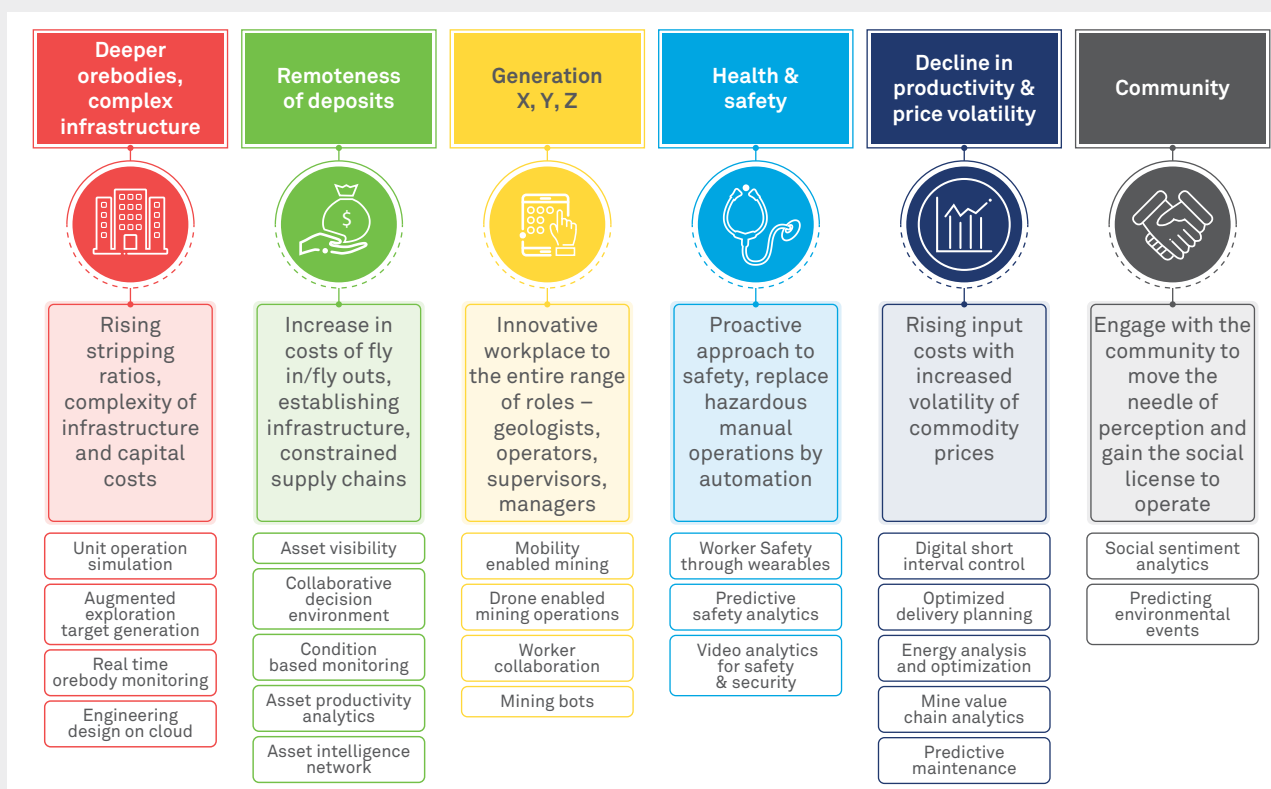# Applying a digital approach to a mining operation

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The impact of digital technologies and the underlying benefits to a mining business is now well established. However, applying the approach at the site of a mining operation where local management control exists requires a flexible and pragmatic approach. Most modern mines have implemented legacy systems (with proprietary intellectual property) that collect data, contextualize as well as provide a preliminary analysis from such data. Having said that, they fall short in managing end-to-end workflows, and as a result, have in-built inefficiencies. Every mine is unique in some aspects (a deeper ore body underground operation, remoteness of deposit, a next generation workforce, a complex outbound supply chain, a low-grade deposit, high labor cost, etc.) Therefore, there is no one-size-fits-all and any overarching digital mining framework needs to be tailored to the individual operation in question.

Approach to digital strategy

The following section provides an overview of key digital strategies that are relevant across a broad category of mining sites. The devil however, lies in the details and the context for a site. A few examples to illustrate the same are given below:

- Short interval control strategy could have varied context between an open cast and an underground operation where the activities inherently are more dependent on one another and lack visibility and mature systems

- Worker safety via wearables would need to be relatively easier to conceptualize in an open cast operation versus an underground operation where environmental conditions are more detrimental (which could again vary depending on commodities—metals vs. non-metals such as coal)

- Optimized delivery planning could be relatively simple for a single site operation versus an operation where multiple modes of transport are involved and the miner's control over the supply chain (rail, ports ownership, etc.)

