



In partnership with



The Future Of Mining | Technology

July 2021

Foreword

Welcome to the third and final report in our series exploring the Future of Mining in Africa, in collaboration with Africa Legal, the leading online thought-leadership platform for professional services in Africa. In this series of reports we have surveyed more than 400 professionals across the mining community and interviewed some of the world's leading mining experts on how topics including diversity and sustainability are critical to making the mining industry fit for the 21st century.

This concluding part focuses on the impact of technology in shaping the mining sector and the potential for innovation to transform the way mines operate in the future. We examine how technology can help mining companies achieve greater diversity and sustainability, as well as identifying the innovation bottlenecks that hinder faster adoption for African mining operations and contemplating the future that can make mining safer and more efficient while reducing its overall impact on the environment.

The influence of technology on the future of mining has vast potential. With the adoption of deep technology such as data analytics, robotics, automation and artificial intelligence, mining companies can start to develop new ways of extracting minerals in remote locations, improve health and safety practices, and drive the transition to renewable energy. As mines across the continent mature and drilling becomes harder, technology will extend mine life by enabling existing resources to be maximised, and new development assets to be found, and unlock greater value for all stakeholders.

Research and development is currently ongoing around the world to push the envelope of what is possible for the future of mining—from fully autonomous mines with driverless vehicles and robotic machinery to innovation that can reduce waste by repurposing mining byproducts for other commercial uses. The possibilities that are opened up by deep tech adoption and the desire to continue to innovate, are truly exciting and promise to be genuinely transformative.

Technology is also helping the mining industry become more inclusive. Our first report highlighted the importance to the industry of continuing to look for diversity, in particular diversity away from the workforce that traditionally has been the mainstay of mining operations.

Technology helps drive increased female participation in the workforce, and can also make the mining industry more attractive to younger people, through a wider range of roles outside of those perceived as traditional mining roles.

The adoption of some technologies will also change the nature of the employment opportunities available. The roles associated with them will be at a higher skill level. This will reduce the number of opportunities for traditional employment levels in lower skilled roles, which can impact on the desire for them to be embraced in some African jurisdictions. However, from a long term perspective, it will also create opportunities for local communities to train in new technologies and help close the skills gap on the continent.

At a time when environmental performance and awareness is under such great scrutiny for the global economy, technology can also support the reduction of the environmental impact of mining operations. Stability of power supply is a constant challenge in the transition to low carbon alternatives, and innovation is critical to further develop the use of purely renewable energy as a reliable power source.

We hope you have enjoyed our series on the Future of Mining in Africa, and that the reports generate further discussion, thoughts, and ideas. The data and insights featured in our reports have highlighted that diversity, sustainability, and technology are intimately linked, and embracing all three areas is fundamental to the future success and longevity of the mining sector.

Matthew Johnson

Partner and Global Head of Mining

About us

Hogan Lovells is a pre-eminent full-service global law firm with 50 offices worldwide. We have a deep understanding of and passion for Africa and have been active on the continent for over 40 years, working with international and local clients in the public, DFI and private sectors. Our lawyers are considered trusted advisers with the experience, knowledge and local understanding to navigate complex and challenging business issues. We have a dedicated Africa team that stretches from our office in Johannesburg, across EMEA and to The Americas and Asia-Pacific. Within Africa, we work with a select group of leading local law firms to ensure that we deliver the best possible results and provide a service of the highest quality.

The Hogan Lovells mining practice provides the full spectrum of legal services to the mining sector in a wide range of areas; from financing, securities and transactions, to project development, commercial contracts, sales and

marketing arrangements, environmental, regulatory, and dispute resolution. Our clients include every type of stakeholder in a mining transaction project. Our extractive clients include both private and publicly traded mining companies engaged in a number of industries, including gold, copper, coal, iron, silver, nickel, diamond, uranium, and platinum.

Our mining lawyers operate out of the key international mining hubs and the strength of our team comes from our international network and ability to draw upon skills from all corners of the globe. We leverage our global expertise for the benefit of our clients and deploy integrated international deal teams wherever you need us.





