

White Paper

Beyond Detection: Rethinking AI's Role in Workplace Safety



The workplace safety industry is in the midst of a technological revolution. AI-powered computer vision, predictive analytics, and real-time monitoring systems are no longer futuristic concepts.

▶ Beyond Detection: Rethinking AI's Role in Workplace Safety

The workplace safety industry is in the midst of a technological revolution. AI-powered computer vision, predictive analytics, and real-time monitoring systems are no longer futuristic concepts. —they're accessible, deployable, and increasingly common. The global AI in computer vision market is projected to grow from \$23.42 billion in 2025 to \$63.48 billion by 2030, much of that growth occurring in workplace safety applications (MarketsandMarkets, 2024).

Organizations are making substantial investments in these technologies, and the value proposition is compelling: better visibility into workplace hazards, faster response times, and data-driven insights that were previously impossible to obtain.

But as we work with organizations deploying these systems, we keep coming back to a fundamental question: What kind of safety are we actually building?

Detection: Where the Technology Stops

AI detection—no matter how sophisticated or fast—identifies hazards after unsafe behaviors or

conditions have already begun. The system sees the worker in the hazardous position, notices the missing PPE, catches the bypassed guard, and then responds.

This is valuable. Research shows that AI-driven predictive analytics are transforming EHS management from reactive to preventive approaches, with companies achieving significant reductions in workplace hazards. The visibility these systems provide is genuinely unprecedented.

But let's be precise about what's happening: We're getting better at reaction, not prevention.

By the time the AI detects something, the unsafe choice has already been made. The worker is already in motion. The hazardous condition already exists. We can intervene faster than we could with traditional methods, absolutely. **But the situation we're concerned about—it's already unfolding.**

This isn't a flaw in the technology—it's just the reality of what detection systems do. They excel at identification and rapid response. What they can't do is address why the unsafe behavior seemed necessary or acceptable in the first place.

Understanding: What Detection Can't Tell You

Let's walk through a scenario that could happen in any industry: A worker climbs onto an elevated storage rack to retrieve materials without fall protection. The AI system detects this. An alert goes out. A supervisor responds quickly. The immediate situation gets addressed—the worker comes down safely, there's a conversation about fall protection requirements, perhaps some corrective action follows.

Now ask: Why did this happen?

Was fall protection equipment unavailable or inconvenient to access? Was the worker under time pressure to meet a deadline? Is retrieving materials from that location a common enough task that proper fall protection systems should have been installed? Did the worker understand the severity of fall risk? Is there a culture where "quick tasks" don't warrant full protection? Were there competing demands that made shortcuts seem reasonable?

The AI told you what happened. But it can't tell you why it happened, and the "why" is where prevention actually lives.

This is the pattern we see repeatedly: organizations invest in powerful detection capabilities but don't have the systems in place to transform those detections into organizational learning. The technology does its job beautifully, but then the insights go into a dashboard, generate a corrective action for one individual, or become another data point in a sea of metrics. The detection happened. The learning didn't.

Surveillance: What Research Shows About Surveillance and Motivation

There's another consideration that doesn't get discussed enough: what constant monitoring does to the people being monitored and to the culture being built.

The American Psychological Association found that 56% of monitored employees report increased stress and tension at work (APA, 2022). Research on electronic monitoring demonstrates that surveillance via technology actually undermines employees' learning and voice behavior, the exact behaviors organizations need for safety improvement (Kensbock & Stöckmann, 2021). A comprehensive meta-analysis published in *Computers in Human Behavior Reports* found that electronic monitoring negatively impacts employee job satisfaction, increases stress, and can lead to counterproductive work behaviors (Siegel et al., 2022). When people feel constantly watched, they become less likely to speak up about problems, less engaged in creative problem-solving, and less likely to suggest the very improvements that could eliminate hazards at their source.

This matters because of what research shows about human motivation. People with higher levels of intrinsic motivation, those who engage in safety because it aligns with personal values, perform better and sustain those behaviors more effectively over time (Singh et al., 2024). When safety becomes psychologically meaningful

and workers invest in self-protection because they genuinely care, you get lasting cultural change.

