The state of digital transformation in the South African mining industry

Ten insights into 4IR

2023

Our second study on how the Fourth Industrial Revolution is building value in our mining industry and where it's headed, including a focus on ESG

pwc

MANDELA MINING PRECINCT
MINDS FOR MINES

MINERALS COUNCIL
SOUTH AFRICA

Joint effort: PWC/MCSA/MMP RTIMS Programme

2021 Study – Digital and 4IR Maturity

2023 Study – Digital, 4IR and **ESG**

2022/23:

20+ **CEOs** have spoken

Their nominated Executives provided additional **practical** insights

Engaged 3 **Unions**

30+ Insights summarised into Ten

Qualitative and quantitative interviews and questionnaire

Contents

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Insight 1: Mining CEOs and their executives are being deliberate

The CEO guides while the C-Suite searches for value

The CEO is the strategic steward with focus on:

- Delivering on commitments made to shareholders and communities;
- Defining work across mining value chain - finding, mining, treating & trading;
- Carbon neutrality, renewable mines, improved resource & data-driven business strategies incorporating digital enablers; and
- The focus is on measurable value creation, i.e. tracking the real world benefits.

STRATEGY

EXECUTION

APPROACH

The Executive Team owns and expands the roadmap:

- Equal participation for all in operations = buy in;
- Trust in the leadership team is key to success and adoption of new digital tools;
- The entire management team are involved in the digital programme:
  - Developing the right culture;
  - Setting up the enabling environment;
  - Reducing duplication;
  - Expanding the roadmap;
  - Achieving the roadmap; and
  - Embedding environment for prediction, analysis and real time insights.

How to get there:

- Build your roadmap; and
- Realise you are on a journey.

Insight 1: Mining CEOs and their executives are being deliberate

Digital Champions do it on purpose:

- Nearly all respondents have programmes at various levels of maturity along the value chain with at least a portion at a digital champion level;

- Variations are driven by type of mining, and access to technology above ground is still easier than for underground mining;

- However, the complexity of integrating new technologies into legacy systems has forced miners to identify new revenue models and leverage existing infrastructure; and

- Advancements in technology means the roadmap is never static - our respondents have all developed roadmaps that extend beyond 2025.

Digital novice	• We are seeing a change from 'digital only' projects to 'every project embeds digital'
Digital follower	• Followers are starting to see the value of 4iR and digital (in silos) but it is not yet embedded into strategy
Digital innovator	• There is rise of ecosystems and connected practices backed by a strategy that explicitly utilises digital tools
Digital champion	• Our three digital champions seek mastery of connected digital ecosystems weaving 4IR, innovation, and technology into the critical elements of the future of mining
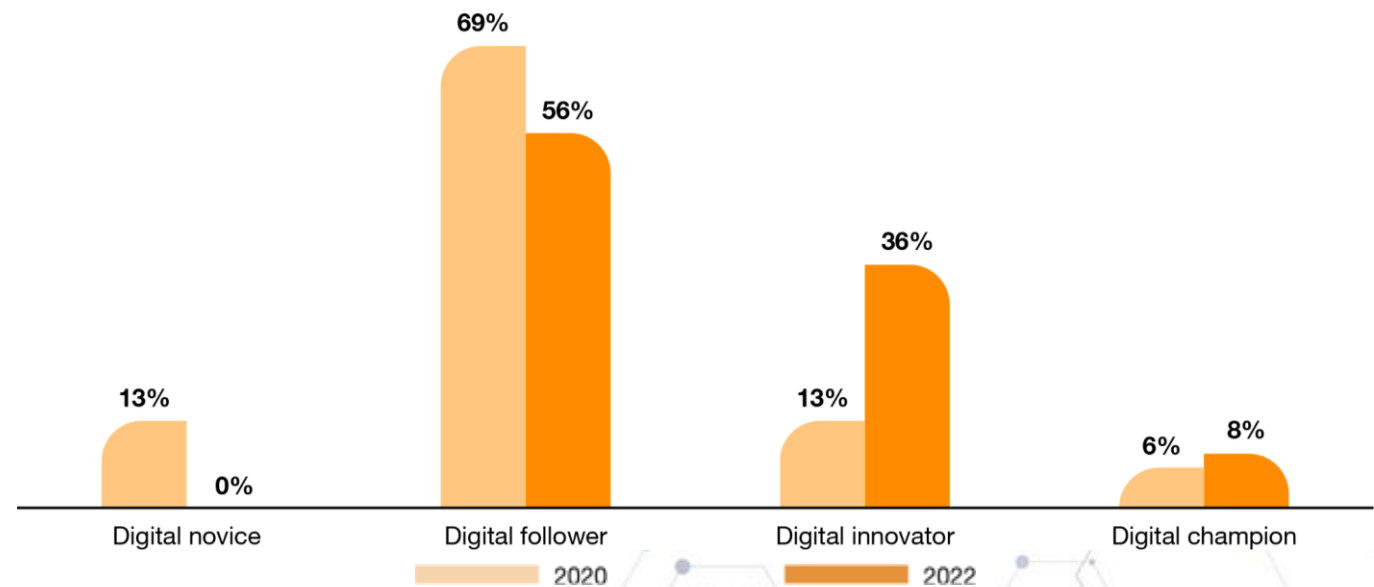
Figure 1: Digital maturity levels (2020 vs 2022)