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Africa Legal provides increased access to news, market insight, jobs and online courses via one integrated online platform for the African legal community around the world. Building on our established relationship, we are delighted to support Hogan Lovells in their desire to create visibility over core issues affecting the future of the mining sector and wish to thank our community for their willing participation.



The Great Enabler - How Technology Can Transform Africa's Mining Industry

Africa is abundant in natural resources. It is home to almost a third of the world's mineral reserves, 40% of the world's gold and as much as 90% of its chromium and platinum. Yet to unlock that resource richness, Africa's mining industry needs urgent modernisation.

Across our Future of Mining series, we have explored this need for greater diversity in the mining sector—from creating more opportunities for local workers, to providing a safer and more secure environment for women on site. We also explored the need for greater sustainability—from being more efficient,

to doing more to support and develop the communities where mining companies are operating. Underpinning all of this is technology.

Not only can it help provide jobs for local workers and improve female participation in the industry, deep tech help mines become more sustainable and have less impact on the local ecosystem. In this third and final report, we look at how technology is vital for driving the industry forward and the ways tech can reshape how African mining companies operate in the future and unlock the value of the continent's resources for the benefit of all.

Africa is home to **40%**
of the world's gold and
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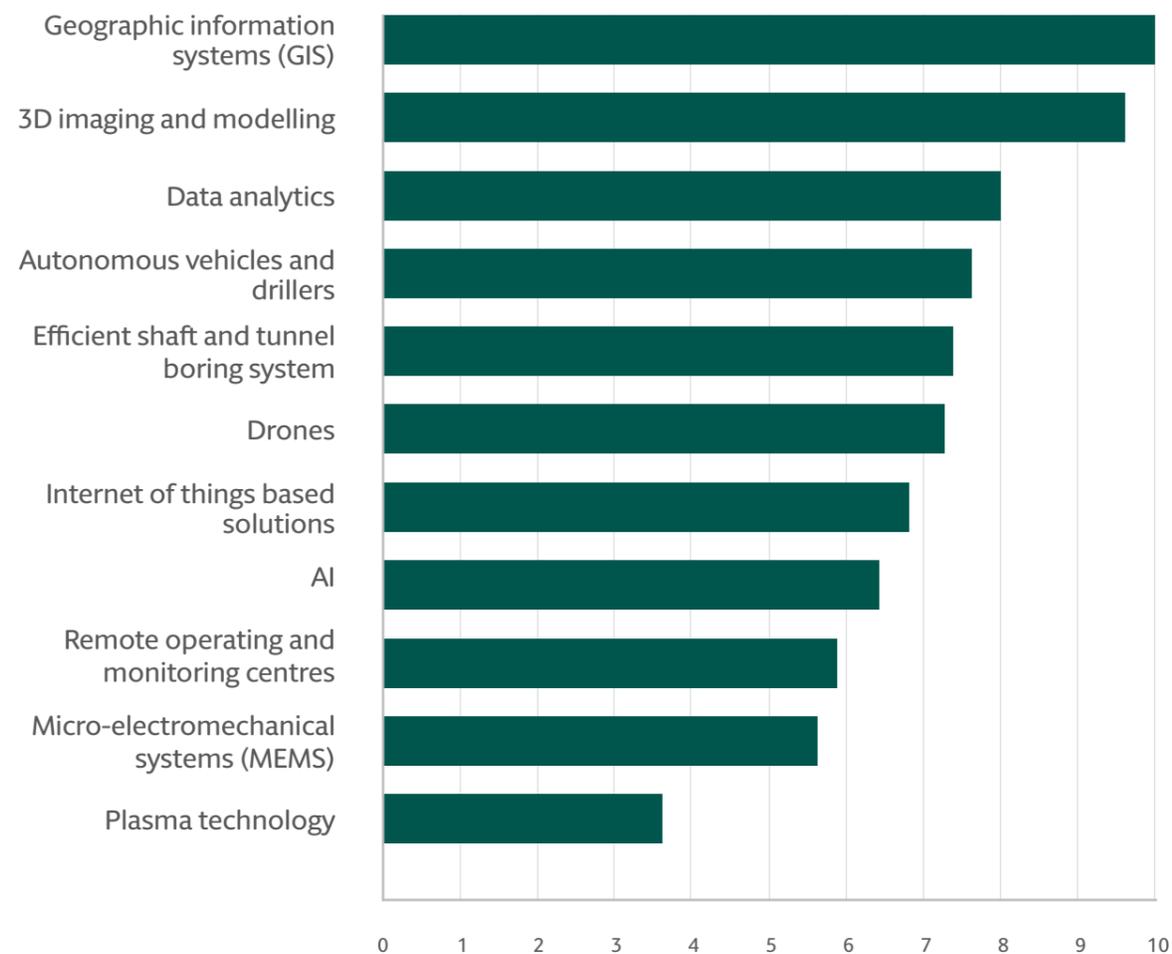


