

SAFETY AND RISK MANAGEMENT IN THE AGE OF IIoT AND DIGITAL TRANSFORMATION



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Driving Business Performance Through Operational Excellence

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Driving Business Performance Through Operational Excellence



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SECTION 1

Executive Summary

Executive Summary

Safety is a cost-center, right? The traditional view within industrial operations is that workplace safety comes at the expense of productivity. This misconception is rooted in an outdated view in which companies and even environment, health and safety (EHS) leaders cast the safety function as the “compliance cop,” enforcing regulations and standards regardless of their negative impact on plant operations performance.

There have been great strides in recent years to change the mentality that safety improvements mean trade-offs in operating performance. With widespread adoption of continuous improvement initiatives such as Lean and Six Sigma, EHS and safety management are more often viewed as **vital contributors to Operational Excellence and business performance**. Also, the powerful Digital Transformation trend in industrial organizations — known as Smart Manufacturing or Industry 4.0 — highlights how EHS can and should add value to the business.

Despite this progress, EHS business leaders still have trouble articulating the strategic value of investing in safety process improvements and technology capabilities. Safety and automation leaders face similar challenges in showing the ROI of safety systems technology. This is a critical gap now that industrial companies are launching initiatives to rethink and digitalize operations. If safety and automation leaders aren't part the discussion, they will miss a tremendous opportunity.

Our research consistently shows that disparate systems and fragmented data sources are the main barrier to EHS performance improvement. Yet, when making the case to invest in Digital Trans-

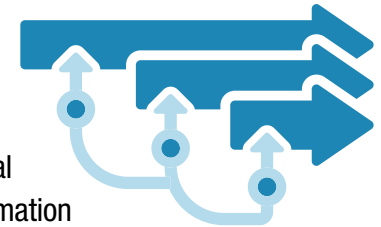
formation needed to fix these problems, we find that the financial justification is often lacking.

The research presented in this eBook sheds new light on the business value of safety. It shows a clear association between the adoption of safety and risk management best practices and operational benefits. Key topics include:

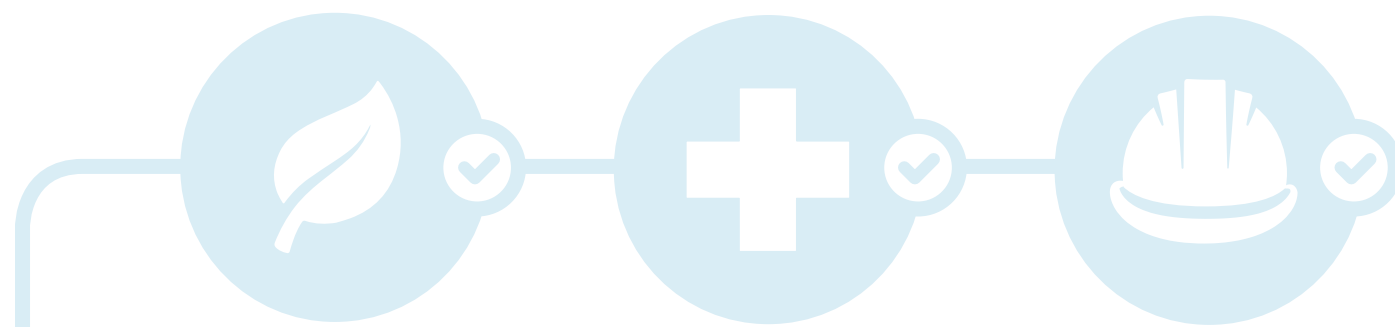
- Business drivers and strategic objectives of safety initiatives
- Adoption rates of safety and risk management people, process and technology capabilities in industrial organizations
- Safety and risk best practices most associated with operational benefits
- Action steps to help EHS business leaders communicate the strategic value of safety initiatives

DIGITAL TRANSFORMATION FRAMEWORK

by LNS Research describes a systematic approach to simultaneous and interconnected digital initiatives, in order to manage transformation across all levels and functions of the organization.



 [Click to learn more about the Digital Transformation Framework](#)





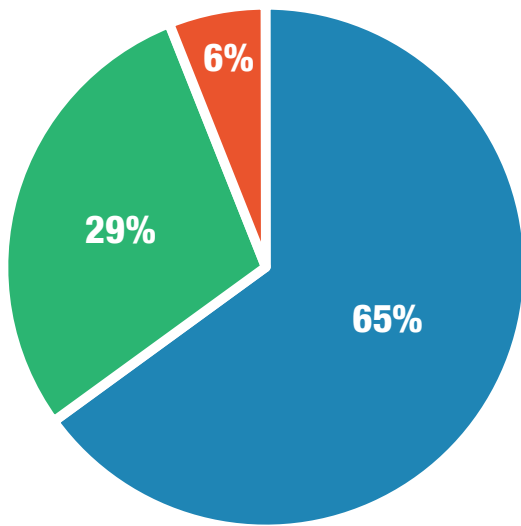
SECTION 2

Research Demographics

Research Demographics

The data presented in this eBook is drawn from primary research conducted by LNS Research on the topic of safety and risk management best practices and their relationship to business performance. We gathered data via an online survey in the fall of 2017 from 300 respondents across different geographic regions and company sizes. Respondents are mainly operations, EHS and engineering managers and professionals in industrial organizations, weighted towards discrete manufacturing.

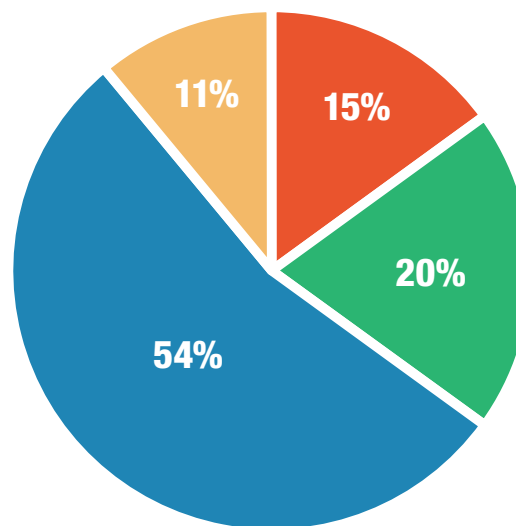
We selectively supplemented the data from this survey with data from the ongoing LNS Research EHS Management survey, which has a similar demographic profile.



GEOGRAPHY

HQ Location

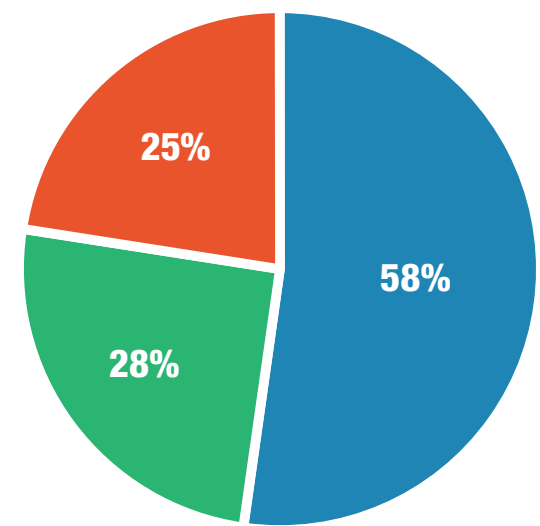
- North America
- Europe
- Rest of World



REVENUE

Company Revenue

- Small: less than \$250 million
- Medium: \$250 million to \$1 billion
- Large: more than \$1 billion
- Not specified



INDUSTRY

- Discrete Manufacturing
- Process Manufacturing
- Batch Manufacturing

Does not equal 100% as respondent organizations operate in multiple segments.