Mining companies have set a pace that service/solution providers need to engage with;

Service/solution providers are part of a broader ecosystem whether they like it or not (ESG);

Mining companies need to report/deliver on ESG – how do service/solution providers help them achieve this;

Data is king but what about value creation;

Roadmaps are dynamic;

Integration and legacy systems (technical debt) an issue;

Where are service/solutions providers on the maturity curve if no miners are digital novices?

Insight 2: Technology is being applied where it has the greatest measurable benefit

Key drivers to consider for going digital in mining:

- Older mines can struggle with digital transformation (legacy systems)
- New mines are designed with digital in mind - upfront
- Lack of qualified resources
- Resistance to change from the workforce

Key Initiatives miners are focusing on

- Integrated reporting;
- Integrated mine planning;
- Logistics automation;
- Digitally optimised supply chains,
- Integrated source-to-pay and finance functions;
- HR standardisation, digital training and skills development; and
- Underwritten by platforms within the business used to promote & share innovations.

Figure 2: Where are you on the journey to digital transformation?

Insight 2: Technology is being applied where it has the greatest measurable benefit

1

How is value defined?

- 'Proper integration - driving for value', and 'Return in value either through cost saving or increasing returns. Not only short-term returns.'
- Miners have not yet fully quantified non-financial value from perspective of stakeholders, employees and community members

2

The value of digital transformation is primarily:

- Visibility and transparency (#1);
- Reduction of bureaucracy (#2); and
- Ultimately the ability to make better decisions (the biggest benefit in 3-5 years)

3

Digital is helping miners to:

- Move away from historic siloed ways of working;
- Change the way people think (give them context); and
- Empower people to be successful together
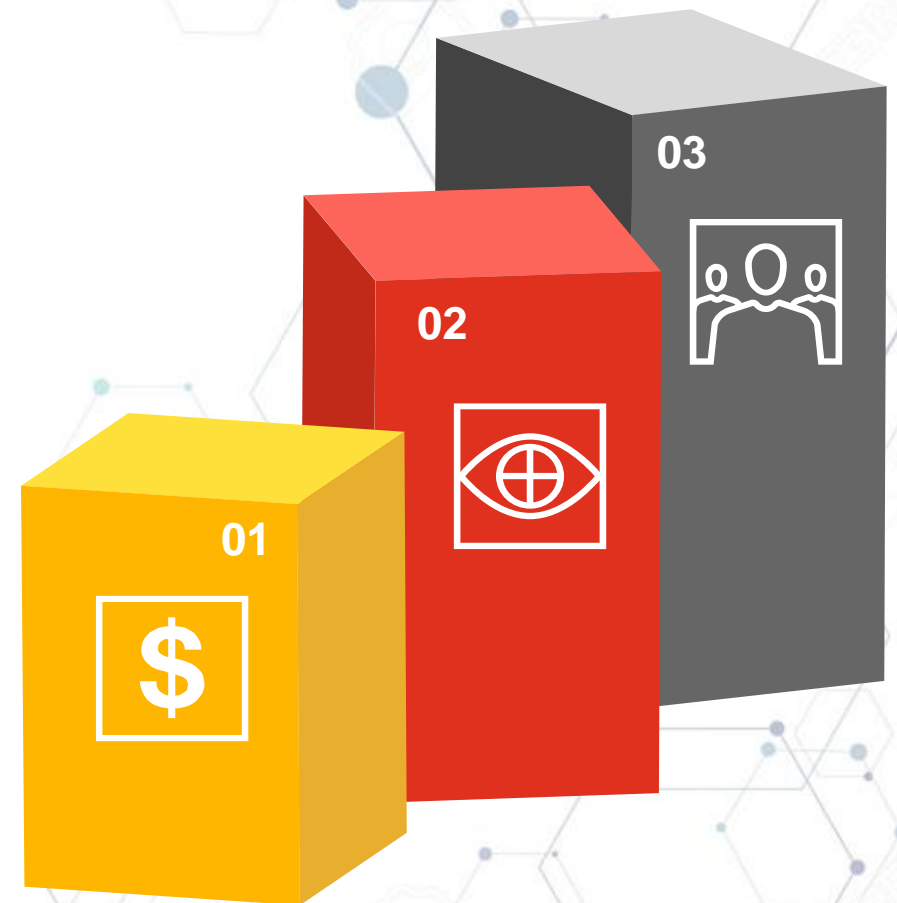
Miners are driving the innovation agenda stronger than before;

