



## **TREND 9**

# On the road to zero harm

## **CREATING THE NEXT GENERATION OF INTEGRATED PREDICTIVE SAFETY SYSTEMS**

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COVID-19 HAS PUT safety in the spotlight for everyone, driving heightened awareness of our actions and movements as we go about our daily lives. While the focus on safety is obviously not new for the mining industry, conditions are now in place to move the dial toward a goal of zero harm through the use of predictive analytics and wearables. In doing so, however, companies will likely need to integrate different data pools and systems, while more proactively driving industry collaboration. If this does not happen, we may still be highlighting the potential for improvement a few years from now, without having seen much progress.

While safety has always been central to mining, COVID-19 has highlighted that it is essential to maintaining employee and community trust. As a result, companies are now going beyond putting robust internal controls in place and are investing in intensive training. Many are also taking steps to move workers out of harm's way through the accelerated rollout of automation and robotics solutions.

To move the dial on safety outcomes, however, the industry should embrace a new generation of integrated and predictive systems. The spread of COVID-19 may have smoothed the way for wearables by making people more comfortable with tracking and tracing mechanisms. However, wearables are likely just a first step.

To take this to the next level, mining companies would need to create programs designed to prevent safety incidents before they occur. The ability to pool data to drive increasingly complex analytics now makes it possible to move from historical

safety analysis to predictive solutions. The key is to leverage this confluence of issues to usher in a new wave of safety systems that put companies on the path to zero harm. This means harnessing the power of safety analytics in a more integrated way than in the past.

## An integrated approach to safety analytics

There is little question that the next generation of advanced analytics and artificial intelligence (AI) has the potential to move significantly toward zero harm. With the right data, analytics can help companies go beyond a simple analysis of past events to identify potential future scenarios that create a higher risk of an incident occurring. These predictive models can help prevent safety incidents before they occur.

One of the sticking points for advanced analytics, however, involves aggregating the right data. Many companies have learned the hard way that simply collecting massive amounts of safety data is insufficient. Most mining companies have in-depth reports tracking the number of worker injuries sustained, the frequency rate of safety incidents, and many other metrics. But this data is all collected after the fact. Companies serious about monitoring conditions to proactively prevent incidents need greater insight into the circumstances and drivers of those incidents.

While this begins with the ability to recognize early warning signs, it does not stop there. "There are numerous stories of companies around the world

that were forewarned of a potential safety hazard but that failed to take appropriate action to prevent it,” say Karla Velasquez, Mining & Metals partner, Deloitte Peru. “This underscores the very real need for some companies to improve their internal controls.”

To reach zero harm, most companies must consequently go far beyond their current practices. What additional tools and training are needed? Do certain working conditions enhance safety outcomes? Are there particular behaviors

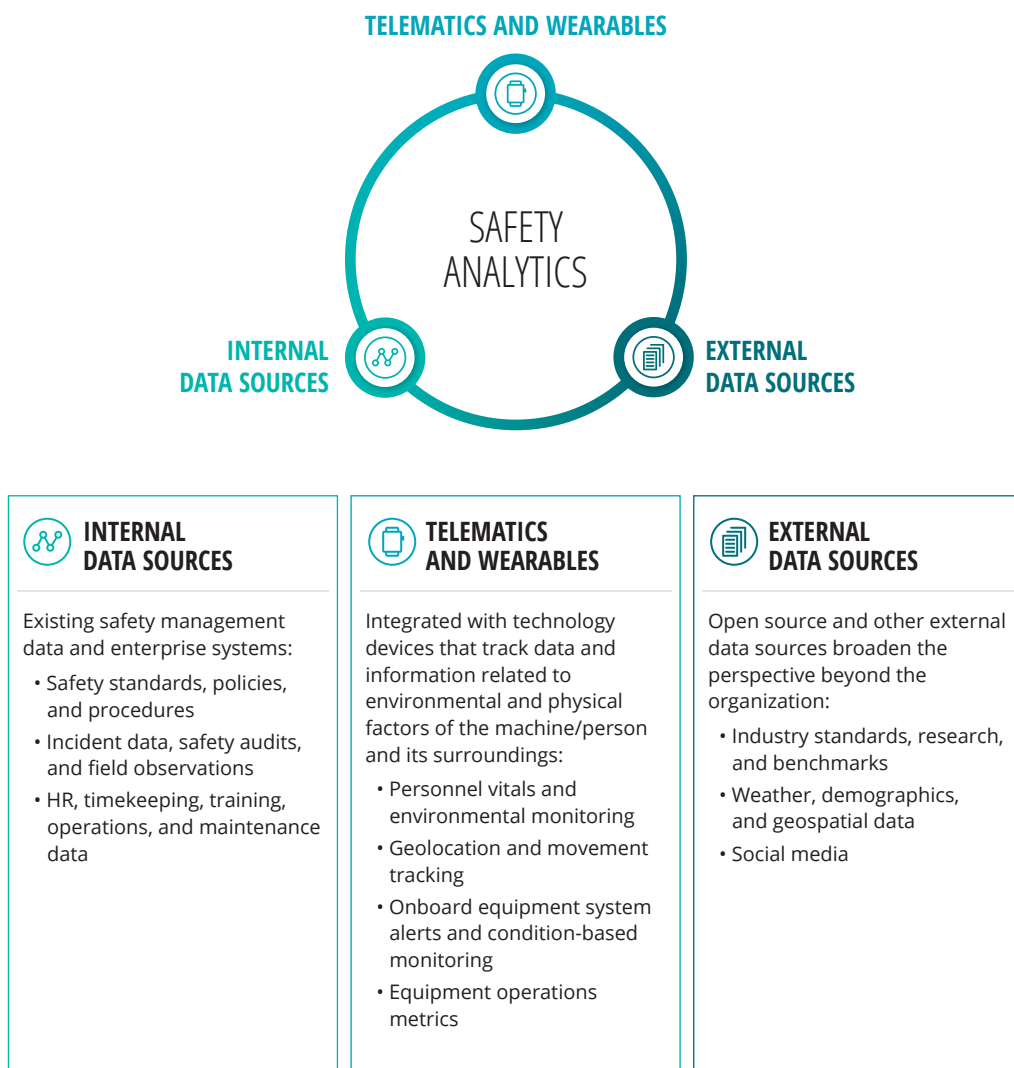
companies should encourage or avoid? Insights to consider related to these questions and more can be found in data that already exists (figure 1).