SECTION 3

Business Objectives and Challenges

Operational Performance Improvement Drives Safety Initiatives

Companies don't start an initiative unless it supports the business. Beyond a basic desire to "do the right thing," companies make decisions to invest in safety based on expected business value. Since every organization has limited resources, each initiative needs to be justified by its return on investment.

Our survey data show the primary business driver for undertaking safety initiatives is to help meet Operational Excellence goals. Mitigating the impact of regulatory sanctions and costly incidents

on business performance also plays a big role. The top strategic objectives of safety initiatives also mirror these drivers. Clearly, investments in safety management are viewed as key to Operational Excellence and a smooth-running, compliant, and profitable business.

Business Context for Safety Initiatives

BUSINESS DRIVERS

- #1 Meet Operational Excellence goals
- #2 Regulatory enforcement
- #3 Incidents and accidents
- #4 New management team
- #5 Pressure from business partners

STRATEGIC OBJECTIVES

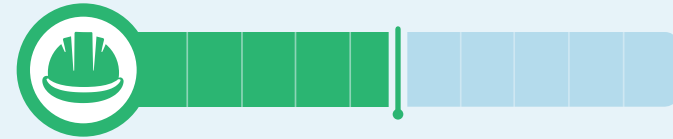
- #1 Reduce risk of adverse events
- #2 Compliance assurance
- #3 Improve operational performance
- #4 Standardize global operations
- #5 Reduce safety costs

The Gap Between Good Safety Intentions and Execution

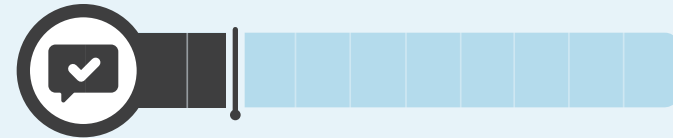
Industrial enterprises have embraced workplace safety: nearly half of respondents (49%) indicate that safety is viewed as a core value across all levels of their organization. It's a positive sign that protecting workers and safeguarding operations is viewed as a business priority by senior executives, operations leaders and frontline workers alike.

However, when it comes to implementing safety as a value, there's still a disconnect. Only 19% of respondents report that their organization has C-level commitment to safety, as demonstrated by investments in personnel and technology. This gap in "walking the talk" reflects an organizational culture that is not fully supportive of safety — which helps explain why manufacturers and other industrial organizations continue to experience incidents and accidents that harm people, reduce productivity and, ultimately, stymie profitable growth.

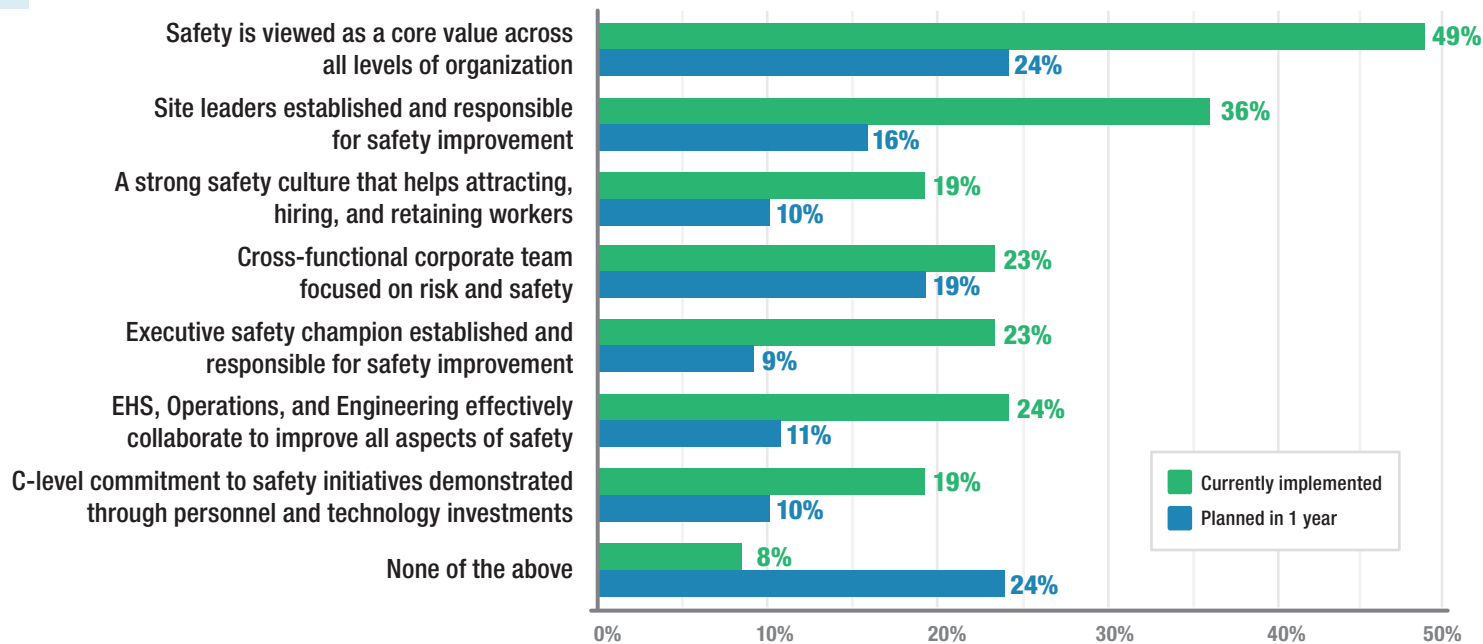
49% OF COMPANIES claim safety as a core value...



Yet only **19% HAVE EXECUTIVE COMMITMENT** to make necessary investments.



Safety Culture Capabilities



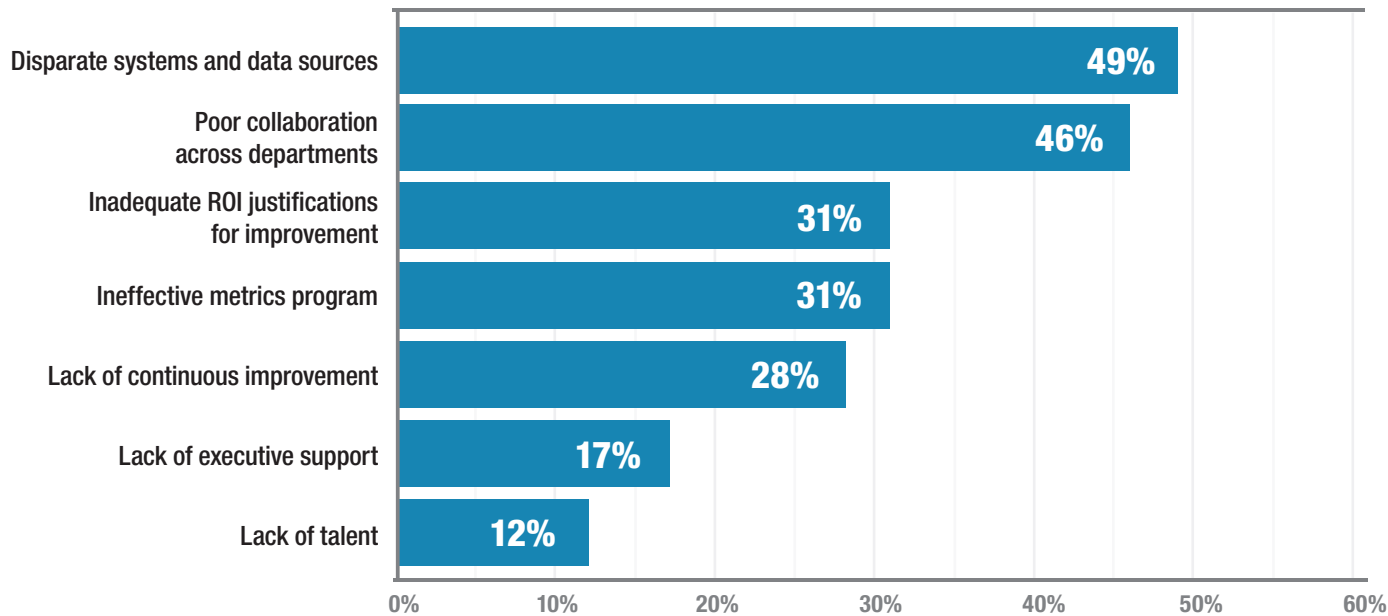
Barriers to Safety and Environmental Performance Improvement