Current Realities

The survey findings show the technologies that have had the biggest impact on mining operations over the past decade are those that are more established—geographic information systems was ranked first, followed by 3D imaging and modelling, and then data analytics. But more advanced tech has also left a mark over the past 10 years.

Respondents ranked drone technology as having the fourth biggest impact, with autonomous vehicles and drillers ranked fifth. What that indicates is a slightly uneven pace of change, with some mining companies more willing to embrace next generation technologies that have the potential to transform the way the industry operates.

In your view, what technologies have impacted mining operations most significantly in the past 10 years?



Despite the huge potential for digital transformation in the mining industry—from making sites more efficient, to improving safety—change is not going to come easy for organisations that have deeply entrenched ways of operating.

“There are those that are onboard and those that have not been onboard that are starting to wake up, but many organisations don’t have the right people to help them make this change,” said Alex Atkins, a non-executive director at Australian mining companies Perenti and Strandline Resources.

“It’s a massive mindset shift— they need to work with young ‘digital natives’ and they need people from outside of the industry to help them on the journey. It’s very difficult for some on the inside to let go of those control levers and their influence over the organisation. It’s a shift from command and control to a collaborative ecosystem. It requires a shift in risk appetite as experimentation is required when you are inventing something new.”

While there are many industries that are further along the tech adoption curve than mining, Gareth Morgan, founder and Chief Executive of satellite analytics company Terrabotics, says the oil and gas sector could serve as a benchmark for mining companies to follow.

“The oil and gas sector has huge similarities with the mining sector, but there is a notable difference between both sectors when it comes to the appetite and drive for adopting new technologies,” he said. “Every major oil and gas company not only has an innovation department but they also explicitly have a Silicon Valley-style venture capital arm for external tech start-up investing. Mining companies just aren’t doing this to the same extent—they might have some kind of venture unit, but it is primarily focused on investing in new mining projects, not external tech companies, there’s not even a mindset to scout for technology solutions in the same way.”

Current Realities

Technology is also going to have a significant impact on the ability of mining companies to be more sustainable. As indicated in our previous 'Future of Mining - Sustainability' research project, when asked what had been the key drivers towards sustainability in African mining to date, survey respondents ranked technology as the third most important factor behind government policies and corporate culture. When asked to think ahead and consider

future drivers of sustainability, 'standard technology' was ranked eighth out of 10 factors, however 'deep technology' was ranked fifth. That suggests standard tech has driven the sustainability agenda as far as possible and more solutions such as artificial intelligence (AI), machine learning and intuitive data analytics will be required to take it to the next level.

Industry insights

Q&A with Gareth Morgan

Founder & Chief Executive, Terrabotics

To what extent do budget constraints impact how mining companies adopt technology?

"It's not like they don't have the budgets, but it's generally quite a conservative industry and so it's more about the rocks than the tech. Tech is often just an afterthought, so although it feels like the budgets should be there, there's often inertia to adopting new technologies or even just changing existing workflows and ways of doing things rather than taking time out of what you're doing and spending money on doing something different to business-as-usual."

Do new entrants have an advantage over traditional mining companies when deploying technology?