However, many companies struggle to access this level of data. That’s partly because it often resides in disconnected systems. “As mining companies move toward integrated nerve centers and begin to build enterprisewide data lakes, they’ll be able to harness the data necessary to run advanced predictive models,” explains Shak Parran, partner, Consulting, Deloitte Canada.

FIGURE 1

### Safety analytics: Data sourcing

Building on the core data contained by health and safety systems, policies, and procedures, safety analytics relies on the integration of disparate data sets to deliver deeper insights.



Source: Deloitte analysis.

By allowing companies to combine vast amounts of data, rather than viewing each in isolation, an integrated approach can help them uncover hidden patterns of behavior or conditions that contribute to incidents. At the same time, predictive models can position them to target high-risk operational scenarios and employee groups in order to intervene before these incidents occur.

A key here will be for miners to unify their disparate data sources to provide everyone across the organization with access to consistent, reliable, and always available data. If data ownership remains informal, with undefined accountability and inconsistent data standards, safety analytics simply

can't yield the benefits it promises. Real insight hinges on mature data governance, which may see mining companies appointing chief data officers or other executives responsible for establishing data standards across the organization. Turning the potential for a zero-harm future into reality may also require mining companies to look beyond their own internal data sources.

“To successfully predict the risk level of activities, many disparate data sources are required—sometimes even from several companies,” Shak Parran adds. “This underscores the need for greater cross-industry collaboration.”

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## CASE STUDY

### Uncovering safety insights

A mining company was looking to improve its already strong safety record through the use of data and analytics. To help it prepare for its safety analytics journey, we:

- Assisted with the aggregation of more than 5,000 safety incident reports and all historical human resource (HR), payroll, timekeeping, equipment and maintenance, production, census, geospatial, and climate-related data for a period of five years
- Provided safety insights based on patterns of behavior and trends, as well as insights relating to key safety management questions identified by the company
- Created an interactive dashboard providing the ability to deep dive into the company's safety management and other data
- Uncovered hidden relationships between the company's individual performance incentive program and incident likelihood; the effects of changing production levels; and the impact of age, tenure, and other socio-demographic characteristics of its employee base
- Identified opportunities to improve data quality and enhance the collection and management of safety data

As a result of this engagement, the company was able to execute diagnostics at several of its mine sites and design interventions to facilitate both short-term safety gains and long-term strategic changes. With improved data quality, the company now also generates more accurate insights and has been able to centralize a vast amount of distinct data sources into one common source of truth—positioning it to clearly identify instances where safety initiatives may need to be improved, dynamically select and predict the impact of factors on incident occurrence, and recognize high-risk activities in advance.

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## The world of wearables

One way in which companies have been looking to collect safety data is through wearable technologies. As the march of technological innovation continues apace, countless wearable devices have been developed to help improve health and safety outcomes. These span a wide range, with an array of hard hats, watches, clothing, eyeglasses, and more, designed to deliver various benefits—from collision avoidance and environmental monitoring to fatigue management and personal injury reduction.