Industrial enterprises attempting to realize safety as a core value face significant challenges beyond the disconnect between intentions and investment. According to our survey data, the top challenge to improving safety and environmental performance is “disparate systems and data sources” (49% of respondents), followed closely by poor collaboration across departments (46%).

Fragmented information systems and disconnected business functions are long-standing, intractable issues — but they are not unique to safety and risk management. Given their prevalence, it's no wonder that safety performance often doesn't meet expectations. The key question is how to bring these disparate data and management systems together to improve safety performance.



Top Challenges to Safety and Environmental Performance Improvement



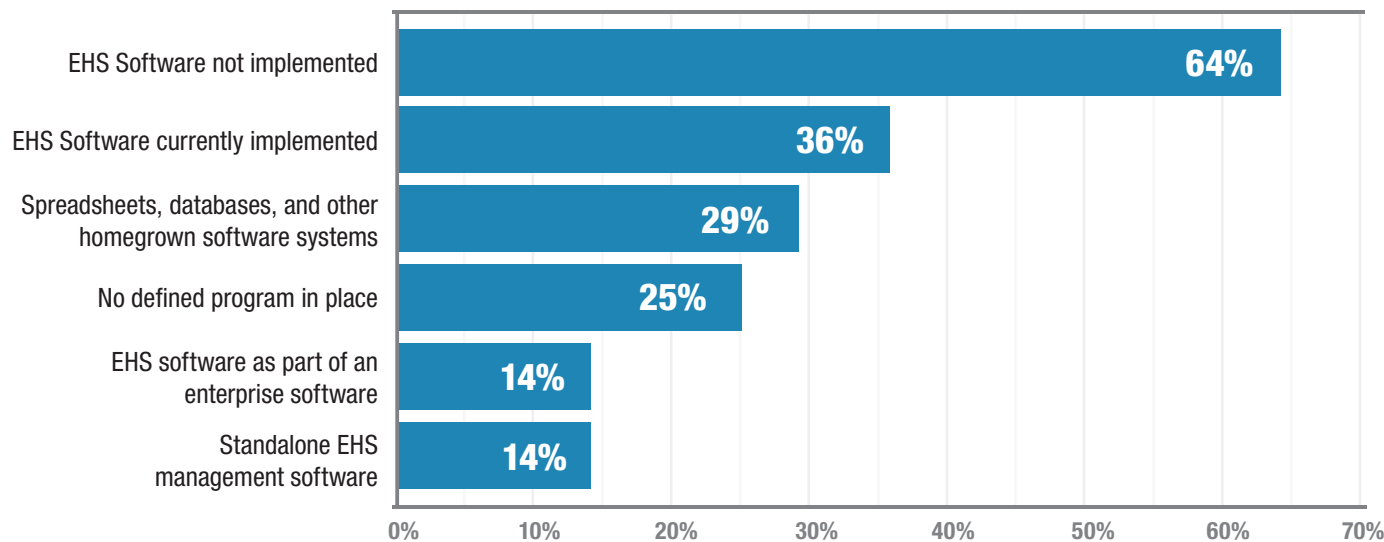
Ad Hoc Approaches to Managing Safety and EHS Persist

Remarkably, most companies still manage safety and environmental performance without the benefit of dedicated EHS software — in fact, 64% of respondents have not implemented it. Point solutions and homegrown systems, such as spreadsheets and custom databases, are still prevalent. Even where EHS software exists, it's often not integrated with other business systems and processes. In many cases, there is no defined program or system in place.

This shows that there is a large opportunity for organizations to more effectively use modern information technology to manage safety performance systematically, on par with other business functions such as sales, procurement, supply chain, and others.



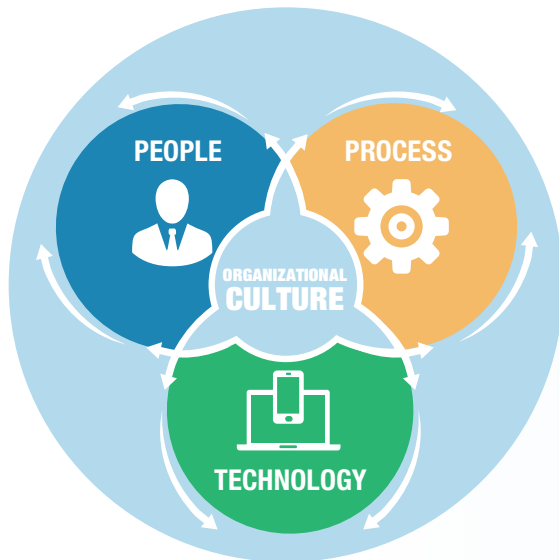
How are EHS processes and performance managed today?



Safety is Integral to Operational Excellence

Smooth-running, high-performing operations depend on getting safety right to avoid incidents and improve productivity. In many industrial organizations, safety/EHS and operations staff work together to achieve safety and risk management goals. However, the lack of cross-functional collaboration continues to surface as a key barrier to reaching those goals.

Fundamentally, Operational Excellence requires close alignment of people, process and technology capabilities across the core functional pillars of operations, asset management, quality and EHS management. Manufacturers that maximize Operational Excellence are those that embed safety and risk management into their core business operations to optimize compliance, risk management and productivity. However, shortcomings in one of these functional pillars will create some instability and if two or more pillars are ineffective, then the whole platform becomes unsteady.



People – Process – Technology
Operational Excellence Platform

Fall short on any pillar and your OpEx platform becomes fragile

Fall short on two or more pillars and your OpEx platform becomes totally unstable



OPERATIONAL EXCELLENCE SUPPORT



SECTION 4

State of Play: Adoption of Safety and Risk Best Practices

Collaboration: The Missing Link Between EHS, Operations and Engineering

A manufacturing organization's safety performance is the result of the complex interactions of people and processes working towards Operational Excellence goals. Typically, the shared organizational objectives of operations, engineering and EHS business functions are: safeguarding people and operations, driving efficiencies, and improving profitability. Yet, in only 24% of organizations, do teams effectively collaborate to improve all aspects of safety. At the corporate level, less than a quarter of survey participants indicate that their organizations have a cross-functional team focused on safety and risk. In short, organizational silos still block safety improvement.

