



ioco

Whitepaper

Digital Trends in Mining

Introduction

The mining industry is accustomed to operating in an unstable environment: constantly battling a volatile global economy, fluctuations in demand, availability of resources, a shortage of skilled labour, government regulations and social responsibility requirements, all while experiencing cost pressures and profitability demands from shareholders.

Challenges, however, lead to innovation; there are currently more opportunities than risks for Mining companies willing to make changes that will drive long term value. Companies are futureproofing their operations and reducing costs by becoming hyper-connected and digitally enabled, creating truly modern, safe and productive mines in the process.

Mining companies are fundamentally changing how they operate and how mining processes and data relate to one another. In addition to the technology involved, this will require a change in infrastructure, management practices, and governance and security systems. Accomplishing this successfully requires a coordinated, organisation-wide response that must be integrated and comprehensive across the mining value chain and from the ground to the boardroom.

Everyone is talking about Digital Mining... but the impact of this on each operation must be determined.

No two mining operations are the same; there is no one-size-fits-all solution. Each mine will have to investigate their own reality and determine how best to overcome their current operating challenges as well as the challenges that the potential implementation and utilisation of technology will have in their business. iOCO has identified seven distinct trends that have a direct influence on the ability of mining operations to overcome current operating challenges.



Target Operating Model

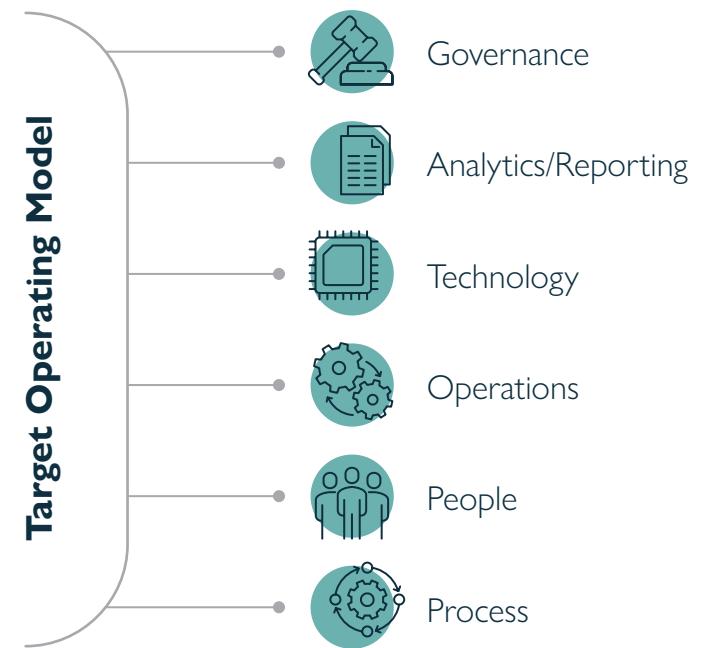
Mine managers, senior executives and board members must understand the changing business and operating environment. It is imperative that they challenge the assumptions under which the operating teams are functioning, and force them to innovate relentlessly and continuously.

“ A well-defined operating model ensures the organisational construct is linked appropriately to execution in order to deliver sustainable value and a new way of work. ”

It is necessary to develop a business architecture that provides a holistic and integrated view of all mining operations linked to the business and mining strategy, the organisational structure, as well as the information and technology strategy of the mine by aligning strategic objectives and tactical demands

The whole organisation needs to be changed, not just the IT/OT Function. IT/OT Projects are often not regarded as projects that effect business transformation. Technology alone will never be enough to unlock all the potential value. Mines need to be strategic in their approach to developing operating models or architecture; these must be clear, concise, and practical in order to transform the business.

The model must drive innovation, generate value and enable employees to make faster and smarter business decisions to enable agile, resilient operations that are able to respond to change at speed. IT/OT Convergence. It is imperative that organisations have a clear and documented operating model that is updated and adapted to changes in the operating environment (reactively) and strategy (proactively).