"Legacy operations are built to a specific mine plan and the technology is chosen at the early stages and they stick to it—so if you're a legacy operation you might be working on a decades-long mine plan and there's very little room for manoeuvre to introduce new things when you're talking about machinery, equipment and mechanisation. But with digital technologies, software-based deep technology and internet of things-

type sensors, that can really be superimposed on top of any operation, especially when you've got cloud-based digital services—that's the beauty of those types of technologies."

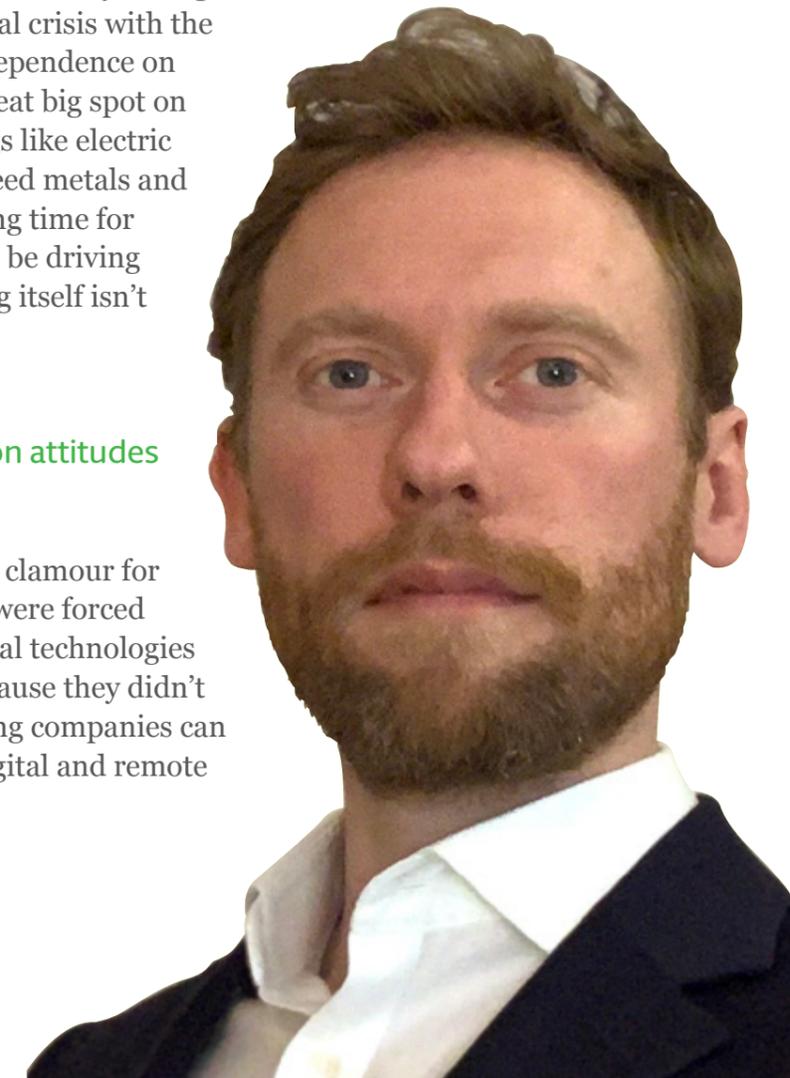
What are the key challenges mining companies face when seeking to adopt technology?

"It's an industry that is very susceptible to the commodities cycle, so there's a boom and bust, and then budgets get cut. But oil and gas has the same thing, and often you will see more innovation in the oil and gas sector during the collapse of the cycle because people are suddenly willing to listen to new and more efficient ways of doing things, and that's where technology can step in.

It's also interesting looking at mining because we're in this interesting period right now where perhaps more than ever before you've got the energy sector going through an existential crisis with the energy transition and the reduction in dependence on hydrocarbons, and that opens up this great big spot on the stage for mining to step in. For things like electric vehicles, wind turbines and solar, you need metals and all the related materials, so it's an exciting time for mining. But ironically, while mining will be driving the future big technology themes, mining itself isn't technology driven."