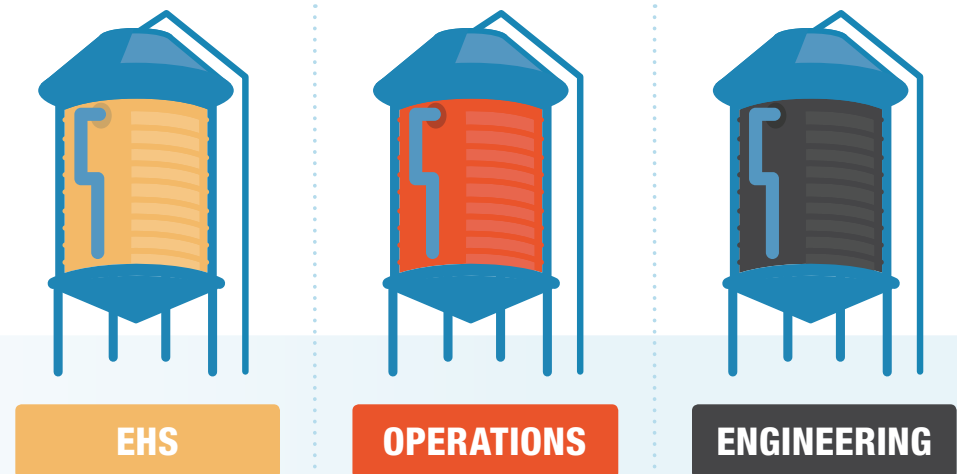
Only **24% OF COMPANIES** collaborate across EHS, operations and engineering to improve safety.



Only **23% OF COMPANIES** have an enterprise cross-functional safety and risk team.



ORGANIZATIONAL SILOS DIMINISH SAFETY PERFORMANCE



A Lifecycle Approach to Risk Management is Necessary, But Uncommon

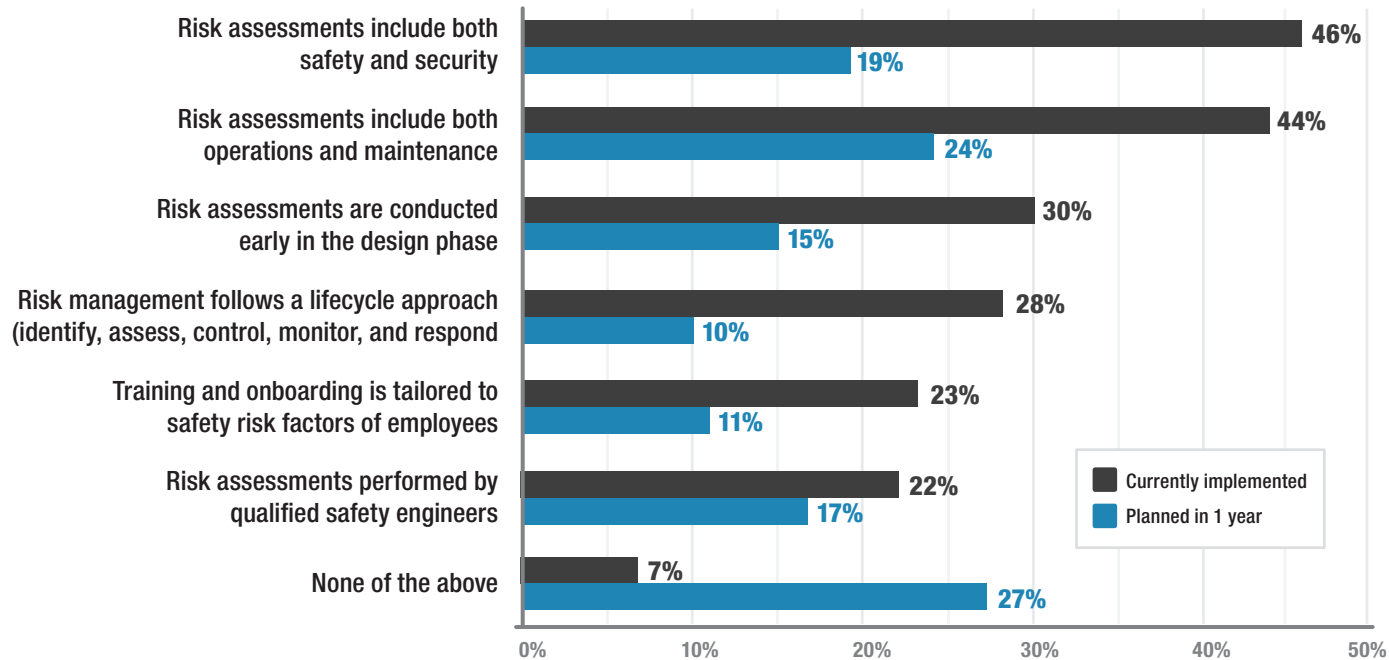
Widely-adopted safety system and EHS management standards call for a lifecycle process for risk management. This closed-loop approach addresses risk across the entire equipment and production process lifecycle, from design to retirement. Yet, only 28% of industrial organizations use a lifecycle approach that encompasses risk identification, assessment, control, monitoring and response. This means exposure to operational risk is more common than not.

On a more positive note, when risk assessments are done, it often involves cross-functional collaboration. Frequently, safety and security issues, and operations and maintenance issues are paired together in

the risk assessment process. Given that a lack of cross-functional teamwork is a major barrier to safety and EHS performance improvement, this is a positive trend — and should be encouraged.