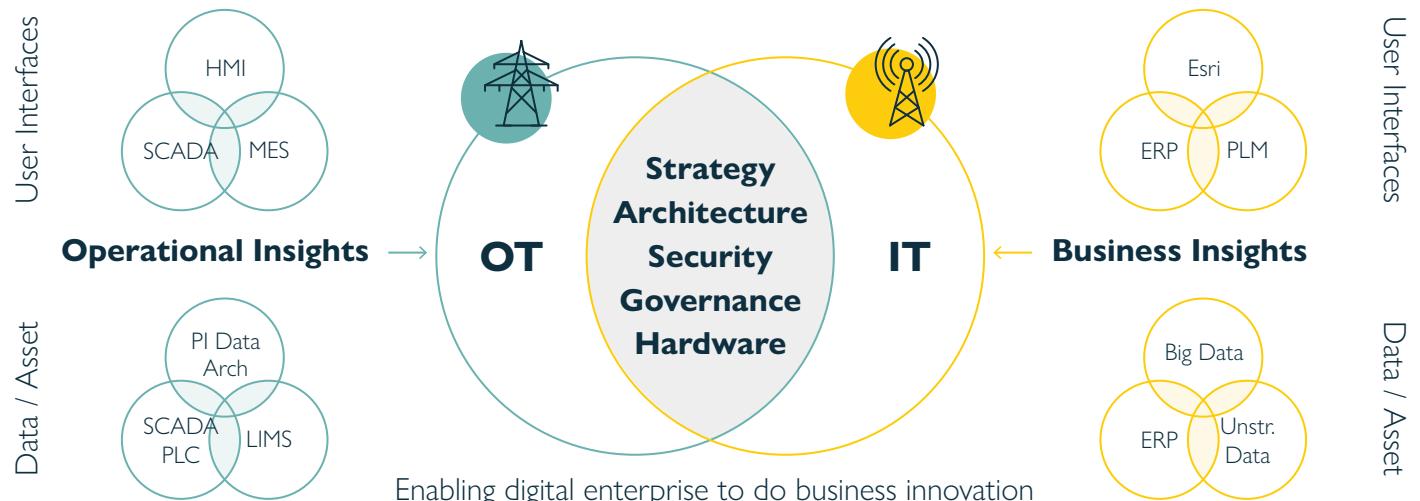
IT/OT Convergence

The internet of things (IoT), paired with edge computing, has given rise to the convergence between information technology (IT) and operational technology (OT) systems. The two systems no longer operate in silos but are integrated with one another to enable optimised operations. Bringing systems together enables an organisation to streamline its processes as defined in the target operating model.

“ Modern technology is impacting the ability of miners to use data in an integrated and holistic manner to unlock potential value across the mining value chain. ”

IOT and OT is bringing together the digital and physical world and this will have wide ranging implication with regards to process improvement as well as the management of physical assets. The benefits of the convergence of IT and OT systems relate to cost, performance, productivity, and agility. One of the biggest trends into 2022 underlying digital transformation and the creation of standardised production environments is the use of IoT and OT in production. The biggest benefits will stem from Production Optimisation, Condition Based Monitoring, Energy Management, Autonomous Vehicles and Environmental Management, once an organisation gains greater control of costs and begins looking at KPIs in real time, it becomes empowered with the ability to react with agility and flexibility to real-life problems and opportunities, with resultant performance and productivity benefits. The operating model of your IT/IM/OT organisation must clearly reflect these changes and your operating priorities and realities.

The Convergence of Information and Operational Technology



Cloud Strategy

Worldwide end-user spending on public cloud services is continuing to grow and the impact of this development on Mining Organisations should not be underestimated. While transitioning to the functional and organisational constructs developed as part of the target operating model can be difficult, standardising and moving to the cloud can be just as challenging.

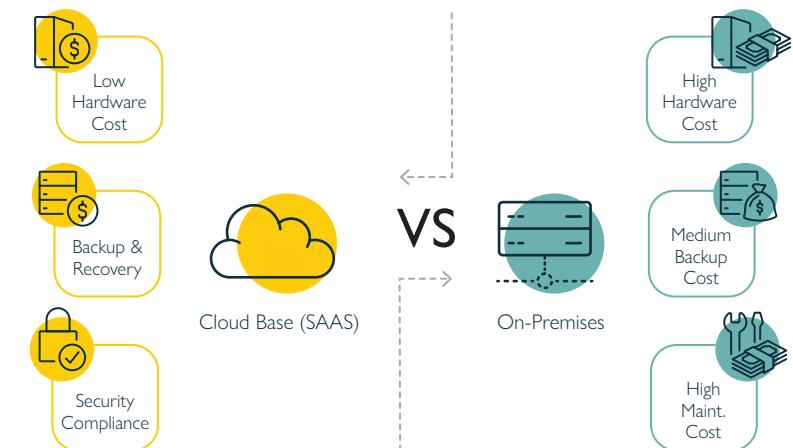
“ It has been said that the world’s most valuable resource is no longer oil, it’s data. ”

