



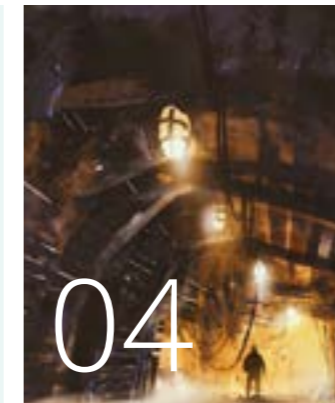
**Intelligent Mining**  
Delivering real value

For private circulation only  
October 2019

# Contents

Introduction

04



Digital as enabler to unleash India's mining potential

06



11

Future is intelligent mining



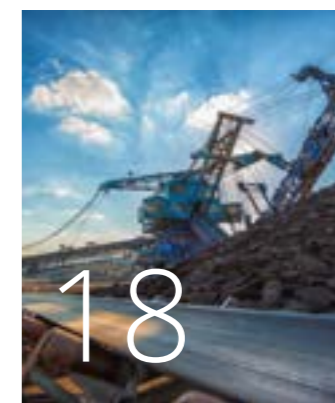
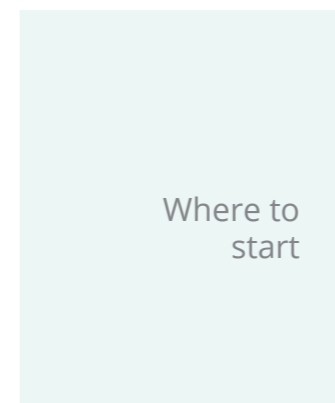
14

Intelligent mining will require Organisation transformation




Where to start

18







**Digital is now impacting the mining industry. Technology has advanced to such an extent that the barriers of high cost of entry and a very physical value chain are no longer enough to provide protection against large-scale disruption.**

The disruption of business models with advent of Industry 4.0 has been a reality for many of the industries over the last few years. A digital enterprise continuously redefines what it offers, how it delivers, and how it operates to drive competitive differentiation, maximize profitability, and minimize enterprise risk. Costs in bandwidth, storage, and computing are declining at a rapid pace in this digital era thus bringing large scale disruptions across industries and organizations.

Digital is now impacting the mining industry. To capitalise on the digital revolution, mining companies need to drive radical change. Yet many mining companies still focus on point solutions – underestimating internal organisational barriers and decision constraints that can hinder their ability to disrupt and prosper. This is particularly relevant for the Indian mining industry where many organizations are at the initial stages of their digital journey to achieve the potential for significant growth.

Intelligent Mining translates to broader organization transformation, and not just a mine. Intelligent Mining is about understanding where waste is created in the business, ranging from inherent variability in the orebody, design and structural waste to process variability. Intelligent Mining will impact decision making, engagement with workforce communities, and optimal utilization of resources.

Deloitte's Intelligent Mining Solution transforms business and organizational activities, processes, competencies and models to fully leverage the opportunities of digital technologies and their impact across the mining value chain in a strategic way, keeping in mind the present and future.





# DIGITAL AS ENABLER TO UNLEASH INDIA'S MINING POTENTIAL

**India aspires to be a US \$5 trillion economy by FY24 and US \$10 trillion by FY30, Metals & Mining is expected to have a significant play in this growth journey with current contribution ~5% of India's GDP (\$150 billion) ^**

#### **Current situation of Indian mining Industry \***

- India has identified 5.71 lakh sq. km as the obvious geological potential (OGP) area, but only 10 per cent of it has been explored and 1.5 per cent is being mined.
- India's share in the global production of metallic minerals, such as bauxite, chromite, iron ore and manganese ore is relatively high; India is ranked 4th to 6th among global producers.
- In industrial minerals, India is a large producer of zinc, aluminium and steel, ranking 5th, 5th and 3rd respectively.
- High incidence of taxes, royalties and levies in comparison to global standards (more than 65 per cent) resulting in high landed cost of raw material for the industry

#### **India has the potential to be**

- India has huge mineral potential, as its prospective geology is broadly similar to that of Western Australia, especially in relation to iron ore, bauxite, coal, diamonds, and heavy mineral sands.
- Double the area explored from 10 per cent of obvious geological potential (OGP) area to 20 per cent
- Accelerate the growth of the mining sector with an average growth of 8.5% till FY23.\*\*
- Government is looking to increase production of mineral by 200% in next 7 years and reduce import of minerals and metals by developing in-house capability \*\*
- Expediently operationalize commercial coal mining and develop platforms for global participation in the mining business.