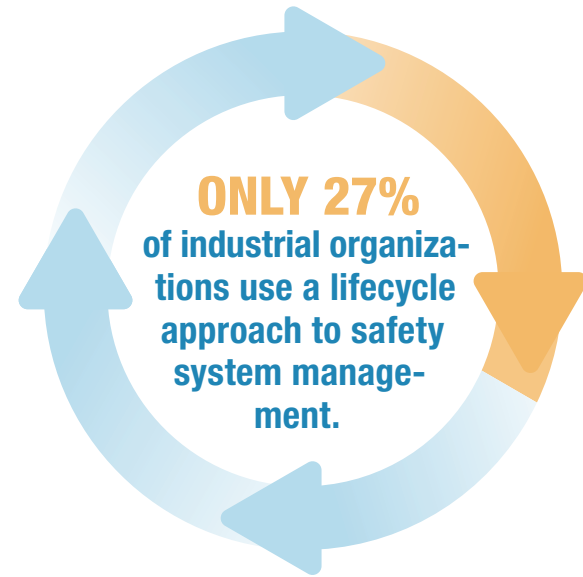


Risk Management Process Capabilities

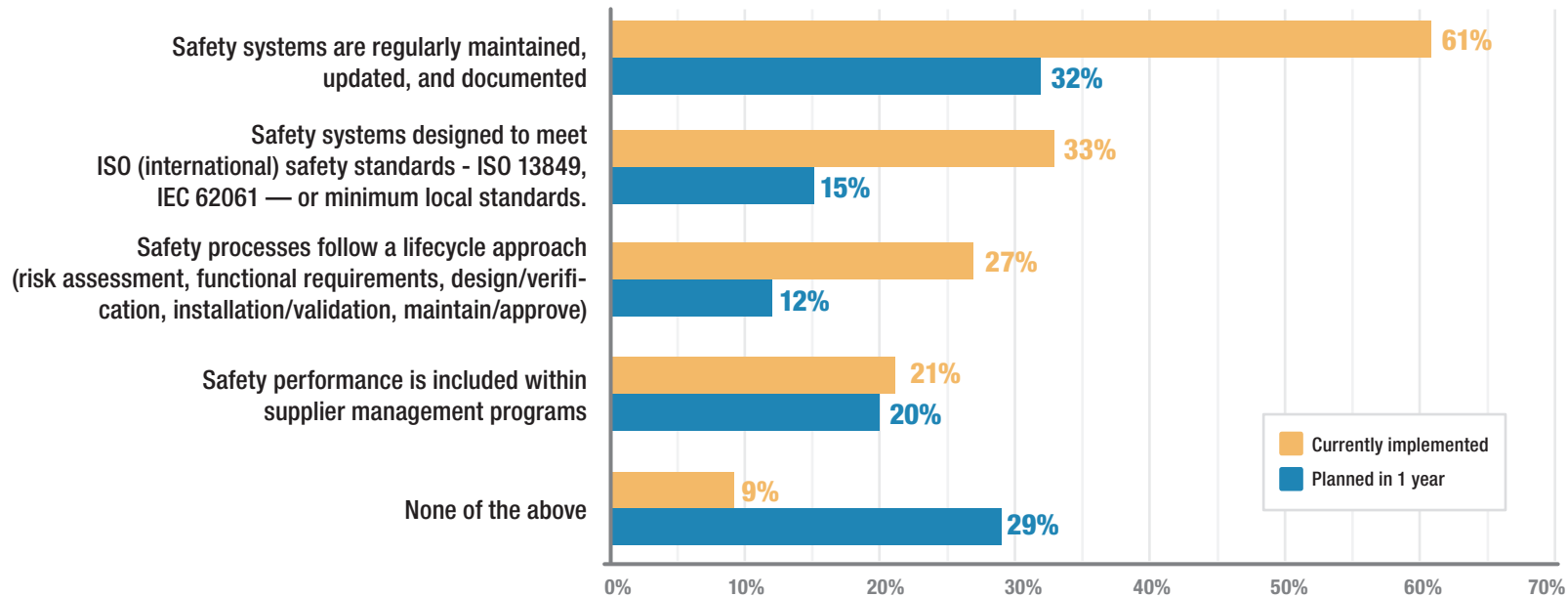


Safety System Process Capabilities: Room for Improvement

For better or for worse, the adoption of safety system process best practices mirrors the pattern for risk management processes. Most companies report doing a good job of the fundamentals of managing safety systems, with regular maintenance, updating and documentation occurring, and a significant percentage (33%) having design safety systems in accordance with ISO standards or local requirements. But fewer organizations (27%) state they use a lifecycle approach to safety system management. This is somewhat contradictory with the preceding results and further indicates that the typical approach to safety systems is fragmented.



Safety Process Capabilities



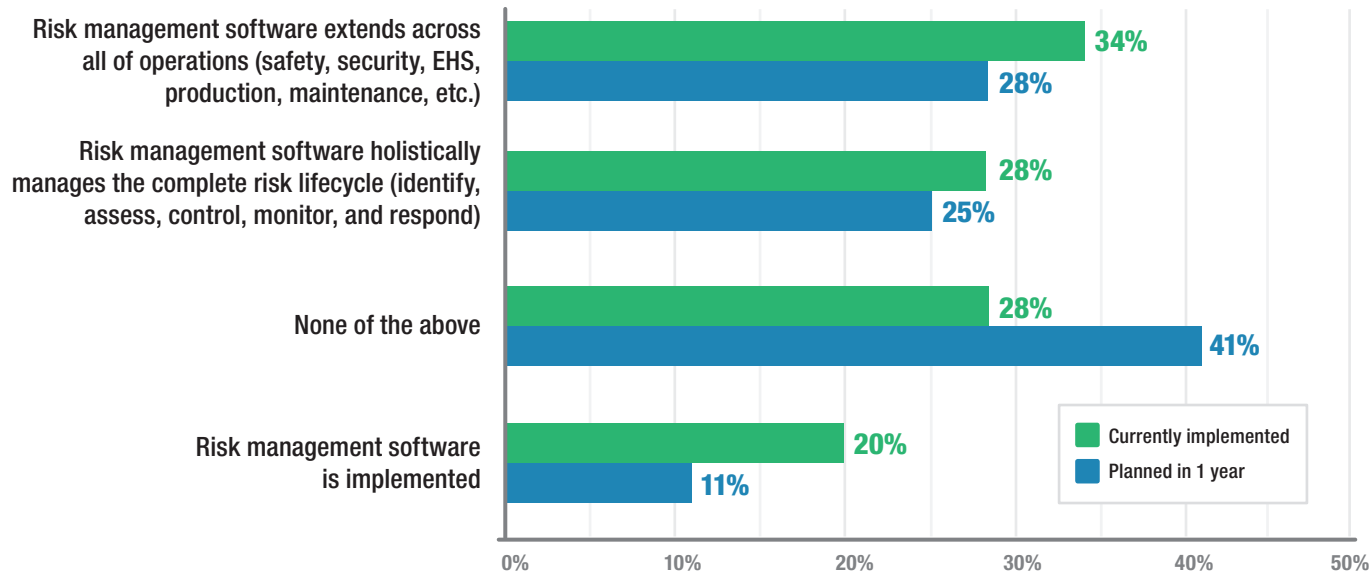
Risk Management Software: Available but Underutilized

Less than a third of respondents report that dedicated risk management software has been implemented or will be implemented within a year. Given the complexity of a robust closed-loop risk management process, and the consequences of under-managing operational risks, this adoption rate is on the low side.

However, there are bright spots among those running risk management software. Most (62%) indicate its use extends or will soon extend across all core operational functions (e.g. production, maintenance, safety, security, EHS, etc.) and 53% use it to manage across the risk management lifecycle. It seems that despite a low overall adoption rate, organizations that use dedicated risk management systems are trending towards a holistic approach.