The way in which a mining company acquires, stores, analyses and reports data can be a competitive advantage – if it is balanced with the associated risks and potential unforeseen events that can threaten the safety and integrity of that data. Cloud solutions provide mining organisations with freedom from hardware constraints, whilst enabling agility and always-on access to current functionality. On the other hand, there are cost implications regarding software, hardware, licencing, operations and support.

Mining companies have historically been comfortable with running software locally. It is considered a less risky option, as the mine can always guarantee access to business and operational information.

Cloud services assist in containing software operating costs and preventing data loss and can provide mines with the ability to affordably store large amounts of relevant operational and business data securely. This is coupled with a variety of software-as-a-service solutions for core business systems, as well as operations and engineering tools that can be effectively deployed in relevant areas based on a detailed analysis of the business and operational constraints.

Before a mine can make the decision to adopt either an on-premise or cloud solution, a physical constraint analysis; a detailed risk assessment and cost/benefit analysis; and a process, reporting and analytical requirement analysis are required.



IT Security

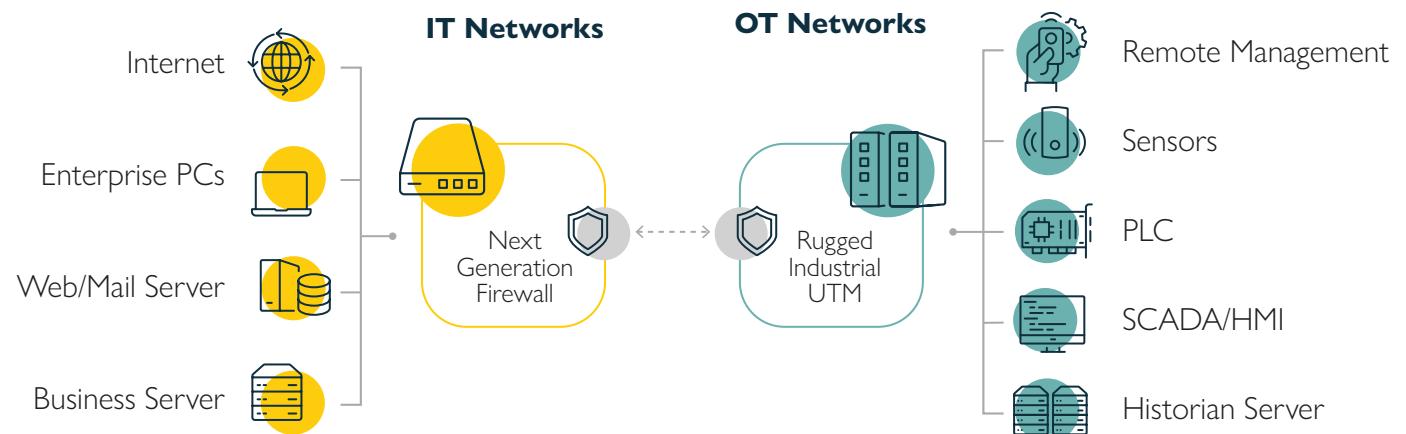
As IT and OT systems merge, and some business and organisational systems move into the cloud, organisations are experiencing situations where systems and data are not secure, opening the organisation up to cyber-attacks and fraud. Up until recently cyber-attacks remained almost solely within the IT environment.

Traditionally, OT was an “air-gapped” environment, meaning that it was not connected to external networks. With more organisations starting to merge their IT and OT environments and interconnecting networks as they increase their investment in automation, smart devices and other technologies, a fundamental change is required in the traditional role of security in OT and IT systems.

“ A fundamental change is required in the traditional role of security in OT and IT Systems. ”

IT security is crucial in every organisation to keep its data secure and under control. IT also has touchpoints with the internet, which exposes it to a higher security risk. In OT there are fewer touchpoints, but the safety and availability of equipment and processes are of primary concern – losing control of this area can lead to both financial and production losses, and even direct physical harm.

