Industrial Transformation: Architecture and Analytics Just the Beginning ➜

RESEARCH | IX Architectural Paths 1 of 3: Three Paths & Understanding IX Infrastructure ➜

RESEARCH | IX Architectural Paths 2 of 3: Evaluating IX Platforms and IX Applications & Analytics ➜

RESEARCH | IX Architectural Paths 3 of 3: Looking at IX Strategic Partners ➜

RESEARCH | Industrial Transformation Success: How to Secure Operations' Buy in to Create
Effective Leadership ➜

RESEARCH | IX Digital Readiness ➜

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