Risk Management Process Capabilities

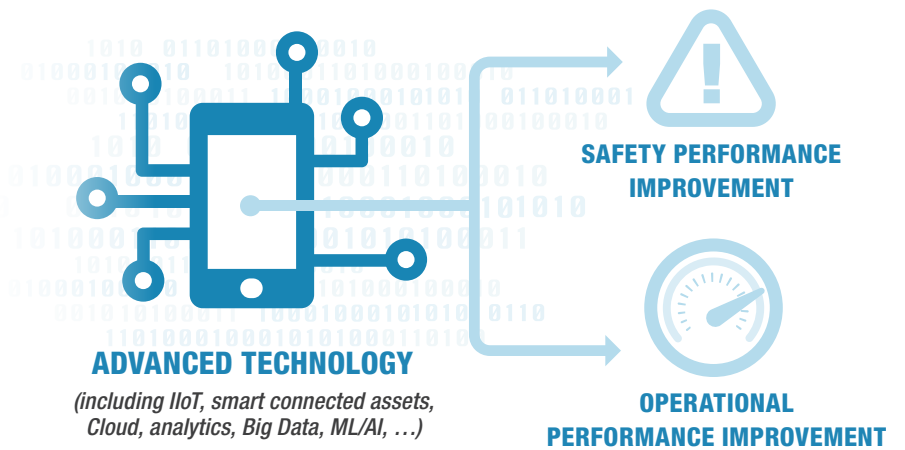


Safety Technology: Untapped Potential to Mitigate Risk and Improve Performance

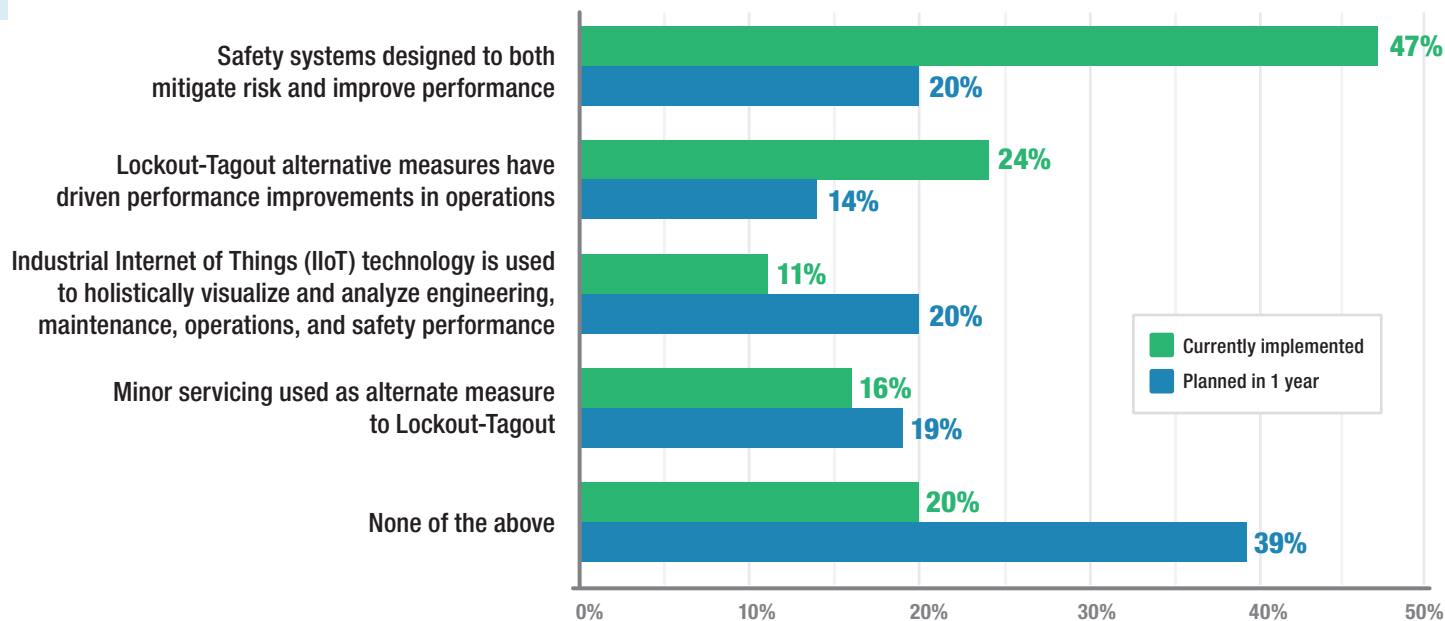
Two thirds of respondents report that their safety systems are designed to both mitigate risk and improve performance, or are planned to do so soon, and nearly half say that capability is in place today. While simultaneously improving safety and productivity is a worthy objective, other data suggests the opportunity to use advanced technology for this is not yet being fully exploited.

For example, less than a quarter of respondents say that lockout-tagout (LOTO) alternative measures¹ have been used to improved operational performance. Likewise, only 16% say they use minor servicing as an alternative measure to LOTO, although an additional 19% plan to in the next year. Additionally, a relatively low portion of respondents (11%) indicate their organization is leveraging Industrial Internet of Things (IIoT) technologies to holistically manage operations and

safety. Notably, 20% say they will start using IIoT this way in the next 12 months. Evidently, companies are embracing advanced technology in ways that improve safety and productivity, with much upside potential.



Safety Technology Capabilities



¹Alternative measures are technology uses that are compliant with global safety standards to reduce risk to an acceptable level, under specific circumstances outlined in the OSHA Minor Servicing Exception, per 29 CFR 1910.147.

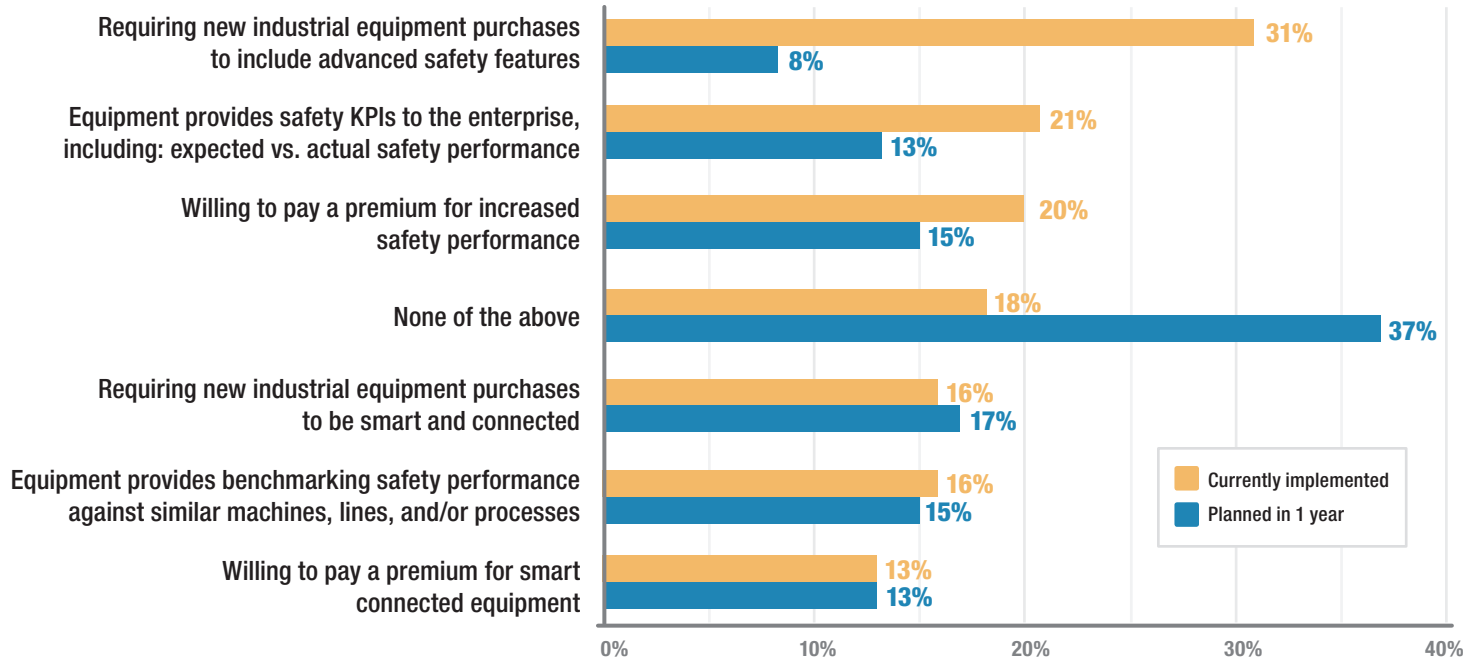
Demands on Equipment Providers for Safety System Capabilities are Light

When it comes to safety system capabilities, manufacturers place relatively light demands on their equipment providers. Although nearly a third of respondents indicate they require new industrial equipment to include advanced safety features, over half (55%) have none of the surveyed safety system practices in place or have no plans to adopt additional ones in the coming year.

The data shows some missed opportunities to leverage advanced safety system technologies. Only 21% of respondents indicate equipment provides safety key performance indicators (KPIs) to the enter-

prise, including expected versus actual safety performance, and a paltry 16% say their equipment provides the ability to benchmark safety performance against similar machines, lines or production processes. However, the safety system practice most commonly planned in the coming year is the requirement for new industrial equipment to be smart and connected, which bodes well for enabling these practices in the future.

Safety System Capabilities





SECTION 5

Evidence of Business Value

How Advanced Safety Process and Technology Capabilities Impact Business Performance

The survey posed this bottom-line question: “Has deployment of advanced safety technology or process capabilities provided improvement in financial or operational performance?” Respondents overwhelmingly said yes, with 75% reporting operational improvements and 60% claiming financial improvements.