**The key question for the Indian mining industry today is how can we achieve our objectives so that the sector contributes more to the country's growth**

Source: "Strategy for New India@75" Niti Aayog, GoI

\*Report of the working group on mineral exploration & development  
<https://mines.gov.in/writereaddata/UploadFile/Sub%20Group%20I.pdf>

\*\* Plans to boost mineral output by 200% in next 7 years: Mines minister  
<https://economictimes.indiatimes.com/industry/indl-goods/svs/metals-mining/plans-to-boost-mineral-output-by-200-in-next-7-years-mines-minister/articleshow/71201789.cms?from=mdr>



## Challenges faced by the Indian mining industry today

Despite an optimistic market view and favourable government actions, these sectors face strong headwinds due to infrastructure deficiency, low capacity utilisation and global phenomenon

1

### Deep seated deposits

Given that open cast mines are ageing and ore grade is declining, miners will need to augment output from underground mines, efficiently, which will require technological advancements specific to geological conditions.

2

### Conversion of resource to reserve

The mining industry has a massive unexplored potential. Even where the resource base is known, the actual mineral output for most minerals has been quite low. There's limited contribution of geochemistry, geophysics, remote sensing, and advanced technology.

3

### Scale of operations

The relatively smaller scale of mining operations in India restricts the miners' ability to bring in desired levels of investment and deploy new technology, in turn lowering the efficiency in operations and productivity.

4

### Low productivity

Productivity remains a major concern with miners. Domestic coal productivity trails far behind the average for the industry globally.

5

### Cost competitiveness

Volatility in the cost of high input, consumables like fuel, explosives etc., supply chain, and logistics costs affect the competitiveness of the miners.

6

### Sustainability

Sustainable mining with responsibility for health, safety of all stakeholders, and environment is an imperative for mining globally. However, the performance of Indian mining on such parameters has been particularly inconsistent.

## How digital can help address some of the Indian mining industry challenges



Indian mining companies across all commodities are facing multiple challenges including declining ore grades and operating efficiency. Responding to such challenges is difficult due to the significant variance inherent to ore bodies. This is exacerbated by costly infrastructure requirements, distant planning horizons and lengthy implementation timelines, notwithstanding dangerous operating environments and subsequent critical safety considerations.

While many companies strive to drive meaningful, sustainable transformation in their operations, they lack real visibility, and struggle to access accurate, complete and timely data or business options. This leads to diminishing returns as they continue to follow the approaches of old – sweating their remaining assets and working harder for smaller ins.

The cost of digital technology is decreasing and digital solutions are being trialed and tested, so there is no better time than now to explore Intelligent Mining, address the underlying causes of obstacles, and focus on value.

Deloitte understands digital transformation. Being digital is about the ability to see differently, think differently, and do differently. The digital future brings great promise. It enables quicker and better decisions that can reduce performance variability and improve equipment utilisation and safety. It can move organisations from a reactive management approach to one that looks forward with insight and confidence.

This potential value realisation will increase further as organisations transition from doing things better to doing things differently:

- **Using digital technology to manage better** – Evidence-based insights allow organisations to do the same work better thus eliminating execution waste (10-20% improvement potential)
- **Integrating information** – Leveraging technology to automate processes and make better system-wide decisions (20-30% improvement potential)
- **Redesigning integrated systems** – Integration and optimisation of all technologies across the mining value chain allows organisations to work differently (greater than 50% improvement potential)

### Digital is the new era of business:

Digital disruption has been changing businesses and operating models, reshaping competitive differentiators, and completely altering the entire fabric of an industry.

### Going digital gives an opportunity for mining organisations to reduce waste and create value by

- Eradicating execution waste by reducing process variability, eliminating process waste by enhancing decision-making, reducing structural waste by automating processes and improving systems
- Removing design waste by using digital technologies in the design of new assets.
- This will also help in facilitating knowledge sharing and training, drives new revenue streams, provides access to new markets, and most importantly, makes day-to-day operations safer for employees.





## It's not just about the technology; it's about changing the way you do business

**Intelligent Mining is about broader organisation transformation, and not just a 'digital mine'.**

**Intelligent Mining will impact the way decisions are made, skills are required, workforce and communities are engaged with, and how optimally resources, such as energy, are utilised.**

### The way DECISIONS are made

1. Automated feedback loops on leading indicators will allow leadership teams to intervene proactively and solve issues before they occur.
2. Operating limits are defined for each of the input measures. A performance deviation triggers the required action and the intelligent workflow therefore becomes the basis of exception management.
3. A decision in relation to an unplanned event such as, 'do I move my mining equipment or use the opportunity to do maintenance?' becomes transparent, collaborative, and fact based.

### How VALUE is shared

1. Digital infrastructure leads to improved quality of life and creating conditions necessary for the accelerated development of communities.
2. Digital disruption has been lowering historical barriers of access to education with online learning platforms that provide valuable and useable skills development.
3. New skills include intangible skills such as EQ, curiosity, creativity, critical thinking, adaptability, and resilience as well as technical skills based on data and algorithms. Shifts in education and skills development provide mining organisations with an opportunity to reskill employees as technology is deployed and invest in skills development in surrounding communities. This helps to address the deficiencies and strengthen local clusters over time.