They know what they want but need help to frame/design the solution;

Value comes from standardised solutions;

Eliminate point solutioning – think across value chain and dependencies;

Help empower the workforce;

Miners have/are being exposed to the tools that help them decide about the challenges (value determination; access to knowledge

Insight 6: We are up to the challenge & have the tools we need to win

" We have spent the last three years gatekeeping and getting people to go to work and get to the face for production "

SA Miners are not satisfied with progress in digital - there is more to be had from the 4IR:

- We have done a lot, but we could have done better:
  - Safety - our fatal incidents (around 108 per annum) are 50% higher than the global mining average among ICMM members;
  - Operations are still 'archaic' - people dependent, behaviour dependent and nowhere near autonomous decision making;
  - OEMs are slow to adopt 4iR technologies - safety systems like proximity detection should be offered with the hardware (not left to mines to integrate).
- We struggle as miners to generate actionable information that is easily consumed by leadership;
- It has become evident that it is immensely complicated to distil information down to pieces of data that are useful in a specific context;
- It takes time and data to start achieving meaningful results - expecting maturity of the first of these platforms in 2025 according to the interviews;
- What to watch out for: make sure the right data is included in your model (be deliberate).

Insight 6: We are up to the challenge & have the tools we need to win

Adoption remains a challenge and the traditional mining process persists:

- Without mature internal capabilities in digital these programs can drive dependency on external experience & complicate adoption and change management,
- Digital has made an enormous impact across three areas of mining:
 - Safety
  - Projects such as digital twinning
  - Processing (automating and digitising processing plants)
- Asset management has transformed due to the availability of data;
- AR/VR training tools are prevalent and are improving on the job safety;
- IoT is implemented by half our respondents and the other half are in pilot stage;
- Predictive maintenance largest challenge outside of sensors and ICT is the OEM itself.

	Planned within 5 years	Piloted	Implemented	Don't know/Not applicable	Not planned
Artificial intelligence (AI/ML)	50%	25%		25%	
Connectivity / Industrial Internet of Things		50%	50%		
Mining Execution Systems (MES)	25%	25%	50%		
Collaborative robots, smart robots, robotic process automation (RPA)	50%		25%	25%	
Virtual reality/Augmented reality solutions, e.g. smart wearables in use in operating environments to supplement skills at point of execution	50%	25%			25%
Virtual reality or augmented reality in use to optimise training for staff			100%		
Digital twin of critical equipment within processing or mining environments	75%			25%	
Condition monitoring (temperature, pressure, vibration etc.) on key equipment			100%		
Predictive maintenance of assets and equipment		50%	25%	25%	
Integrated end-to-end supply chain planning	75%				25%
Blockchain technology	50%				50%

Figure 5: To what extent have you implemented

Insight 6: We are up to the challenge & have the tools we need to win

We need one voice to enact real change:

- Miners are great contributors to South Africa, supplementing government services in places

- The 'good' is not fully recognised by the public

- This has given rise to further expectations - unrealistic expectations?

- **Our respondents feel that there is a need to define mining in the modern context alongside the right social partners (labour, communities, regulators)**

- The unanimous choice of medium for this discourse was the Minerals Council of South Africa - the trusted face of SA Mining.

- **On the technical side the same goes for standards in technology led by Mandela Mining Precinct.**
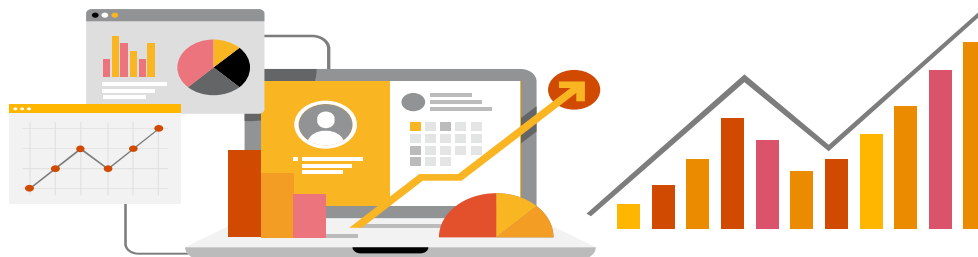
We are all feeling anxiety as we address South Africa's challenges:

- SA is less attractive as an investment destination due to energy, rail, water, transport, security and port issues
- Mining CEOs are concerned about the lack of political will to deal with crime & a failing legal system.
- On top of these challenges CEOs face social and digital tension as we transform to new ways of working.
- The two single biggest challenges the CEOs are facing are:
  - Regulations - because safety and regulation are linked and we need strengthened regulations to 'force' long term thinking; and
  - The cost of Labour because SA was "losing its competitive edge on the international stage"
- The mining leaders discussed:
  - Working together through a common industry body - the Minerals Council - to effect change; and
  - Integration of bulk water, mining, energy, transport, education and labour systems

How can service/solution providers adapt/adjust to meeting the needs of miners?
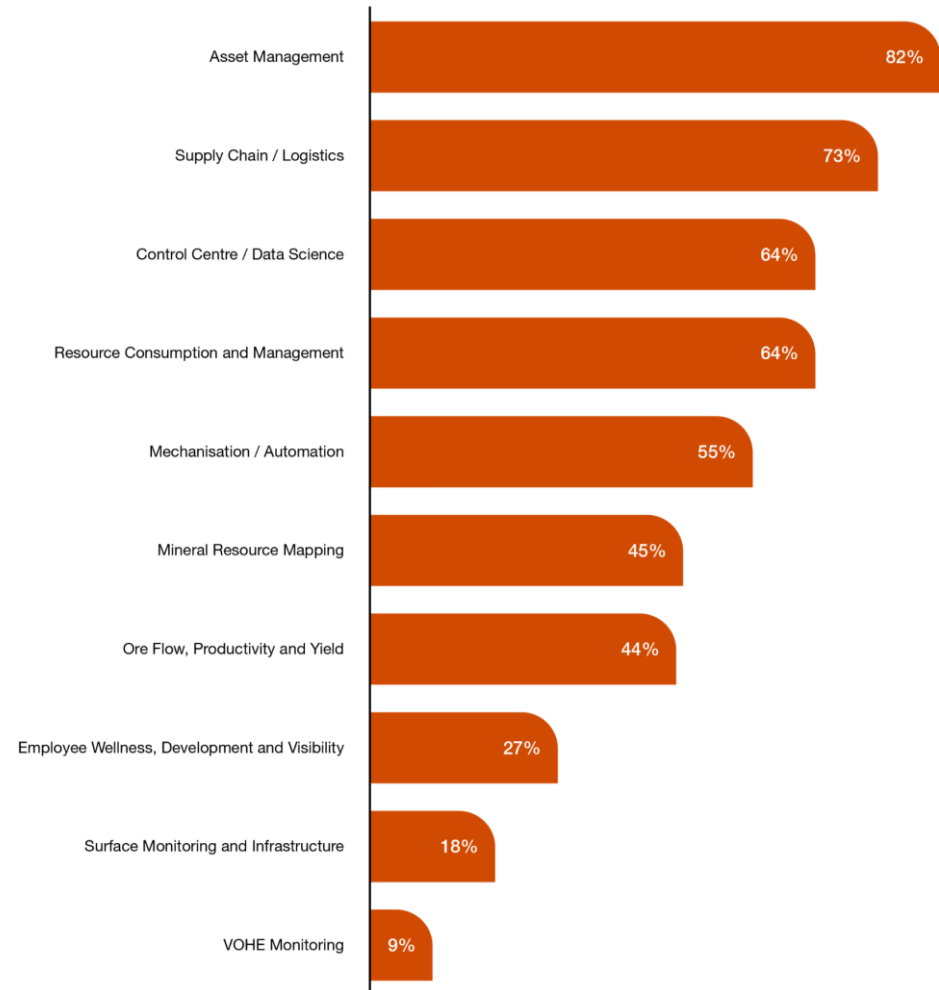
Ecosystem participation, e.g. engagement with Mandela Mining Precinct;

Improve across-the-board (true) collaboration;

Develop and enhance the Talent Pool – future-skilling;

Advance TRLs quicker… Adoption…

82% *of our respondents are looking for value in asset management*

Category	Percentage
Asset Management	82%
Supply Chain / Logistics	73%
Control Centre / Data Science	64%
Resource Consumption and Management	64%
Mechanisation / Automation	55%
Mineral Resource Mapping	45%
Ore Flow, Productivity and Yield	44%
Employee Wellness, Development and Visibility	27%
Surface Monitoring and Infrastructure	18%
VOHE Monitoring	9%

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