These improvements came quickly, with respondents reporting a median time to realize benefits of 12 and 14 months for operational and financial improvements, respectively. Likewise, the benefits were significant, with median improvement in operational and financial metrics of 38% and 37%, respectively.

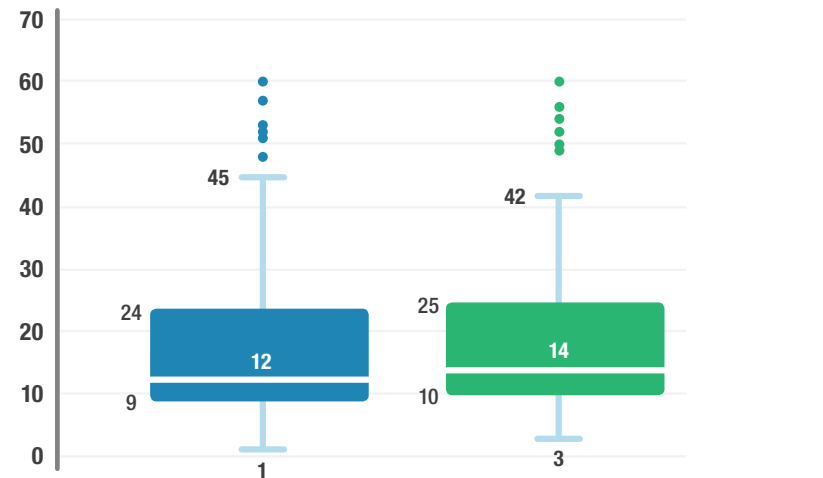
These results show companies broadly perceive significant business benefits from investments in safety process capabilities and technology enablers. Now, let’s examine the specific best practices that explain how these benefits are achieved.

60% OF COMPANIES claim operational and financial benefits from safety investments.

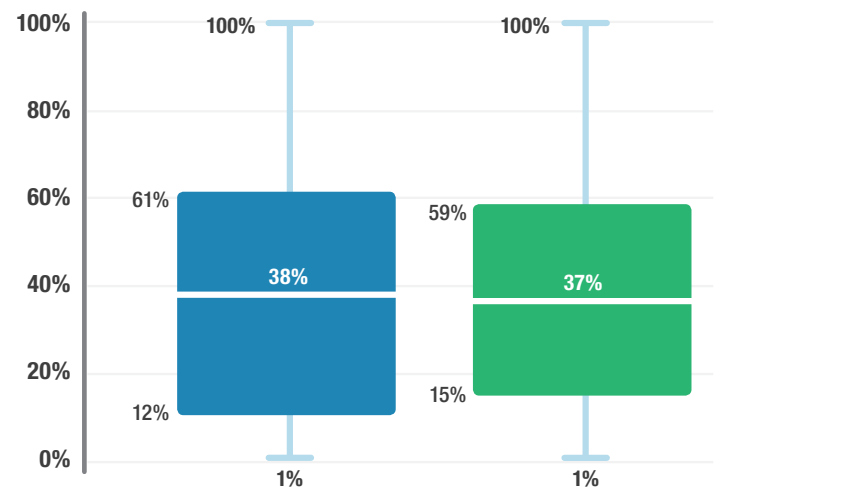


Companies have seen an average of **37% IMPROVEMENT IN FINANCIAL METRICS** from safety investments.

Number of Months to Realize Operational and Financial Benefits



Improvement in Operational and Financial Metrics






Best Practice Adoption Correlates with Safety and Operational Performance

Traditional thinking in industrial organizations is that safety comes at the expense of profitability. In this view, procedures and processes required for safety compliance reduce productivity and increase costs. Fortunately, as companies have evolved towards an Operational Excellence approach of continuous improvement, there has been a shift away from this trade-off mentality.

The survey data strongly supports the notion that adoption of safety

and risk management best practices lead to better operational performance. We gathered data on four commonly-used performance metrics: new product introduction (NPI), on-time delivery, overall equipment effectiveness (OEE), and incident rate (see [Appendix](#) for definitions of these metrics). Companies that implement safety best practices spanning people, process and technology capabilities perform significantly better than those that do not.

| Capability | Best Practice | New Product Introduction | | On Time Delivery | | Overall Equipment Effectiveness | | Incident Rate | |
|---|---|--------------------------|-----------|------------------|-----------|---------------------------------|-----------|---------------|-----------|
| | | IMPL. | NOT IMPL. | IMPL. | NOT IMPL. | IMPL. | NOT IMPL. | IMPL. | NOT IMPL. |
|  PEOPLE | EHS, Operations and Engineering effectively collaborate to improve all aspects of safety | * | * | 95 | 85 | * | * | 1.7 | 2 |
| | A strong safety culture that helps to attract, hire and retain workers | * | * | * | * | 82 | 77 | * | * |
| | Training and onboarding is tailored to employees' safety risk factors | 82 | 64 | * | * | 81 | 76 | * | * |
|  PROCESS | Safety systems are designed to meet ISO safety standards or minimum local standards | 80 | 65 | 90 | 85 | * | * | 1.7 | 2 |
| | Risk assessments are conducted early in the design phase | 85 | 61 | 95 | 85 | * | * | * | * |
| | Risk assessments include both operations and maintenance | 80 | 71 | 90 | 85 | * | * | * | * |
| | Risk management follows a lifecycle approach | * | * | * | * | 82 | 77 | 1.8 | 2 |
|  TECH-NOLOGY | Requiring new industrial equipment purchases to include advanced safety features | 86 | 63 | 92 | 83 | * | * | 1.9 | 2 |
| | Safety systems are designed to both mitigate risk and improve performance | 85 | 61 | * | * | * | * | 1.6 | 3 |
| | Risk management software is implemented | 89 | 63 | 94 | 83 | * | * | 1.5 | 2 |
| | Risk management software holistically manages the complete risk lifecycle | * | * | * | * | * | * | 0.6 | 2 |
| | Equipment provides benchmarking safety performance data | * | * | 95 | 85 | * | * | * | * |
| | Lockout-Tagout alternatives have driven performance improvements | * | * | * | * | 84 | 77 | * | * |
| | Industrial Internet of Things (IIoT) technology is used to holistically visualize and analyze engineering, maintenance, operations and safety performance | * | * | * | * | * | * | 1.5 | 2 |

*Value does not represent marked change or improvement between best practice implemented and not implemented.

Cross-Functional Collaboration Benefits Safety and Operational Performance

An essential part of the LNS Research viewpoint on Operational Excellence is it requires a strong cross-functional platform, enabled by the right alignment of people, process and technology capabilities. The importance of the people and organizational culture aspect is borne out by the survey data. Organizations in which operations, EHS and engineering effectively collaborate to improve all aspects of safety reported median incident rates at 15% lower than those that don't. Additionally, on-time delivery also performed better (12%) with effective cross-functional collaboration on safety.

This is especially noteworthy because historically in many industrial organizations there has been a divide between EHS and engineering. It's clear: a more collaborative approach yields business benefits.