### What SKILLS we require

1. Almost every job will be re-invented, creating the "augmented workforce": working next to and with smart machines.
2. Proactive upskilling and reskilling of manual and semi-skilled labour is a business and social imperative for the mining industry.
3. Organisations Implementing systemic changes in how they organise and develop workforces smartly, will spur workplace innovation, and cultivate digital cultures and experiences.

### How RESOURCES are managed

1. Intelligent Mining will make it possible to manage resources such as energy, labour, equipment, and infrastructure as a variable cost. For example, infrastructure such as conveyor systems can be integrated with energy monitoring across the value chain to optimise system utilisation.
2. Intelligent Mining integrates with smart automation based on equipment capacity, availability and utilisation. Energy therefore becomes an input parameter that is subject to resource allocation similar to employees and material. Optimisation of this variable resource, across the value chain, will improve sustainability and reduce utility consumption.

# FUTURE IS INTELLIGENT MINING

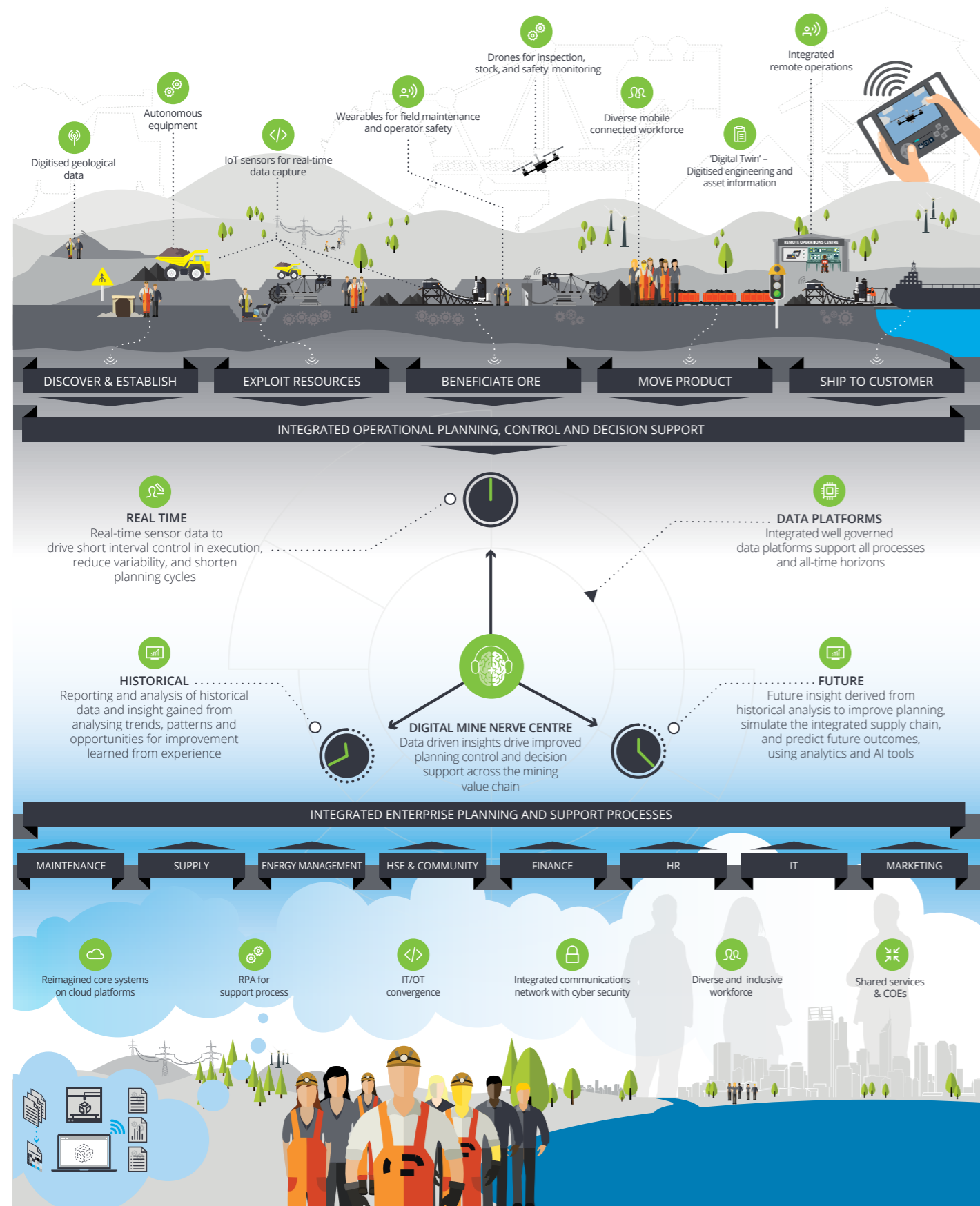
The question for business leaders is how to turn potential benefits into reality. Success for mining companies is not about adopting the latest applications or technology solutions, these will continue to develop and evolve. They must instead embed digital thinking into the heart of their business strategy and practices in order to completely transform the way corporate decisions are made across the enterprise. To "begin with the end in mind", we have envisaged the future state intelligent mine and how this might transform the core mining processes, the flow of information and the supporting back-office processes.

