Miners must act fast to mitigate data-related health and safety risks

The physical safety threats posed by outdated data handling practices in functions like mine planning are mounting. Deswik's Jay Gillon makes a case for the swift adoption of modern data management systems.

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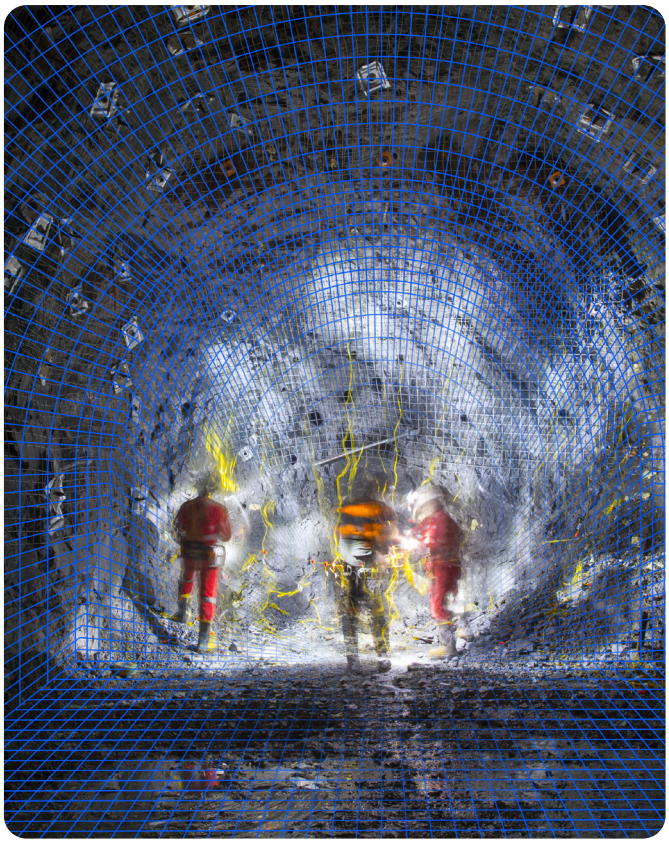


Data is one of the most valuable assets that mining companies have today. Yet for many, its management is a rapidly growing source of risk.

By 2025, Statista predicts that the total amount of data created, captured, copied, and consumed globally will exceed 181 zettabytes (a 33% increase from 120 zettabytes in 2023, and a 448% increase from 33 zettabytes in 2018).

Instrumented, smart mining operations generate colossal amounts of data. For example, in 2018, Rio Tinto's Pilbara operations, which include 16 mines, 1,500km of rail, three ports and more, were reported to create 2.4 terabytes of data every minute – a number which, considering the growth rates cited by Statista, will have increased exponentially in the ensuing years.

When supported by modern management systems and practices, more data can mean safer, more efficient and agile mines with more value-generation opportunities. Still, without them, it can also mean more risks.