But surveillance-based approaches create extrinsic control: people work safely because they're being watched, not because they're internally committed. Research consistently shows this creates fragile safety performance that depends on the monitoring system remaining active and comprehensive. When coverage gaps appear, and they always do, the performance degrades.

We're not suggesting monitoring has no role. We're pointing out that monitoring alone, without building intrinsic motivation and genuine cultural commitment, has significant limitations that organizations need to understand.



Learning: Teaching AI What Actually Matters

Another thing worth discussing is the fact that AI systems only know to detect what we've trained them to detect.

While this seems obvious, the implications are significant. When you deploy a computer vision system, it comes with pre-trained models for common hazards, such as missing PPE, unsafe positions, procedural violations, etc. But every organization has context-specific risks, unique operational challenges, and particular hazard patterns that matter in their environment.

If your AI system isn't continuously learning from your organization's experience, from your tailgates, incident investigations, near-miss patterns, worker input about emerging risks, it remains static. It keeps looking for the same things while your actual risk landscape evolves.

This is where organizational learning becomes bidirectional: AI provides insights > Organization investigates and learns > Organization feeds that learning back to refine what AI monitors > Better, more contextual insights emerge.

Without this continuous learning loop, you're limited to detecting generic hazards while potentially missing the specific patterns and precursors that matter most in your unique operational context. The technology can be sophisticated, but without organizational intelligence guiding what it should pay attention to, it can't adapt to what you're learning about your specific risks.

Prevention: What Changes Conditions Before They Become Hazards

When we talk about prevention, we're talking about creating organizational conditions where hazardous situations are less likely to develop in the first place.

This means asking different questions: Not "How quickly can we catch hazardous situations?" but "What conditions are creating these situations, and how can we change them?" Not "How many hazards can we detect?" but "What do these patterns tell us about our systems, and what needs redesigning?" Not "How do we improve compliance?" but "How do we build an environment where working safely is the natural, obvious choice?"

Prevention emerges when leadership creates conditions where safety is genuinely resourced and prioritized, when work systems are designed so the safe approach is actually the practical approach, when culture develops where people feel psychologically safe raising concerns about systemic issues, and when human factors like time pressure and competing demands are understood and actively managed.

This is organizational transformation work, and it's where technology alone isn't sufficient. AI can illuminate patterns and provide data, but humans must interpret meaning, redesign systems, and build the cultural conditions that make safety sustainable.





Integration: Where AI Actually Adds Value

AI becomes most valuable when it's integrated into a broader organizational learning system. Here's what that looks like in practice:

Signals meet context.

Detection systems identify where hazards cluster and when they occur. But organizations provide the context, investigating why those patterns exist, what operational pressures contribute, what systemic issues are creating conditions for those hazards. AI-powered systems analyzing multiple inputs together (sensor data, environmental factors, historical patterns) can identify risky patterns and inform preventive measures. This integration enables questions that no single data source can answer.

Multiple sources create intelligence.

AI detection combined with worker input about obstacles, operational data showing production pressures, cultural assessments revealing psychological safety, and historical incident patterns creates comprehensive understanding. Organizations with strong safety cultures use this integrated intelligence to investigate patterns, involve workers in problem-solving, and redesign systems based on what they learn collectively.

Continuous learning cycles.

The organization teaches AI what matters in their specific context, AI reveals patterns the organization couldn't see alone, the organization investigates and learns from those patterns, and that learning feeds back to refine what AI should monitor. This creates evolving intelligence rather than static detection.

Assessment: Three Questions Before You Invest

Based on our work with 150+ organizations implementing serious injury and fatality prevention programs, we'd suggest considering three questions before investing heavily in detection technology:

1 What will we do with what we discover?

If the AI reveals 100 new hazard patterns, do you have the resources to investigate root causes, the authority to make system changes, the cultural foundation for open dialogue about obstacles, and the governance to ensure insights drive meaningful action?



2 Are we building detection capability or prevention capability?

Catching hazardous situations faster versus understanding patterns to eliminate their sources are different strategies requiring different organizational approaches. Both have value, but clarity about which you're building toward matters significantly.