Deloitte Publication, Intelligent Mining, Delivering Real Value, March 2018

<https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Energy-and-Resources/gx-intelligent-mining-mar-2018.pdf>



# Future digital mine visualisation



## To “begin with the end in mind”, we have envisaged the future state digital mine and how this will transform the core mining processes and the flow of information

### Integration of core and support processes

To fully leverage the power of digital, miners need to integrate assets across the value chain. This will enable them to view information in multiple time horizons, improve planning, control and decision-making.

We believe that the pace of digital transformation is more about people than technology. We have, and will continue to invest in solutions that solve industry challenges. These pre-configured solutions are based on best-in-class platforms from our established partner network, integrated through a robust, but flexible technology architecture. Selected examples of these solutions include:

**Integrated digital planning:** Eliminates waste, creates value by obtaining a better understanding of the ore-body, and provides more complete, timely and integrated information to improve budget forecasting for optimal resource management. Market data, procurement, maintenance and workforce planning are integrated with mining and financial plans to provide optimal holistic forecasts requirements.

### The digital mine nerve centre – data-driven planning, control, and decision-making

The direct benefits of automation and digitisation in execution will be significant, and even greater value will be realised when the data is used to plan, optimise, and integrate the activity across the value chain. To fully leverage the automation of core operations, companies will need to rethink the way in which they generate and process information, and utilise data-driven analytics techniques to optimise their complex systems all the way from pit to customer.

The information layer or “nerve centre” of a digital mine will bring together data across the mining value chain in multiple time-horizons, to improve planning, control and decision-making, in order to optimise volume, cost and capital expenditure, and also improve safety.

Real-time data derived from processing equipment and machinery sensors during operation will enable short interval control to identify key drivers of process variability, and drive rapid and focused operational improvements.

More timely data from across the value chain will also enable ore-body models, mine plans, and financial models to be updated more frequently, and shorten the planning cycles.

Reporting and analysis of historical data will enable insight from trends, patterns and

opportunities for improvement learned from experience.

Future insight will be derived from historical analysis to improve planning, simulate the integrated supply chain, and predict future outcomes. Increasing use of analytics and artificial intelligence (AI) tools will support knowledge workers

Central to enabling this will be an integrated and well-governed data platform to support analysis across all time horizons, and a centre of excellence in data management, reporting and analytics, which employs specialist data scientists and analysts.

Globally, **69%** of mining companies are looking at remote operation and monitoring centres, **29%** at robotics, and **27%** at unmanned drones.

### Support processes – re-imagined ERP and automated support processes

Finally, the effects of digitisation will extend beyond the core operations and the flow of information to the supporting processes and systems of functions such as supply chain, HR, and finance.

Mining organisations are going to be challenged to completely re-think their corporate structures, as new entrants to the mining industry without existing corporate infrastructure are able to establish new and innovative models for delivering their non-mining requirements.

There is a strong and growing trend towards not simply upgrading, but fundamentally “re-imagining” Enterprise Resource Planning (ERP) and other support systems, using cloud-based

solutions that have a low cost of ownership and contemporary user interfaces.

A lean set of corporate processes will be assisted by robotic process automation (RPA), which will automate repetitive human activities to reduce costs and errors, and artificial intelligence (AI) which will closely support knowledge workers.

The convergence of information technology (IT) and operational technology (OT), and the integrated management of these historically separate domains, is an enabler for automation and digitisation of both core and support processes.

Fully integrated communications networks, leveraging the Long Term Evolution

(LTE) spectrum, will support the mobile workforce across all platforms, and cyber security will mitigate the risks of greater connectivity.

Technologies will enable work to be moved to locations which can support a more diverse and inclusive workforce, including primary carers and people with physical disabilities.

Shared services centres and Centres of Expertise will employ a mix of on-shore, off-shore and robotic workforce, with increased human-machine interaction and new and different skills.



