



White
Paper

DIGITISATION IN MINING

The digitally enabled, hyperconnected mine



Proudly EOH

Digitisation in mining

Technology is swiftly emerging as a key driver of competitive advantage. This is closely tied to the merging of the digital and physical realms, which is instrumental in advancing the digital transformation of the business and the economy.

The mining industry cannot afford to ignore this trend. Mining digitisation connects key assets in and across the mine and across the mining value chain, including people, technology and processes. This results in improved operational performance because it improves visibility across the mining value chain and enables real-time decisions based on current information. Mines can respond to changes in production, supply and customer conditions with greater speed and agility.

It is possible for mines to make the shift towards an operating environment where relevant data is collected and interpreted to reduce the complexity of the business and operations and optimise performance. Data is typically collected from processes and equipment. To ensure that solutions provide the necessary benefits and can be scaled, it is best to take a holistic approach that focuses on process, people and investments in technology.

Digitisation must drive enhanced performance and production across the mine value chain. During production, miners aim to extract ore at optimal cost while making the minimum impact on the environment. At the same time, mining and engineering assets must be optimally maintained to enhance operational throughput, performance and cost management.

Digitisation and process improvement are interconnected; one cannot be achieved without the other. Therefore, miners must focus on process and not just technology to ensure optimised and integrated processes across the mine value chain.

Digitisation must improve the visibility of operations and the business and provide insights into these areas. It must enable data-driven decision-making as information is transformed into an asset for the organisation. Enabling connectivity and integrating sensors and data are therefore crucial focal points when considering technology investments. These elements also lay the foundation for the wider digital transformation of an organisation.

Data that is collected during the production process needs to be employed as an input within a business process. It must enable a mine employee to make the modifications or raise the necessary notifications to improve performance, prevent a breakdown or expedite tasks more swiftly.

Currently mining companies are generating vast amounts of data across different processes and functions. But they often do not have the capability to contextualise the data and convert it into meaningful insights for intelligent decision-making.

The solutions to this challenge often cut across different processes and departments, and may include data analytics, artificial intelligence (AI), machine learning, predictive analytics and digital twin.

Digitisation will dramatically improve performance across all functions in the mine value chain by augmenting the ability to make the right decisions. It makes the biggest impact in areas where there is the potential to capture real-time information. The result will be a higher return on invested capital. What is needed is a technologically proficient organisation that understands the value of information and the power of informed decision-making.

Aspects of digitisation in mining

How digitisation optimises key processes and functions:



Mine value chain:

- It enables the visual representation of the entire mine value chain, from exploration, development, production planning, scheduling and real-time operational visibility, through to inventory, transport logistics and end consumption.
- Enables integration between geology and conveying systems, allowing the mine to increase production performance by developing insights into the discrepancies between operations and planning functions.
- Supports real-time decision-making and understanding the impact of decisions in one area of the business on the rest of the operations.
- Delivers seamless integration across suppliers and customers and reduces intermediaries through smart contracts and blockchain.





Production:

- Allows continuous, efficient production performance through real-time visibility of production data.
- Enables short interval control (SIC), resulting in decisions and actions taken during operational shifts that will have an immediate impact on production performance and yield.
- Turns data into insights, enabling the optimisation of the production process through downtime analysis, delay accounting and process optimisation.
- Optimises production through data analysis and production initiatives based on real-time information on constraints, including energy and financial inputs.



Assets:

- Makes it possible to predict equipment failure through continuous monitoring and predictive analytics. This is supported by root cause analysis to minimise the impact on production, reduce scheduled and unscheduled downtime events and identify underperforming equipment.
- Enables data collection, aggregation, and analysis, boosting asset efficiency and stabilising production.
- Optimises production throughput to cause less equipment wear.
- Permits analysis of production downtime to prioritise maintenance based on status of equipment and production conditions. Mines can also determine the impact of new equipment and new operating procedures.