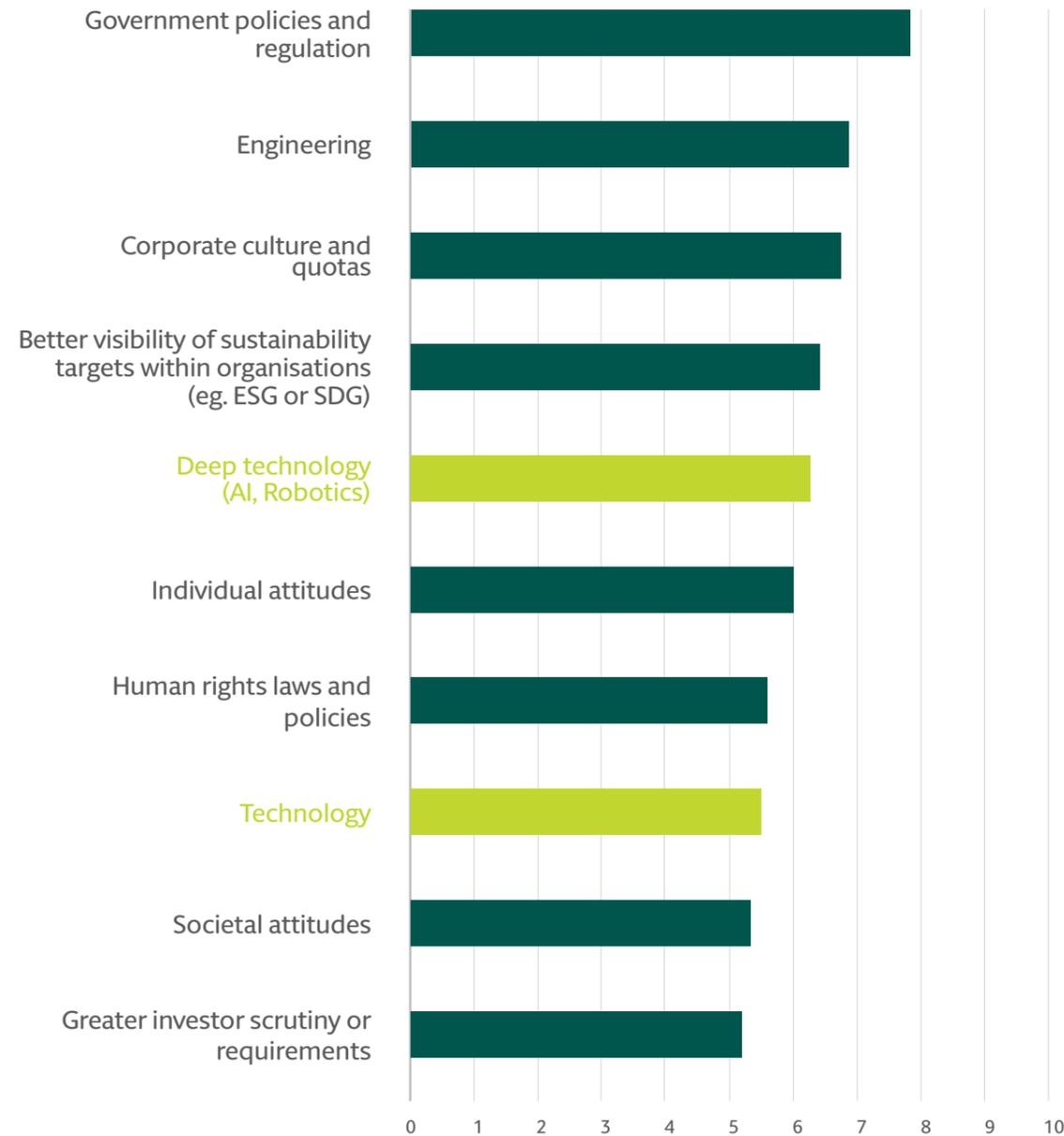
What impact has the pandemic had on attitudes towards technology?

"During Covid there was suddenly a real clamour for the use of new technology because they were forced to be remote, that's allowed people to trial technologies they weren't prepared to trial before because they didn't really have to, so it has shown that mining companies can find things for people to do in a more digital and remote way."