# INTELLIGENT MINING WILL REQUIRE ORGANISATION TRANSFORMATION

## The organisational transformation is explained in 5 steps:

### 1 Developing a digital strategy and managing digital transformation:

Rather than spawning disconnected initiatives, the digital strategy has to be motivated from the enterprise level and the value of digital initiatives have to be clearly defined by the organisation as a whole. Digital initiatives are often focused on the technical solution and are not always driven by a well-articulated vision and strategy, nor a direct link to business value. Digital transformation should begin with an understanding of the desired future state, and the value to be created. A key challenge in this new digital era is the ability to deliver change at the pace that achieves short-term results (within existing constraints) while maintaining flexibility to enable longer-term transformation. New approaches can be tested in a pilot or sandbox environment, rolled out in phases, or easily shelved. Another key challenge is the large number of vendors offering products and platforms to provide solutions for many digital opportunities, but no single vendor has a complete solution for the entire future digital mine - organisations will need to be able to manage an ecosystem of providers, which will evolve over time.

### 2 Automating operations and digital assets:

From our experience with major mining organisations in programmes such as autonomous haulage and remote operations, we understand the benefits and key considerations for successful implementation. In this context, collaboration is critical as companies will need to operate in an ecosystem of providers and partners, and will also need strong programme management and integration capabilities. A key question is how many mining organisations have really delivered on the promise of remote operations centres to challenge and change their operations, including taking advantage of a global skillset (most operations centres are still single product/single country focused). Most asset-intensive organisations face challenges with management of engineering and asset information throughout the asset lifecycle, including data integrity issues and time wasted looking for documents. An initial step towards the creation of a "digital twin" should be an assessment of engineering data management (EDM) capabilities and maturity, to highlight the gaps and focus digitisation efforts on the areas of greatest value and impact.

### 3 Delivering the digital mine nerve centre:

To deliver on the digital mine nerve centre, companies must establish a capability to use data to resolve a wide range of business problems. In essence, intelligent business decisions will ultimately hinge on access to timely and relevant information, in all time horizons. Most organisations only use a fraction of the data they are already collecting, let alone the potential real-time volume that could be captured via IoT, and many are still struggling with limited business intelligence capability from historical ERP environments and non-integrated operational systems. Skills and experience in data science and analytics are in demand and scarce. Establishing the capability for an insight-driven organisation requires developing and embedding data science and analytic skills across the organisation, as well as the foundational data platforms and analytic tools.

### 4 Implementing supporting platforms and enablers:

Today, many roads to digital transformation are blocked by core systems such as ERP, which are often expensive to run and maintain, and inflexible for future changes. Upgrading core systems to cloud-based applications and platforms can deliver total cost of ownership (TCO) benefits (typically in the range of 20-40%) and improved user experience, as the capability of these solutions, and the associated "as a service" business models, have matured. Around the edges of core systems there are typically many manual processes and spreadsheets. Complementary to core system changes, RPA can replace some tasks currently performed by humans, presenting an opportunity for cost reduction in support processes and shared services. Mining companies should embark on proof of concept and pilot implementations to test the potential benefits and gain experience in a rapidly growing domain.

### 5 Leading a diverse, distributed and connected work force:

As the digital mine becomes a reality, our interpretation of what work is and how it gets done is constantly changing. The future of work needs to consider the impact of human machine interaction on future work, workforce, and workplace. The future workforce will demand and expect an improved user experience, based on their experience as consumers. 74% of global business executives surveyed by Forrester state that they have a digital strategy, but only 15% believe they have the necessary capabilities and skills to execute that strategy. The digital mine is an organisation transformation; it requires a new approach to leadership, a culture which embraces data-led decision-making and diversity, a new way of operating, and diverse and different skills and capabilities. This is no easy task for mining companies, which will increasingly find themselves competing for scarce digital talent. To succeed, companies must bring in these new skills whilst also supporting their current high talent pipeline to successfully make the transition.

#### A successful transformation is dependent on:

- Integration of core and support processes underpinned by a robust technology architecture
- A transformed workforce augmented by decision support and real-time performance management
- Resilient leadership with a relentless drive for value realisation, coupled with real endorsement for agile ways of work





# Workforce strategy

The workforce strategy must support the digital agenda to ensure successful digital strategy execution. Workforce strategy focuses on ensuring that the right people are at the right place at the right time. This requires a focus across the following three dimensions: redesigned work, augmented workforce, and connected workplace.

Not to be confused with operational workforce or capacity planning, strategic workforce planning is the ability to proactively determine the shape, size and profile of the workforce to meet the digital strategy. This will require an accurate prediction of the speed and scale of disruption to certain jobs and future skill requirements. As these future skills are in demand, the cost to fill these roles will determine the priority, feasibility, and employment model (employee, contractor, partner, crowdsourced, etc.)



## Redesigned work

The type of work people will do in the Intelligent Mine: Jobs will generally be more knowledge-based and the nature of work will change. The workforce will need to interact with technology and make complex decisions based on data and insights. An

example of this is a specialised engineer that can support an on-site supervisor remotely in fault-finding. The engineer can visually see an exploded view of the sub-assembly on a HoloLens6 and then provide guidance on corrective actions.