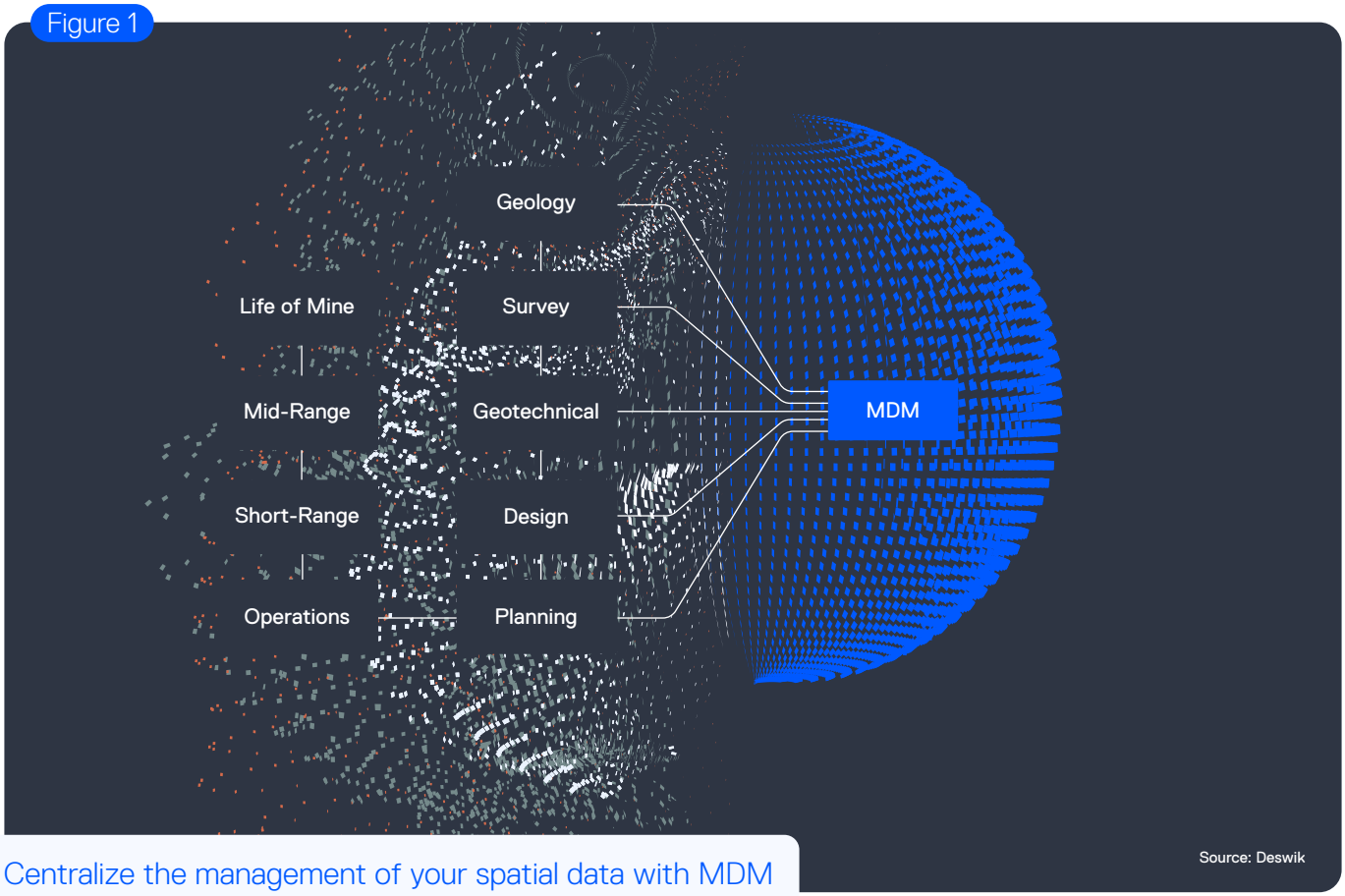
These are often perceived to be mainly corporate; for instance, errors created through manual data handling that are picked up during a standards audit and must be time-consumingly traced back to the source. But more worrying are the physical health and safety dangers that poor data management practices pose.

More data, more safety risks

One function where these impacts are becoming increasingly clear is mine planning. Historically, mine planning, like most tasks, was handled on paper. Later, engineers adopted programs like AutoCAD and Microsoft Excel, but the two weren't linked. The onus was on the engineers to transfer information between the two systems and keep the plan and spreadsheet up to date.

Today, we use 3D CAD models with attributed data, alongside a Gantt chart scheduler. The two programs are connected so that when a change is made in one it's reflected in the other. Whereas in the past it might have taken a month or more to create a life-of-mine (LOM) plan for a caving operation, now we can run dozens of scenarios to find the optimal design in just a few hours.

Figure 1



Centralize the management of your spatial data with MDM

Today, mine planning is informed by hundreds of data streams, from orebody knowledge which evolves with drilling and development of a deposit, to live production data from ore sorting and mineral processing; it's a function that's constantly moving in response to dynamic datasets.

In turn, each iteration of a plan generates its own data, and the level of detail increases as the time horizon narrows. For example, a long-range, LOM plan will include significantly less detail than a short-term plan which informs daily work (see Figure 1).

As we move across time horizons, each plan has more data associated with it. For execution, detailed designs are produced for every cut or blast round in different areas of the mine. These are often created in different programs and stored in something like a Windows-based, file-management system.

The result is lots of different file types residing in disparate systems, and users may require datasets from various locations to complete their tasks. Data validation is also time-consuming and relies on people for approvals.

While file-based data management systems have served a purpose, they have significant limitations; principally that they rely on humans to manage them. When multiple users have access to a system and there's little or no visibility of who's working on what, it can be very easy for an engineer to grab the wrong data and start work on a design. Under these circumstances, even the most experienced workers can make mistakes, and often these won't be noticed until execution.

The sum of all this is, at best, process inefficiencies where designs need to be revised on the fly and people and equipment are kept waiting. Or, at worst, a suboptimal design is executed which could, for example, see people working close to a live blast zone or drill into the water table and flood the mine.

Understanding the human impact

Going forward, these risks could be exacerbated by the global shortage of skilled mining talent. As veteran engineers retire and fewer graduates take their places, those who remain are taking on greater workloads and making decisions for which they might be underqualified or experienced. In the face of such pressures, it's incredibly easy to make errors.

The more we use technology to mine, the more data will be generated, and without modern, fit-for-purpose systems to handle that data, the more health and safety risks it will pose.

A simple mistake in mine planning because of poor data management could mean that a worker doesn't go home to their family that night or suffers life-changing injuries. We often talk about safety in terms of numbers, but it's important not to lose sight of the human impact.

Ahead of a presentation at a recent health and safety conference, I decided to survey a number of my industry peers to assess the pervasiveness of this issue. With over 200 mining engineers on staff globally, I was able to collect 19 responses in a single day.