Mines need to heed Gartner’s advice and align their standards, policies, tools, processes, and staff between the IT and the business to the changing OT systems, while developing a comprehensive cybersecurity strategy that considers the entire security lifecycle, from the mine to the business system.



Real Time Information

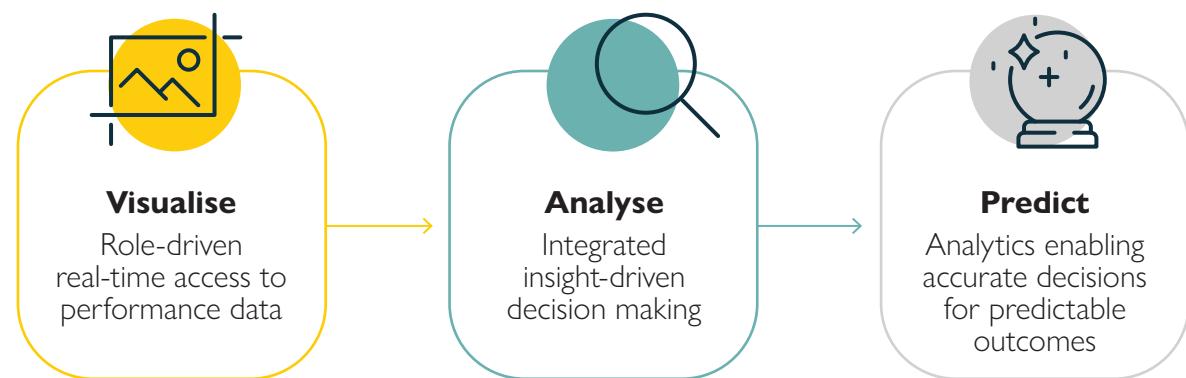
To improve productivity and efficiency mining, the focus should thus be on real-time decision making and specifically Short Interval Control, which allows the monitoring and review of operational plans and performance based on targets, metrics and KPIs.

This, coupled with the correct processes, people, and technology (systems/sensors/gateways/edge devices etc.) will enable mines to extract maximum value out of every process, every day and every shift.

IoT and OT Projects must be grounded in business outcomes; do not get caught-up in all the different types of technology and succeed in only doing pilots driven by technology vendors.

“ The drive for increased control and automation in mining can seem daunting as there are no ready-made solutions. ”

Linking disparate data sources through a platform-based approach is the key, as that delivers on-demand alerts and reports, enabling the improvement of asset utilisation and reliability, the minimisation of downtime, the streamlining of mine planning and the optimisation of fleet resources. Variances to these can be analysed and appropriate action taken in real time during a shift.



This has all become viable in the last few years thanks to technological advances and improved communication infrastructure in both underground and in opencast mining environments.

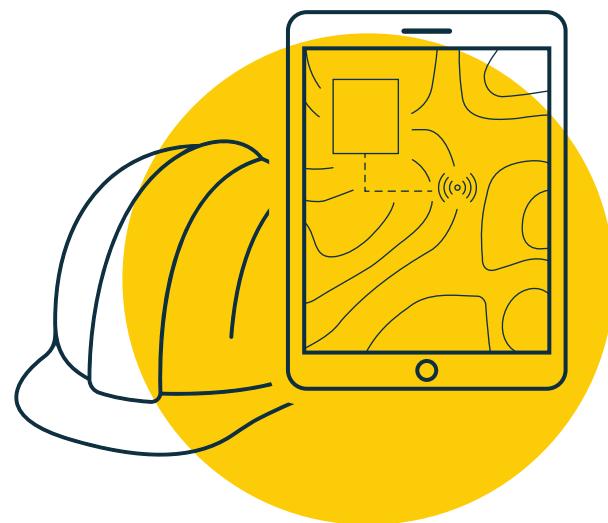
Workforce Digitisation

While the automation of processes and a convergence of work and skills may lead to a reduction or rationalisation of the workforce, it will also increase safe and rewarding jobs. The digitisation of the mining sector should be seen as an opportunity to re-skill and redirect workers into higher-value technology-driven jobs such as data mining and data analytics.

“ Digital technology will redefine how mines operate which will impact every job in the industry.”

Automation and big data are leading priorities, and every operator and supervisor will require a certain level of technological literacy. New roles will be created that will be a combination of both business and technology jobs, supporting the convergence of business and technology, and IT and OT.