- Video analytics for safety and security would depend on the local context of the mine location and socio-economic factors

- Asset visibility could vary depending on existing dispatch systems used, its coverage for all asset types and ability to manage individual areas (drill-blast, haul road, load-haul, rom & dumps, etc.)

Deeper orebodies, complex infrastructure	Remoteness of deposits	Generation X, Y, Z	Health & safety	Decline in productivity & price volatility	Community
Rising stripping ratios, complexity of infrastructure and capital costs	Increase in costs of fly in/fly outs, establishing infrastructure, constrained supply chains	Innovative workplace to the entire range of roles – geologists, operators, supervisors, managers	Proactive approach to safety, replace hazardous manual operations by automation	Rising input costs with increased volatility of commodity prices	Engage with the community to move the needle of perception and gain the social license to operate
Unit operation simulation	Asset visibility	Mobility enabled mining	Worker Safety through wearables	Digital short interval control	Social sentiment analytics
Augmented exploration target generation	Collaborative decision environment	Drone enabled mining operations	Predictive safety analytics	Optimized delivery planning	Predicting environmental events
Real time orebody monitoring	Condition based monitoring	Worker collaboration	Video analytics for safety & security	Energy analysis and optimization	
Engineering design on cloud	Asset productivity analytics	Mining bots		Mine value chain analytics	
	Asset intelligence network			Predictive maintenance	

The benefits of a digital program in mining is well documented with significant untapped potential for productivity improvement.

So, a carefully thought-out strategy with prioritization needs to be arrived at before embarking on a digital mission to transform the site operation.

Applying a digital mining framework to a mining site

Once the broad digital strategies are arrived at and understood, the next step is to undertake an assessment and review of the processes and applications that are currently being used for each mining function in the scope of the digital strategy. This is important to understand the investment that has already been made and if all areas are in focus. Identify how close the current applications and landscape fit with industry best practices for operational functions. This will review the key operational technologies at the mine to determine their existing use, their existing configurations and determine improvement projects and the technology roadmap they need to improve their operations and identify opportunities for cost reduction and increased productivity and safety.

Once this review is done, each digital strategy can be broken down into multiple use cases, with each having a journey of its own (often spanning multiple years) which can be programmed into a roadmap of digital projects to be delivered in an agile manner using a set of integrated platforms. It is likely that a combination of leveraging existing technology investments (enablers for digital) and modern digital technologies would be used with intermediate transitional approaches to usage of full blown integrated digital platforms

Few key considerations:

These are important guidelines to keep in mind while adopting a framework to a site operation:

- Identify operations management site champions for each strategy, not just IT alone. A top-down approach is important to harvest business value. Mining GMs to the COO must own such a program to a great degree.

- Identify quick wins for buy-in from the business and operations to sustain business sponsorship of the program, especially in the first 12 months of the program

- Adopt agile approaches to build block by block rather than prolonged backend design where the full fruits can only come months later

- Adopt an enterprise architecture philosophy to digital design and integration, something that would continuously evolve as the digital technologies are also maturing. Identify dependencies early as they could impact technology choices being made in the short and long term

- Updating the operating model: Change management programs are needed to help through the dramatic changes—for example, learning how and why to use a connected worker interface rather than turning to their familiar, dog-eared manual way of exchanging data

Conclusion:

The benefits of a digital program in mining is well documented in the media. There is significant untapped potential for productivity improvement with a global average overall equipment effectiveness (OEE) performance of 27 percent for underground mining, 39 percent for open-pit mining, and 69 percent for crushing and grinding—compared with 88 percent for upstream oil and gas, 90 percent for steel, and 92 percent for oil refining. A 30 percent+ productivity benefits and cost reduction is not unachievable provided the hurdle of integration with existing technologies is overcome and risks of lack of knowledge to exploit new technologies is managed by the mining organization.

References:

How digital innovation can improve mining productivity. (https://www.mckinsey.com/industries/metals-and-mining/our-insights/how-digital-innovation-can-improve-mining-productivity)

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Sudip Chaudhuri heads the mining practice in Wipro and leads a team of domain and technology professionals working in the areas of Mining Process Optimization. Over a period of 20 years, Sudip has had extensive experience in applying IT for Mining and Mineral Processing industries across roles of go to market, conceptualization, solution design, delivery of complex operations centric programs.

In his role as a practitioner he has successfully led or mentored multiple projects for improving asset utilization, operational efficiencies, driving insights from data, capital project portfolio strategies and embedding technology in operations for improving work practices that lead to top line growth and bottom line savings. In his current role he is responsible for advising clients on mining systems, creating innovative solutions and developing competencies that can provide the right technology enablement in a challenging industry environment.

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