BEST PRACTICE:

Operations, EHS, and Engineering Collaborate Effectively to Improve All Aspects of Safety

Incident Rate

| | |
|---|---|
| ✗ BEST PRACTICE NOT IMPLEMENTED: 2.0 | ✓ BEST PRACTICE IMPLEMENTED: 1.7 |
|---|---|



15% LOWER INCIDENT RATE

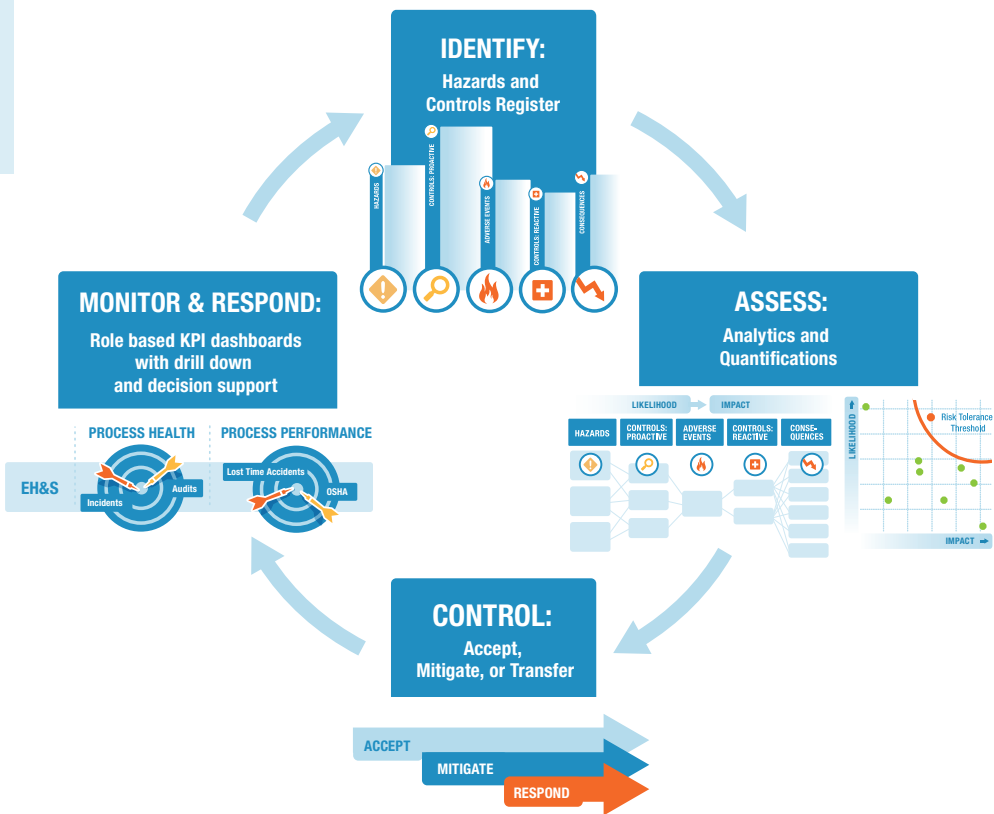
with safety collaboration by Operations, Engineering and EHS.

Closed-Loop Risk Management Processes Pay Off

Management system standards such as ISO 13849 and IEC 62061 are widely implemented by manufacturers for governance of safety systems. These standards call for a lifecycle approach to risk management encompassing identification, assessment, control, monitoring and responding. Similarly, closed-loop risk management processes are a principal element of popular EHS consensus standards such as ISO 140001 and OHSAS 18001.

Implementing such a rigorous lifecycle approach to risk management is associated with both improved safety and operational performance as measured by incident rate and overall equipment effectiveness (OEE) metrics. Efforts to incorporate safety considerations early on also have a positive impact. When safety systems are designed to meet ISO standards, and risk assessments are performed in the design phase, companies do a better job at introducing new products to the market and meeting on-time delivery targets. In short, proactive, closed-loop risk management processes with a lifecycle approach help improve both safety and operating results.

CLOSED-LOOP RISK MANAGEMENT PROCESS



| BEST PRACTICE: Risk Management Follows a Lifecycle Approach | |
|---|---|
| Incident Rate | |
| ✗ BEST PRACTICE NOT IMPLEMENTED: 2.0 | ✓ BEST PRACTICE IMPLEMENTED: 1.8 |
| Overall Equipment Effectiveness | |
| ✗ BEST PRACTICE NOT IMPLEMENTED: 77 | ✓ BEST PRACTICE IMPLEMENTED: 82 |

7% HIGHER OEE and 10% LOWER INCIDENT RATE
with lifecycle risk management.

Technology Enablers Help Drive Safety and Performance

Although technology is not in and of itself a solution, using it as an enabler of safety and risk management processes drives performance benefits. Implementing lifecycle risk management is complex from business process and data management perspectives. Clearly, companies that run dedicated risk management software see significantly better safety and operational performance than those that try to get by without it, as reflected by incident rates, successful new product introductions (NPIs) and on-time delivery. Plus, where risk management software is used to manage the complete risk lifecycle holistically, reported incident rates are 70% lower than in organizations where it's not.

The survey data points to several other best practices in the use of advanced technology to improve safety and operational performance:

- Requiring new industrial equipment purchases to include advanced safety features
- Safety systems are designed to mitigate risk and improve performance
- Lockout-tagout alternative measures drive performance improvements in operations
- Industrial Internet of Things (IIoT) technology is used to holistically visualize and analyze engineering, maintenance, operations and safety performance

Bottom line: the use of advanced safety technology and the innovations it enables provides fertile ground for performance improvement.

| BEST PRACTICE: Risk Management Software is Implemented | |
|--|---|
| New Product Introduction | |
| ✗ BEST PRACTICE NOT IMPLEMENTED: 63 | ✓ BEST PRACTICE IMPLEMENTED: 89 |
| On Time Delivery | |
| ✗ BEST PRACTICE NOT IMPLEMENTED: 83 | ✓ BEST PRACTICE IMPLEMENTED: 94 |
| Incident Rate | |
| ✗ BEST PRACTICE NOT IMPLEMENTED: 2.0 | ✓ BEST PRACTICE IMPLEMENTED: 1.5 |





SECTION 6

Recommendations

Recommendations

Environment, health and safety management isn't just good business; it's good for the business because of the value it adds for Operational Excellence and in turn business and financial results. While safety, EHS and automation leaders have long understood the benefits of enterprise-wide EHS management and cultivating a culture around it, they have also struggled to articulate the strategic value it offers. Today's Digital Transformation initiatives – both within companies and throughout the industrial sector – highlight how safety investments can add value to the business. As EHS leaders [consider their plans and start developing a business case](#), they should keep in mind the correlation between best practices adoption and operational benefits.

Specifically, they should:

- 1. Strengthen cross-functional collaboration.** Often EHS, safety and operations teams aren't effectively collaborating on a holistic approach to safety improvement. Yet such [collaboration is associated with lower incident rates and improved operational performance](#). There is much upside potential for these groups to work closely together to achieve shared safety and productivity goals.
- 2. Show executive management how to walk the safety talk.** There's often a gap between stated organizational commitment to safety as a core value and allocation of resources to realize it. Provide the senior leadership team with evidence about the potential value of investing in safety improvements to help them sponsor initiatives that strengthen both safety and operational performance.
- 3. Approach the business case as a journey, not an event.** Approval and funding of a safety improvement initiative requires sound business justification. Each organization should assess its current safety and risk management maturity across people,

process and technology practices to determine an appropriate focus and scope of improvement. After showing initial success, the company can undertake additional projects delivering more value, eventually leading to a master business case for executive sponsorship.

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APPENDIX



Performance Metrics Definitions

On Time Delivery (OTD)

Percentage of products delivered on time and complete with no errors, re-promise dates or expedited shipments.

Overall Equipment Effectiveness (OEE)

Percentage of planned production time that is productive, considering availability, performance and quality.

New Product Introduction(s) (NPI)

Percentage of new products hitting time, volume and quality targets.

Incident Rate (IR)

Number of OSHA recordable injuries/illness per 200,000 hours worked, or equivalent incident rate outside the U.S. (Total Recordable Incident Rate).