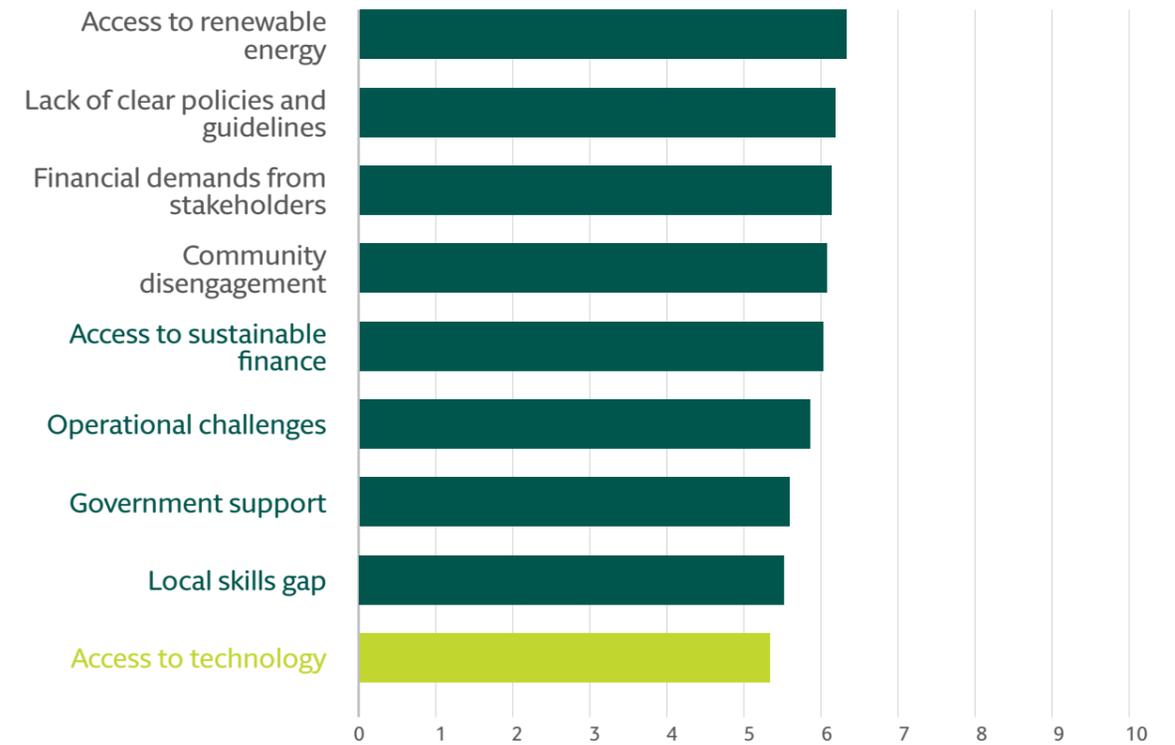


Current Realities

What in your view, is the most important influencer(s) to improve sustainability in mining going forward?



What have been the biggest hurdles the mining sector has faced to date in improving sustainability?



The African mining industry can also look to efforts elsewhere in the world where mining organisations are utilising tech to improve the sustainability of their operations. Take Canada's Copper Mountain Mining Corporation, for example. It has partnered with MineSense Technologies, whose tech measures and reports ore grades and characteristics, meaning more economic ore can be

recovered from waste rock and more waste rock can be removed from economic ore.

Other mining companies are looking at ways to reuse by-products. For instance, Rio Tinto is taking part in a European-funded innovation project to help convert bauxite residue into aggregates that can be used to make other products, such as concrete, tiles and insulation.

Industry insights

Q&A with Candice Pillay

Legal Principal: Mining Regulatory, Anglo American

What are the key ways tech innovation has changed the mining industry?

“The key way tech has changed the mining industry is through sustainability—having a smaller footprint, less environmental disturbance, a lower impact on the physical environment and in time, hopefully fewer relocations. And improvements in technology also have a positive impact on aspects like efficiency in energy use and the introduction of new types of energy, like green hydrogen.”