3 How will learning flow in both directions?

Can your organization not only receive insights from AI but also feed learning back to refine what the system monitors? Without this bidirectional learning, AI remains generic while your specific risks go unaddressed.

Transformation: The Distinction That Matters

Sustainable safety improvement requires organizational transformation, not just technological enhancement. AI can be powerful within a comprehensive safety strategy. It provides visibility, identifies patterns, enables faster response, and supports data-driven decision making when integrated thoughtfully with organizational learning systems.

But detection is most effective when it's part of a broader approach that includes leadership accountability for creating conditions that support safe work, cultural

development that builds intrinsic commitment, system redesign based on pattern learning, and understanding of human factors that influence decisions under real-world pressures.

We're not skeptical of AI. We're skeptical of any single-point solution to complex organizational challenges. Safety transformation isn't primarily a technology challenge. It's a leadership, culture, systems, and human factors challenge. Technology can illuminate and support progress, but cannot substitute for the organizational work that creates environments where people are set up to succeed in working safely.

- ▶ *Detection tells you what's happening.*
- ▶ *Prevention addresses why it's happening and changes the conditions that allow hazards to develop in the first place.*

Both matter. Both have important roles in modern safety management. But they're different capabilities requiring different organizational approaches, and conflating them creates false confidence. Organizations that achieve truly sustainable safety performance are those that leverage technology's strengths while doing the deeper work of building cultures and systems where people want to work safely and have the conditions to do so successfully.

Resilience: The Kind of Safety That Lasts

As AI capabilities advance and detection becomes even more sophisticated, the fundamental question remains: what are we building toward?

If we're building safety systems that depend primarily on technological monitoring, we create fragility. When technology fails, when coverage gaps exist, when people work outside monitored areas, performance degrades because the system depends on external control rather than internal commitment.

But if we're building safety cultures where people genuinely care about their own wellbeing and that of their colleagues, where safety reflects personal values and organizational commitment to worker wellbeing, we create resilience. That kind of safety persists across varying conditions. It adapts to new hazards. It improves continuously through engaged people who speak up, suggest improvements, and look out for each other because they're intrinsically motivated to do so.

AI can help build toward this vision, but only if we're clear-eyed about what it can and cannot do. It can detect patterns. It can provide data. It can enable faster response. It can learn what we teach it to look for. What it cannot do is replace the leadership commitment, cultural development, and organizational transformation that create prevention rather than sophisticated reaction.

The organizations that will lead in safety are those that understand this distinction, that deploy AI with clear purpose as part of integrated learning systems while maintaining focus on the cultural and systemic work that addresses why hazards emerge in the first place.

That's the kind of prevention that lasts, not because people are being watched, but because they work in environments designed for their success and safety, supported by cultures where they genuinely want to protect themselves and each other.

Connect with Us

Learn more:

Email us at
osr.info.us@dekra.com

Call us: +1-805-646-0166 or visit
DEKRA.us/consulting

References

American Psychological Association. (2022). Employee electronic monitoring and surveillance.

<https://www.apa.org/topics/healthy-workplaces/employee-electronic-monitoring>

Kensbock, J.M., & Stöckmann, C. (2021). "Big brother is watching you": Surveillance via technology undermines employees' learning and voice behavior during digital transformation. *Journal of Business Economics*, 91, 565–594.

<https://doi.org/10.1007/s11573-020-01012-x>

MarketsandMarkets. (2024). AI in computer vision market size, share, & trends.

<https://www.marketsandmarkets.com/Market-Reports/ai-in-computer-vision-market-141658064.html>

Morris, L.S., Grehl, M.M., Rutter, S.B., Mehta, M., & Westwater, M.L. (2022). On what motivates us: A detailed review of intrinsic v. extrinsic motivation. *Psychological Medicine*, 52(10), 1801–1816.

<https://doi.org/10.1017/S0033291722001611>

Siegel, R., König, C. J., & Lazar, V. (2022). The impact of electronic monitoring on employees' job satisfaction, stress, performance, and counterproductive work behavior: A meta-analysis. *Computers in Human Behavior Reports*, 8, 100227. <https://doi.org/10.1016/j.chbr.2022.100227>