## New workforce

The digital workplace enables a more flexible, agile and decision-driven workforce. A hybrid approach is needed where employees with a new set of skills and competencies will work alongside machines and interact with digital technology. To ensure efficient implementation and adoption of these digital technologies, organisations need to bring stakeholders along on the journey ensuring continuous engagement and transparency on:

- The employees experience
- The upskilling, reskilling, and

redeployment of resources

- Training and development requirements
- Recruitment of new skills and alternative employment models

Gamified performance management enables real-time performance information linked to incentive and reward programmes, as well as mitigation mechanisms for poor performance. This is further supported by the ability to track and measure operational performance against the plan in real-time and made visible to employees on dashboards across various engagement platforms.

## Connected Workplace

Intelligent Mining deliberately constructs its workplace to incorporate everything from the physical to digital workspaces. As the lines between physical locations and the place where work happens become more blurred, a diverse workforce will become more involved in what was

traditionally considered core mining.

Deloitte's digital mine nerve centre enables data-driven decision-making by accumulating, integrating, and simplifying information from across the organisation in an environment that simulates a digital twin of the mine.

# Leadership is the key to success

In order to adapt and respond to the demands of a rapidly changing environment, the leaders in the digital organisation need to change the way they think, act and react. To facilitate this transition, leaders need to focus on the following principles:

## Own the transformation

- Be at the forefront of the digital transformation agenda
- Be visible to stakeholders
- Be resilient in the face of constant change

01



## Relentless focus on value

- Leadership should be brave in challenging the status quo
- Relentless focus on value realisation

02



## Taking calculated risks

- Value design thinking
- Create new ways of work
- Create an environment where failure is okay
- Try, fail, try again in a daily occurrence

03



## Start small and scale fast

- Conceptualise possibilities in a virtual world
- Data-driven decision-making
- Lead initiatives by starting small and scaling fast

04



## Dedicated execution capacity

- Take the lead in driving change
- Ensure that there are dedicated resources assigned to drive the transformation process

05





# WHERE TO START

An effective digital transformation programme should be self-funding and not a make-or-break proposition. Identifying and prioritising opportunities should be consistent with the key theme of speed and agility. Deloitte's pre-configured use cases and Digital Value Office (DVO) can incubate the transformation journey by enabling rapid value realisation through collaboration, transparency, and the right partnerships.



Deloitte Publication  
Intelligent Mining : Delivering Real Value, 2018  
<https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Energy-and-Resources/gx-intelligent-mining-mar-2018.pdf>

Deloitte Publication  
The digital revolution : Mining starts to reinvent the future, 2017  
<https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Energy-and-Resources/deloitte-au-er-digital-revolution.pdf>

## Pre-configured use cases

Pre-configured use cases enable organisations to rapidly transition from “the art of the possible” to a working prototype that confirms value. The prioritisation of use cases considers the trade-off between the potential business value and feasibility of implementation.

Delivering value quickly will create momentum for the overall programme as a change catalyst. The steps in getting started are to think big in terms of digital ambition, test small by providing a proof of concept for one or two use cases, and scale fast to maximise value realisation across the organisation.

## Digital value office

In a digital transformation journey, a DVO is the incubation engine that drives transformation through digital technology roll out, and change in work, workforce and workplace. The DVO reports directly into the office of the Chief Executive Officer (CEO). CEO sponsorship is critical as the impact of the transformation journey means that the DVO needs to challenge current operating and business model paradigms. The DVO should be accountable for providing five main deliverables:

- Manage the programme and integration across business units
- Manage the pipeline of digital use cases and initiatives
- Implement use cases
- Organisational change management
- Technology architecture integration

To deliver these outcomes, in a digital environment, the DVO requires more competencies (encompassing people, process and technology) than the typical

## Outside-in view

The ‘outside-in view’ can be enabled by taking a few practical steps to ‘plug-in’ to the external network that include:

- Establishing an AI engine that continuously scans databases for megatrends and disruptive technologies
- Attending relevant conferences and subscribing to publications that track cross-industry views of how digital developments are being adopted
- Establishing strategic partnerships with third-party suppliers that are market leaders in digital transformation.

The ‘outside-in view’ should also be used as a platform to continuously review and refresh the technology alliance partnership ecosystem.



## Outside-in view

The change processes are initiated and managed by means of a few practical processes that ensure that new technologies are adopted and that skills profile of the organisation evolves as digital maturity grows. The DVO should support this transformation through the following support capabilities:

- **A formal agile coaching programme** – Agile ways of working is a fundamental shift from traditional implementation methodologies. Certified agile coaches will guide the implementation teams on, and instilling an agile way of working.
- **Digital fluency training** - Understanding digital technology and the impact it has on traditional business and operating models is an important pre-requisite to digital transformation. Preparing for the fourth industrial revolution requires both leaders and employees to develop a

basic understanding of the opportunities and vulnerabilities to their business. A compulsory digital fluency programme will assist the leadership and staff to understand the disruptive technologies and their implications better.