The results were eye-opening. I asked whether they had, over the course of their careers in mining, seen or heard of an incident where poor data management had resulted in small or large business impacts, near misses, minor or lost-time injuries, or fatalities. Participants could check as many options as needed. Seventy per cent of participants reported near misses, 20% reported lost-time injuries and 20% of incidents involved fatalities.

Further to this, I asked for written accounts of specific incidents and was able to collect over 50 unique descriptions. While the survey was internal and the data unvalidated, the sheer volume of reports from experienced engineers in multiple jurisdictions was enough of an indicator that this may be a far-reaching problem.

Safety needs more than data management

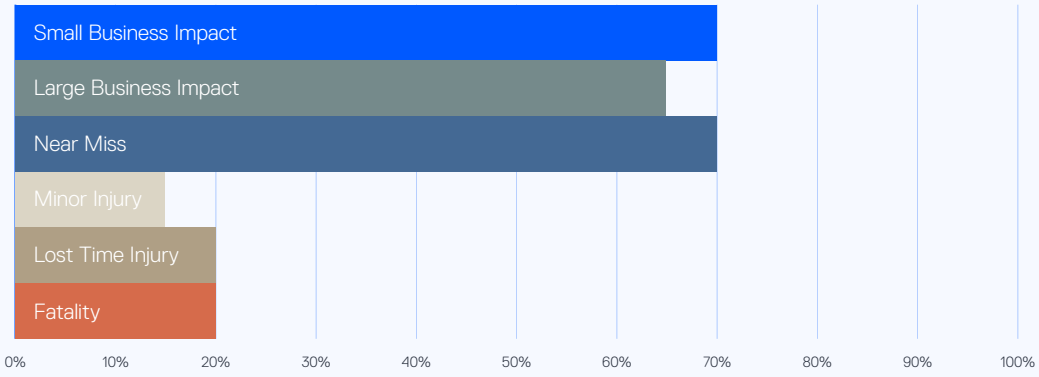
If safety truly is mining companies' highest priority, then protecting the workforce is reason enough for leaders to reconsider the robustness of their businesses' approach to data management. The knock-on financial, environmental and reputational impacts that safety incidents can entail support this, as do the commercial impacts of inefficiencies created by outdated data management practices.

That said, mine data management platforms are not a standalone solution to health and safety challenges. Instead, they are a high-level control that can be applied as part of a carefully designed hierarchy alongside, for instance, administrative controls, like personal protective equipment, training, policies and procedures, to effectively protect workers.

A dedicated data management platform can help mines to engineer inefficiencies and risks out of their processes. It provides them with greater control over how their data is handled, stored and applied in different roles and functions, including mine planning. For instance, by ensuring that engineers are always working with up-to-date data and that it has been validated, data management systems can help create the safest designs with the least amount of rework.

Through improved workflow and centralized management of spatial data, engineers can create good designs faster, because all the information they need is held in

Figure 2



Results from survey on data management and its impacts on operational health and safety.

Source: Deswik

one location. Automation of repeatable tasks frees up experienced engineers to handle more complex designs and problem-solving tasks, which provides greater job satisfaction and helps alleviate pressure from skills shortages.

Guided workflows can also eliminate the disparity between the level of experience that engineers have, elevating the overall quality of plans and designs that are produced. These capabilities are becoming ever more important as workforce turnover increases and fewer people are asked to do more.

Built-in process approvals mean that engineers no longer have to walk around the operation with a piece of paper to obtain signatures, and there's no risk of important paperwork getting lost. Auditability also means that it's easy if safety issues do occur, to understand why and take immediate steps to prevent them from happening again.

Building a business case

Implementing an effective data management solution requires more than just software. Organizational changes, including enhanced data security, new workflows and staff training must also be defined, and each of these will entail a cost.

However, forward-thinking mining companies are quickly realizing that the potential safety advantages, whether direct or indirect, far outweigh the necessary capital expenditure. For instance, Nevada Gold Mines is currently installing Deswik MDM (Mine Data Management) at 11 of their sites. Similarly, another tier one miner has also installed MDM on all of their underground operations.

The underground principal consulting engineer, explained:

"Matters related to health and safety played a big role in our decision to implement Deswik MDM. The system provides visibility to our operations and health and safety departments, allowing them to track things like open voids, refuge locations and other aspects critical to the safety of the underground workforce. It also allows automation of risk controls during the mine planning process." – Principal consulting engineer

Most importantly, act now

Workforce safety is mining companies' top priority, and as businesses grow and adopt new technologies and systems, so must their approach to data management. To mitigate health and safety risks posed by rapidly accumulating data in functions such as mine planning, the most important thing is that companies act fast to put appropriate measures in place.

The longer we wait, the harder this problem is going to be to solve because the amount of data that mines produce is only going to increase. Current methods of managing mining data are unsustainable, The faster we act to address these challenges, the less likely it is that data-related incidents could result in production disruptions, lost time injuries or in the most severe cases, even fatalities. ■

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