The new-age mining employee does not currently exist; organisational structures and training programmes and recruitment processes will need to be adapted to take this into account and roles and responsibilities redefined.



The Digitisation Journey

Before mines embark on an operating model, organisational restructure or system implementation linked to a digitisation programme, it is important that they consider the functionality they would like to digitally enable as part of the digitisation programme (as defined in the target operating model), what level of functional maturity each of these capabilities currently embodies, and what level of maturity they're targeting next. Not all processes will automatically be fully enabled, and some processes can and should be fully automated.

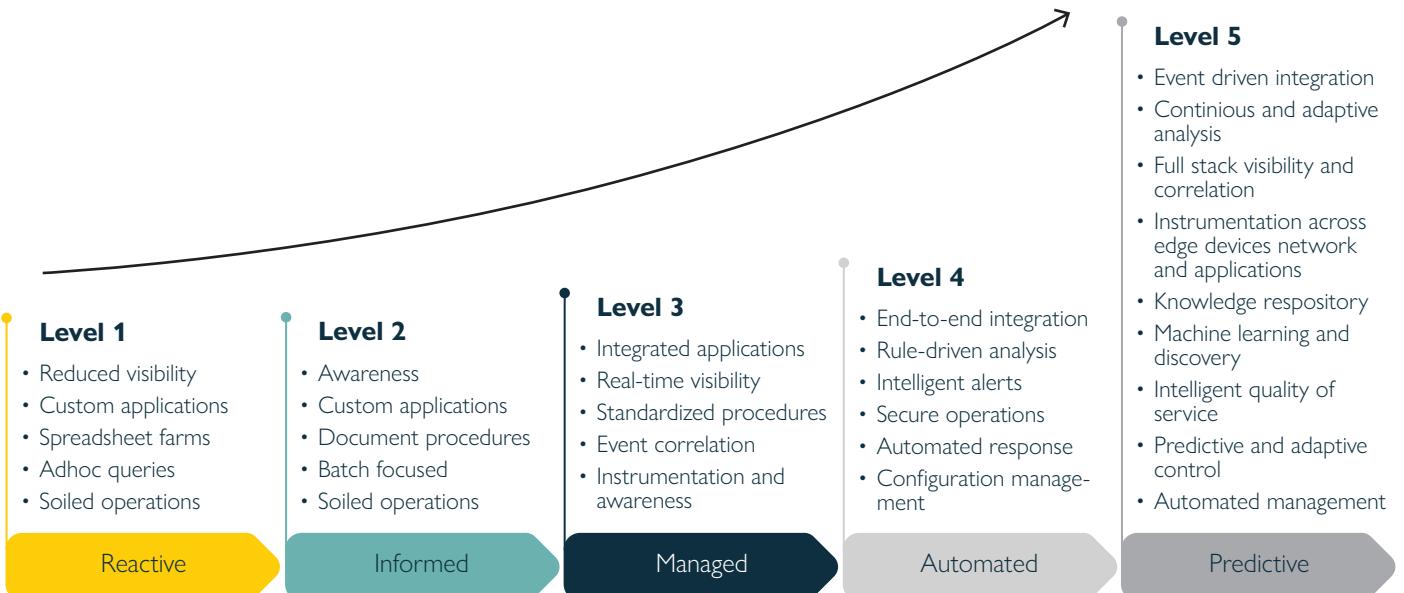
“ Mines should develop a systematic process and system implementation roadmap based on its current and end-state design. ”

It is important to periodically review this roadmap to determine progress against plan, as well as to revise all initiatives in the pipeline to determine if current projects will deliver the desired outcomes.

Maturity Scale

Operations Maturity Model

Standardise on a medium of measure for application assessment



Conclusion

Challenges often lead to innovation and the time has come to make fundamental and dramatic changes to the way mining operates to try and counter the next wave of challenges.

This will not be achieved just tweaking existing processes and implementing some systems to provide the placebo effect of “doing something” or “automating processes”; now is the time to be bold and utilise technology to effect necessary changes and improvements. Appoint an IoT /OT owner in your organisation and focus on more than one use case at a time as optimisation will not be achieved by implementing one solution; at the same time force your company to change by focusing on the operating model, culture, workforce and processes to ensure value a driven and achieved throughout the organisation.

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