While a strong business case exists for many of these devices, mining companies looking to boost their safety performance frequently run into challenges as they begin to use this technology. The primary issue is again a lack of integration. Rather than providing a view of safety performance in alignment with the shift toward integrated operations throughout the enterprise, these solutions remain disconnected and siloed.

“The main reason these technologies are likely struggling to gain traction is because they each operate as stand-alone solutions,” says Gerhard Prinsloo, partner, Consulting, Deloitte Canada. “In some cases, they even compete with one another.”

*One way in which companies have been looking to collect safety data is through wearable technologies.*

The inability to link disparate safety systems together can limit the utility of each individual device and result in cost escalation as new wearables are added to the mix. Additionally, without one integrated solution, workers might end up outfitted in a number of stand-alone devices.

Most critically, however, a lack of integration can prevent companies from using these devices to achieve their strategic health and safety objectives. It’s one thing to use a point solution for a narrow application, such as radio frequency identification (RFID) tags to track people’s movement through the site to optimize workforce mobilization. It’s another thing entirely to extend that solution into an operating environment. That’s especially true when not all technologies can be used in high-risk zones and where there is no open platform that enables enterprisewide analytics.

Lack of interoperability is only one of the issues companies face as they look at implementing wearable solutions. Other concerns involve:

- Donning gear—Basic personal protective equipment (PPE) is routine for most, but additional devices can be unintentionally (or intentionally) omitted or delay workers readying for their shift.
- Catch hazards—Intrusive or bulky devices can hinder work functions, causing frustration or even injuries.
- Harsh working environments—Devices that lack the ruggedness to endure the work environment can become ineffective.
- Connectivity—Unless the device uses lower frequencies, such as those used for site radio systems, real-time feedback and communication is limited, resulting in information lags.
- Infrastructure—Many devices, such as location services, require the underground mine to be equipped with costly infrastructure that can be difficult to install.
- Data collection and storage—In the absence of integration with management systems, the data

collected from devices often requires manual input before it can be analyzed. At the same time, devices recording data need adequate storage capability.

- Privacy—To protect worker privacy and gain buy-in, companies need to consider how to manage personal data collected from devices.

“To break this deadlock, it’s important to bring technology developers together in an experimental culture to encourage the sharing of intellectual property,” says Rakesh Surana, Mining & Metals leader, Deloitte India. “The ultimate aim should be the development of an integrated solution that can aggregate safety data collected from wearables into a single dashboard with the ability to drill down to a single individual.”

There is also a role for the wider industry to play by coming together and driving collaboration in some key areas. For example, industry associations continue to work on defining common standards of interoperability for these wearable devices. Furthermore, there may be an opportunity for the industry to more systematically pool safety and related data to understand trends and aid the development of more systematic and predictive insights.

The solution may be closer than we think. In many ways, COVID-19 has made data sharing more feasible. If mining companies can now work together to share data, we could be on the verge of building truly predictive safety models, designing a fully integrated wearable solution, and laying the foundation for the next generation of predictive safety systems.

## Improving safety outcomes

- **Expand your horizons.** To stay informed about the safety practices in your work environment, consider implementing a camera-based solution that leverages AI on the edge of your network to anonymously monitor compliance with safety protocols. With centralized data delivered through the cloud, you can strengthen safety compliance while respecting worker privacy.
- **Start with the right questions.** Organizations willing to embed data and analytics into safety decision-making should begin the journey with a hypothesis or a plan to answer specific questions (e.g., how do we uncover hidden correlations that may be resulting in safety incidents?). This is important to provide an initial foundation without constraining the analysis and filtering out potentially valuable insights.
- **Think broadly about big data.** Use incident-specific sources of data that aren't related to safety—including operational, financial, human resources, and training data—as well as open-source weather and demographic data to integrate into a safety analytics data set. An enriched data set reveals deeper insights and connections that could not be detected otherwise, thereby exposing hidden risks that can be managed proactively.
- **Revisit your control environment.** While recognizing early warning signs can be critical to the avoidance of safety incidents, it might be insufficient if you lack the capacity to proactively respond. Companies that continue to rely on paper-based safety protocols and verbal reports can limit their ability to devise actions and interventions to prevent future risk scenarios. To gain a comprehensive and objective view of your current-state safety performance, it's important to put actionable practices and policies into place to enhance the overall safety culture and drive safe behaviors.

# Tracking the trends 2021

Closing the trust deficit

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From strategy to execution

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**TREND 10**  
**Meeting demand for green and critical minerals**  
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