- **Change management through hype development** - Change management is the single most important driver of success, an enabler to open the door for employees to embrace the change rather than oppose it. Dynamic change management is therefore about delivering change in a leaner, collaborative, flexible and iterative way by creating hype and a ‘movement’ for change across the organisation. A number of factors to consider in creating a hype or movement for change across the organisation:
  - Focus on the moments that matter

Programme Management Office (PMO). These include:

- Having an outside-in view
- Being a change catalyst
- Being a custodian for digital maturity and tracking
- Taking responsibility for the delivery of assurance and value realisation
- Enabling partner ecosystems
- Reinforcing the digital technology architecture.

- The DVO as the catalyst for change
- Integrate change with agility
- Understand and define the minimal viable change (MVC)
- Embrace the agile way of working, help the organisation ‘get it’

- **Managing the skills pipeline and future of work requirements** – Address digital implications across the dimensions of space, place, talent and technology to define the workplace strategy holistically. Strategic workforce planning within the DVO will typically comprise of the following elements:

- Predictive talent optimisation tools
- Technology augmented professionals
- Gig workers
- Crowdsourcing platforms
- Bots



# The implementation principles that enable this transformation are....

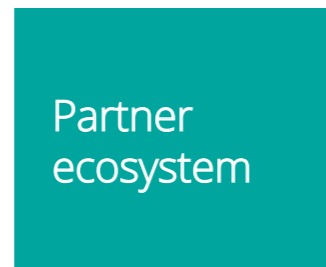


The DVO is the custodian of digital maturity for the organisation. Digital maturity should be assessed against a digital maturity reference model that ranges from smart assets to cognitive/ AI. Maturity, while not a direct indicator of business value, allows articulation of simplified digital use cases that, when implemented and integrated across the value chain, eliminate waste and therefore support the creation of business value. This also allows for a more holistic view of digital transformation based on maturity as the leading indicator.

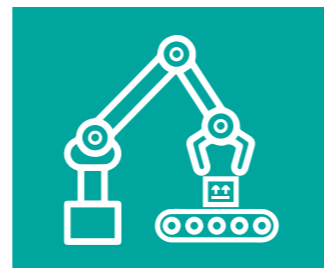


The effective use of a minimum viable product or prototype (MVP) to assess the potential value of a digital solution is critical for approach to value realisation. The value potential guides the DVO in terms of prioritising the funding of initiatives. Thereafter, by assessing the outcomes of an MVP a business case for scaling needs to be developed. The business case is informed by technology, organisational readiness, and data integration costs. Our experience is that digital solutions that are built on cloud-based flexible platforms, are intuitive to use, are reusable across mine operations, and have the most potential to demonstrate value.

The DVO should facilitate delivery assurance by establishing and facilitating appropriate governance structures and functional forums to ensure internal functional alignment and decision support. Risk and quality management are subsets of delivery assurance, and appropriate agile decision-making processes are used to support managing these aspects.



A range of alliance partners is required to provide the full suite of advisory, technology, and integration capabilities to deliver use cases defined during a digitalisation programme. These alliance partnerships cover the full breadth of digital services, across a broad range of emerging technologies, from strategy to execution. Digital transformation is a journey from working with inflexible platforms, products, and workflows to embedding agility in the everyday way of work. The same agility is required to develop and sustain the partner ecosystem. The DVO facilitates integration and cross-functional implementation between the information management team, third-party suppliers, and business unit personnel.



To realise the vision of digital evolution a DVO would typically include a Design Authority (DA) function. The DA can be established as a function that sits within Information Technology (IT) and operates within a more agile governance framework where the business requirements are more dynamic. It is recommended that the DVO competencies include a digital architect that will be responsible for systems of innovation that include:

- Experimental new technology
- Small scale, point solutions
- Agile delivery methods
- Mobile, cloud dominant technologies

## Sample Engagements

### 1 Driving workforce engagement through digital (South Africa)

Deloitte assisted large South African mining company to drive performance and efficiency improvement by leveraging digital tools resulting in high employee moral, reduction in safety related incidents and improved mine productivity.

South African gold mining company engaged Deloitte to mitigate risk in volatile wage negotiations. Deloitte used its digital platforms which engaged 16,500 employees across 5 operations including unions. Designed and deployed campaigns aligned to business objectives to deliver real-time insights to drive business values.