What new tech can make the biggest impact on sustainability in the future?

“We’ve done a lot of work in the microwave space where we are using microwave technology to precondition rock. The process of using microwave technology to precondition rock significantly reduces the energy needed to weaken or break down the natural rock face at the earliest stage, before it is mechanically crushed and milled. The microwave treatment is far less energy intensive when liberating, crushing and milling the rock. Advancements in the use of hydrogen are also worth mentioning, the transition to a low carbon world is an opportunity to drive the development of cleaner technologies.”



What other industries can the mining industry draw lessons from in terms of tech adoption?

“For me, the advances that are made in healthcare and internal surgery specifically are really quite exciting, especially if you’re talking about robot assisted surgery, the use of data to improve diagnostics and the use of virtual reality and augmented reality to improve training and remote consultation. Similarly, the use of robotics in the mining process is a game changer, especially when you talk about the health and safety of employees when accessing remote and difficult to reach ore bodies.”



Jessica Black Livingston

Counsel, Hogan Lovells,
Denver

What are the key ways tech innovation has changed the mining industry?

“There has certainly been a large push for automation and digitisation of mining operations. Automation and digitisation help allow mining companies to realise their full potential, operate more

efficiently and ensure that they are working smarter and safer. For example, 3D modelling, virtual reality and augmented reality allow mining companies to visualise mine systems and use geo-spatial data to virtually construct buildings, plants and mines, as well as to train miners, solve problems, generate reports and monitor facilities and tailings dams, among myriad other uses. Smart data and machine learning can be used to improve operational efficiency, mine safety and production workflow, generating data-driven analytics that help maximise productivity and efficiency. And drones and unmanned aerial systems can map and surveil areas in record time, create time-lapse records of operations, measure inventory and manage assets.”

How important is tech for driving business growth for mining companies?

“The transformative power of technology has made it integral to many businesses’ growth plans: the deployment of technology is a core part of their growth strategy. But the growth potential with new technologies comes with risks, and many companies are not actively considering how to prevent and mitigate risks associated with technology failures. Businesses today have to deploy technology quickly—and that increases the likelihood of its failure. Social media provides an outlet for whistleblowing and allows bad news to travel fast—and that increases the likelihood of exposure. Data privacy laws are tighter and complicated across various jurisdictions. Key among the risks of technological innovation is cybersecurity. Mining companies face significant vulnerabilities and cyber risk if they have not adequately evaluated and protected not only their IT systems, but also their operational technology, such as SCADA systems.”

To what extent has Covid impacted attitudes towards tech in the mining industry?

“By and large, I think Covid has brought to the forefront a lot of the technological issues that we’ve struggled with for the past several years. The challenges of remote working—from a tech perspective such as access to the right equipment, Wi-Fi and internet connectivity—and the significant benefits as well, such as efficiency of human capital, general ease of communications with tools such as Zoom and Teams. One thing a lot of companies struggled with because of Covid was IT security. Tons of employees working remotely, accessing confidential materials from personal laptops or unsecure networks.

Mining companies that have already digitised some of their processes and workflow streams are familiar with the need to ensure top-level cybersecurity protocols are in place. But we saw an enormous upswing in cyber-attacks, including attacks on critical infrastructure that previously were not the main target of hackers. So although Covid has brought a general realisation that tech is a useful tool to help create efficiencies and innovation, we have to be very careful to recognise and address the risks too.”



Innovation Bottlenecks

Tefo Setlhare

Debswana, Entrepreneurship & Enterprise Development Programme lead.

There are a number of constraints that make it difficult for the African mining industry to be on the front foot when it comes to the adoption of technology, says Tefo Setlhare, lead of the entrepreneurship and enterprise development programme at Debswana Diamond Company in Botswana.

“In some areas such as financial services Africa has done very well and is possibly ahead of the curve when it comes to technology, but the same is not true for mining,” said Setlhare. “One of the constraints is connectivity—for things like AI and machine learning, you need sufficient bandwidth and connectivity infrastructure, and that is something we struggle with in Africa. And combined with that, there’s a large power interruption risk in Africa which also constrains technological advancement.”