Workforce:

- Empowers the existing workforce to actively participate in operations by enabling them to view data and KPIs on mobile devices or tablets for real-time decision-making.
- Utilises innovative augmented reality software on mobile devices and other devices to enhance physical equipment and process areas with real-time data and relevant information.
- Implement digitised operating procedures and workflows to enable data collection during safety, maintenance and environmental inspections.
- Access to critical documents, procedures etc.
- Real-time incident reporting
- Provides them with training tools



The Tools

Consistency, predictability, and standardisation are fundamental to improve productivity. Mine decisions are often still based on old, stale information or human observation instead of objective, real-time data.

Typical examples of digitisation initiatives and their benefits include:

Mobility:

Devices and wearables boost productivity and efficiency.

Mobile solutions enable access to real-time data, standards, procedures and alerts, enhancing virtual collaboration by leveraging the collective intelligence within and outside the organisation. Mobility improves safety and security conditions, lowering the risk employees are exposed to and helping to meet regulatory requirements.

Automation:

Autonomous and remote-controlled trucks, excavators and other vehicles can perform many tasks with a great degree of autonomy for extended periods and without human intervention.

Digital Twin:

A virtual representation of operations that enables simulation and decision-making for enhanced planning and production optimisation modelling.

Compute strategy:

Develops processes that are integrated and managed from a single source, enabling relevant employees to connect to the same integrated systems across the mine. Reports can be generated directly on online systems which make the details available to stakeholders when they need it.



Note: Storing operational data in the cloud must be investigated on a case-by-case basis.

Sensing IoT

Tracks assets, monitors environmental and health conditions, and detects proximity of both equipment and people.



Note: Not all sensors and applications are suitable for all types of equipment. Their suitability needs to be assessed on a case-by-case basis.

Data integration and analytic platforms:

Integrated platforms provide visibility and monitoring capabilities by linking operations, disparate devices, and technologies across the value chain. Data is used to improve production, planning, operations, and safety and to make maintenance predictions, reducing cost and minimising downtime. Relevant data must be made available across the value chain to optimise analytical capabilities. Too many vendors are offering point-based analytic capabilities. For digitisation to be effective, integration is paramount.

Security

Convergence between operational technology (OT) and IT Systems requires unique and integrated solutions on networks to ensure data security and eliminate vulnerabilities. This is crucial as mining companies deploy connected assets, infrastructure and sensors for intelligence gathering.

Infrastructure

On-site connectivity ensures access to data as needed, helping to determine site-specific requirements.

Digitisation analysis and implementation methodology

It is important to define the target architecture in terms of the collection, connection, digestion, and integration of data. The objective is to support and advance the digitisation strategy.

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- **Develop digital roadmap:** A digital roadmap for the short, medium, and long term must be developed based on the mine's digital vision. The vision must be in line with the mine's growth aspirations. The design of the digital roadmap must be based on an integrated architecture framework and design principles.
 - **Evaluate technology options:** Evaluate the different technology options available based on business and operational priorities.
 - **Develop business case:** Develop a business case for each solution based on practical application and assumptions to determine the potential return on investment (ROI) of each project.
 - **Architect solution:** Select and architect the appropriate solution in the context of the overall architecture design framework, highlighting the associated risks and dependencies. **Implement solution:** Oversee implementation of the solutions by the vendor or system integrator based on the supplied specifications. Evaluate success based on user acceptance, usability of the solution and value added to operations. Finally, incorporate lessons learnt into the overall digital programme governance.

These steps must be underpinned by clear target values for the digitisation agenda and strategy. It is advisable to set up an entity responsible for monitoring progress and relevant course-correcting throughout the programme. The entity should also focus on entrenching the new way of working, facilitating cross-functional engagement and the development of the skills and capabilities required to support the mine digitisation initiative.

Mining companies around the world are building a culture where workers and advanced systems interact seamlessly, collaborating to achieve optimum value. The success of digital initiatives relies on a clear vision and objective, efficient allocation and utilisation of resources and the support of foundational technologies. This approach will unlock the full value of digital investments and achieve better outcomes today and in the future. A clearly defined set of digitisation requirements, coupled with the implementation of relevant integrated technologies will deliver tangible benefits for mining organisations.





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