Digital Transformation in the Golden Age of Mining Technology

The mining industry is between 30% to 40% less technologically mature than comparable industries. Alarmed? Read more in this first of a three-part series about the opportunities surrounding digital transformations and mining for the future.

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Never before has there been more companies designing and developing new software solutions empowered by the introduction and adoption of sophisticated data collection. In the last 20 years, hardware has become more affordable, more mobile, more sophisticated and therefore more accessible to end users in the mining sector.

Mining staff now have the ability to collect the most minutely detailed field information and the software to process and take advantage of that data is quickly keeping pace. The convergence of highly sophisticated hardware coming into the marketplace, a software boom that continues to grow stronger, a technologically immature market, and an increasingly tech savvy workforce, have formed the perfect storm for explosive growth in the mining technology space. It clearly signals the entrance into a golden age of technology much like the rapid expansion and adoption of the internet towards the end of the 1990s and early 2000s.

Mining has traditionally been known to be a laggard with respect to technological adoption. Boston Consulting Group estimates that the mining industry is between 30% to 40% less technologically mature than comparable industries. Therefore, there's a substantial opportunity to generate value by adopting technology proven in other industrial sectors.

Technology becomes a business imperative

From the standpoint of mining companies, implementation of advanced technology was once an optional add-on to enhance profitability if there was budget to allow for it in the hay-making years between commodity booms and busts. The fundamentals such as planning and scheduling were typically implemented largely due to necessity, but higher end technologies were either too expensive, too complicated, not advanced enough or not tailored specifically to the mining industry.

That opportunity led many companies, from single person startups to Fortune 500s, to direct their focus on developing solutions for the mining industry. In parallel, global efforts to decarbonize economies and move to net zero emissions and the underlying demand for natural resources has meant that technology companies operating in the mining sector are seeing a boom in demand for their products and services.

Whether it's remote sensing being used in exploration activities, optimization technology used in mine design and planning, real-time positioning systems used in fleet management, driverless automated haulage trucks, artificial intelligence predicting equipment failures, autonomous drones used for open pit and underground survey, stochastic techniques applied to scheduling problems, simplification algorithms that turn vast geometric datasets into manageable sizes or historian technologies that natively connect each of these solutions. Wherever we look in mining, there's a vendor that can solve almost every niche problem, and many of these solutions simply did not exist 20 years ago. The pace at which more solutions are entering the marketplace is continually increasing.

Up until 10 to 15 years ago, the range of applications of advanced technologies in mining was relatively limited. However, with the progress that has been made in the tech space, mining companies can now make meaningful improvements in almost every part of their operation by implementing some kind of technological solution that either drives up revenue, drives down costs, makes operations safer or, as has become the priority recently, makes the operation more sustainable.

Technology adoption: not 'if,' but 'when?'

Given dynamic market conditions driven by a plethora of global supply and demand fundamentals, mining companies are seeing that they simply no longer have a choice as to whether to adopt new technologies into their operations if they want to remain competitive. The internal narrative has changed to be more about which technologies to adopt, and when, rather than if. The challenge many are seeing is awareness, and an

appetite for perceived risk when adopting new solutions.

Whether to solve a given problem can relate back to the scale of the issue, what impact a given issue will have on profitability, sustainability or safety as well as other ESG metrics, and naturally the cost versus benefit. Mining companies also must ensure they have the expertise on hand to not only understand the fundamental root causes behind a given issue, but also the ability to comparatively assess the various solutions available as well as the skillset and commitment to maintain adopted solutions on an ongoing basis. The right talent and skill set is important to see the positive effects on operations, while mitigating the effects of staff turnover.

The path to technology adoption

Given that technology generally leads to increased profitability, sustainability, safety, or a combination of the three, implementing technological solutions sounds like a great idea in principle but there are fundamental factors that deter adoption of advanced technologies. Respondents to a recent survey stated that their key concerns around adoption were lack of certainty around ROI, ongoing support, implementation times and their ability or desire to manage and execute change.

Within the ability or willingness to execute change lies one of the key factors that can discourage mining organizations from adopting new technologies. While there may be the desire at the senior leadership level to implement all of the latest and greatest technologies and have a truly digital, automated mine that is safe and sustainable, bringing all of the stakeholders on the journey presents a significant challenge. Perceptions to do with technology and automation within mining companies vary heavily and the degree to which stakeholders are informed, involved and buy in to ideas present crucial elements in the discussion that can affect the process if not properly addressed.

What's ahead?

In many mining operations today, technology is making the difference between a profitable, safe, sustainable and competitive operation and one that's not. The mining industry has expanded and bred an extremely competitive marketplace where tenths of a percent scale can make a difference to not only the revenue figures, but the social and environmental factors.

Mining companies that have developed strong partnerships with their tech providers are among the most competitive and profitable in the market.

If recent studies regarding the number of mines required to support the green economies of the future are true, many mining companies will need to significantly ramp up their efforts to digitalize their operations. New mines will simply implement best-of-breed technological systems from day one, rather than having to retrofit these technologies into mines, systems and processes that weren't designed for the level of digitalization available now.

New mines coming online will simply be built around all the new technology available and will rapidly create an extremely competitive marketplace that will only expand for decades to come. The world is rapidly changing, and in the same way that employees will need to expand their skillsets to stay competitive in the market, today's mining companies must also adapt in order to keep up.