### 3 End-to-end value chain scenario analysis & modelling (Australia)

Deloitte was engaged by large Australian mining company to optimise the mine planning cycle and develop scenarios for mine planning across multiple sites. Deloitte leveraged analytics and created dashboards for insights helping integrated mine planning.

Deloitte implemented end-to-end supply chain solution for large Australian mining company showing key operational metrics in near real time on large screens. Deloitte also built leading business intelligence and data warehouse toolsets. Client was able to generate insights and take quick operational decisions. The solution established a foundational data set for future analytics.

### 2 Predictive analytics, asset health and throughput improvement (South Africa)

Deloitte implemented predictive mill throughput analytics for a silver, lead and zinc mine based out of South Africa. This resulted in predictive analytics and optimisation study which yielded effective and practical advanced water control in the grinding circuit hence optimisation of costs.

Implemented Asset Information Management to enable predictive maintenance across a portfolio of high value assets for large Mining company in South Africa. Deloitte developed solution which has single source for assets health data across pit-to-port. The solution was integrated with visual dashboards with capabilities to monitor asset conditions and alarming high risk assets across value chain.

Deloitte assisted large Iron Ore producer in the Northern Cape, South Africa to achieve the rated capacity of throughput by real-time integrated performance management. The process de-bottlenecking opportunities were identified through various data analytical tools and simulations programmes. Client was able to achieve the rated capacity of output and improved maintenance processes added additional production output.

### 4 Autonomous mining equipment (Australia)

An Australian open pit mining company, planned to introduce autonomous trucks into its mining fleet. Deloitte assisted client and leveraged its edge mining technology to drive programme management support including views on technology trends.

### 5 Mine of the future : Innovation programme (Canada)

Canadian deep level mining company tasked Deloitte with scoping and evaluating an "Autonomous and Electric Mine" transformation programme. Deloitte worked with the client's engineering team to redesign the mine as a fully autonomous mine with no people underground at a 30% reduction in emissions.





# References

Tracking the trends 2019, The top 10 issues transforming the future of mining, Deloitte, 2019 (<https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Energy-and-Resources/gx-er-tracking-the-trends-2019.pdf>)

Intelligent Mining: Delivering Real Value, 2018 <https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Energy-and-Resources/gx-intelligent-mining-mar-2018.pdf>

The Digital Revolution: Mining starts to reinvent the future, Deloitte, 2017 <https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Energy-and-Resources/deloitte-au-er-digital-revolution.pdf>

The Digital Mine: What does it mean for you?, Deloitte, 2017 <https://www2.deloitte.com/content/dam/Deloitte/au/Documents/energy-resources/deloitte-au-er-digital-mine-030817.pdf>

MIT Sloan Management Review and Deloitte Digital 2017

Designing Digital Organisations – Summary of survey findings, MIT Sloan Centre for Information Systems Research

“Strategy for New India@75” Niti Aayog, GoI

Report of the working group on mineral exploration & development <https://mines.gov.in/writereaddata/UploadFile/Sub%20Group%20I.pdf>

Plans to boost mineral output by 200% in next 7 years: Mines minister <https://economictimes.indiatimes.com/industry/indl-goods/svs/metals-mining/plans-to-boost-mineral-output-by-200-in-next-7-years-mines-minister/articleshow/71201789.cms?from=mdr>





**Andrew Swart**

Global Leader, Mining and Metal  
aswart@deloitte.ca



**Debasish Mishra**

India Leader, Energy, Resources  
and Industrial Products  
debmishra@deloitte.com



**Rakesh Surana**

India Leader, Mining and Metal  
rvsurana@deloitte.com

# Deloitte.

Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited, a UK private company limited by guarantee (“DTTL”), its network of member firms, and their related entities. DTTL and each of its member firms are legally separate and independent entities. DTTL (also referred to as “Deloitte Global”) does not provide services to clients. Please see [www.deloitte.com/about](http://www.deloitte.com/about) for a more detailed description of DTTL and its member firms.

This material and the information contained herein prepared by Deloitte Touche Tohmatsu India LLP (DTTI LLP) is intended to provide general information on a particular subject or subjects and is not an exhaustive treatment of such subject(s). This material contains information sourced from third party sites (external sites). DTTI LLP is not responsible for any loss whatsoever caused due to reliance placed on information sourced from such external sites. None of DTTI LLP, Deloitte Touche Tohmatsu Limited, its member firms, or their related entities (collectively, the “Deloitte Network”) is, by means of this material, rendering professional advice or services. The information is not intended to be relied upon as the sole basis for any decision which may affect you or your business. Before making any decision or taking any action that might affect your personal finances or business, you should consult a qualified professional adviser. In particular, it is clarified that DTTI LLP does not provide legal advice and you should consult your legal adviser to address any legal matters or questions of law or for seeking legal advice.

No entity in the Deloitte Network shall be responsible for any loss whatsoever sustained by any person who relies on this material.