Survey respondents said the biggest hurdle to deploying and utilising new technologies is having the skills to develop and deploy the technology, followed by unionisation and job protection, and then inflexible workers—or rather, people who are reluctant to embrace change.

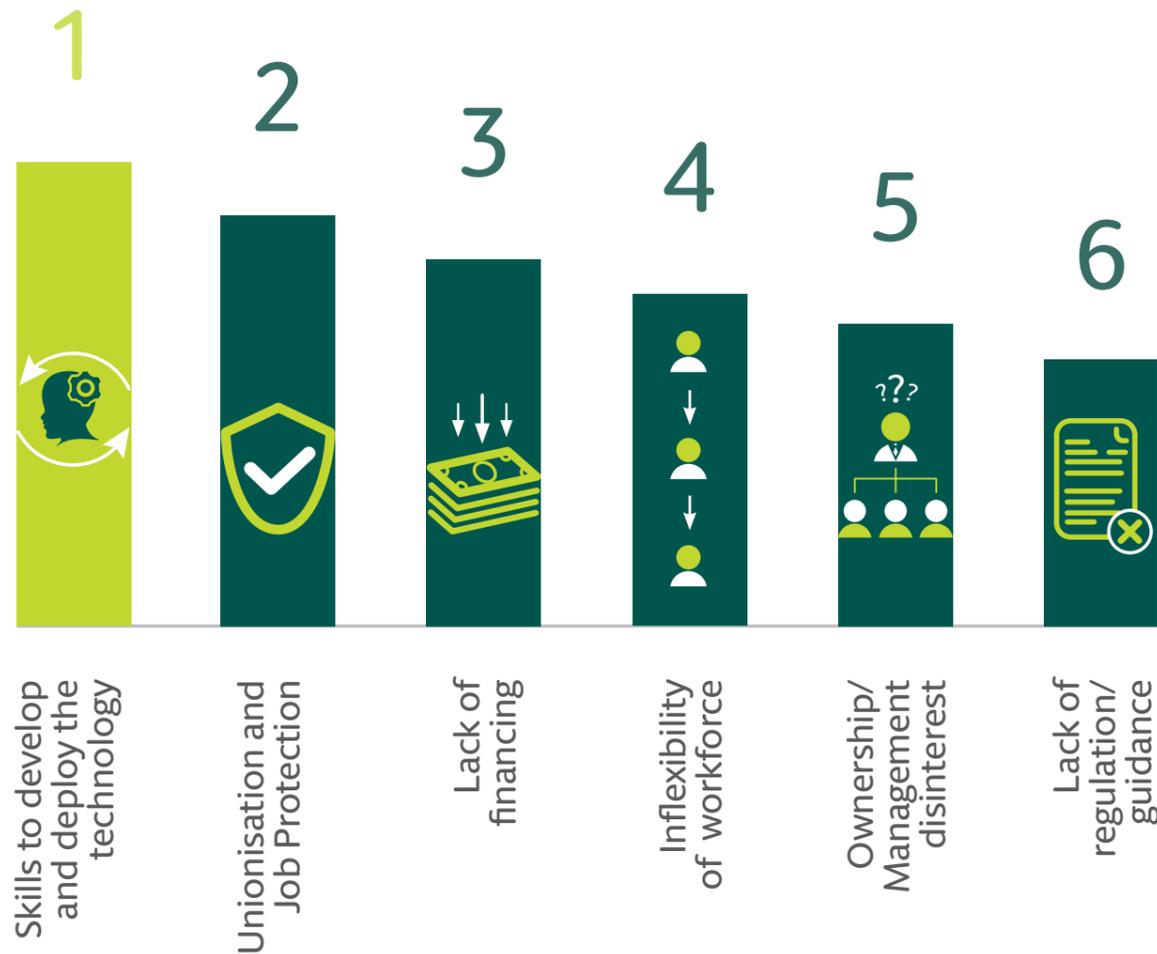
“In some areas such as financial services Africa has done very well and is possibly ahead of the curve when it comes to technology, but the same is not true for mining.”



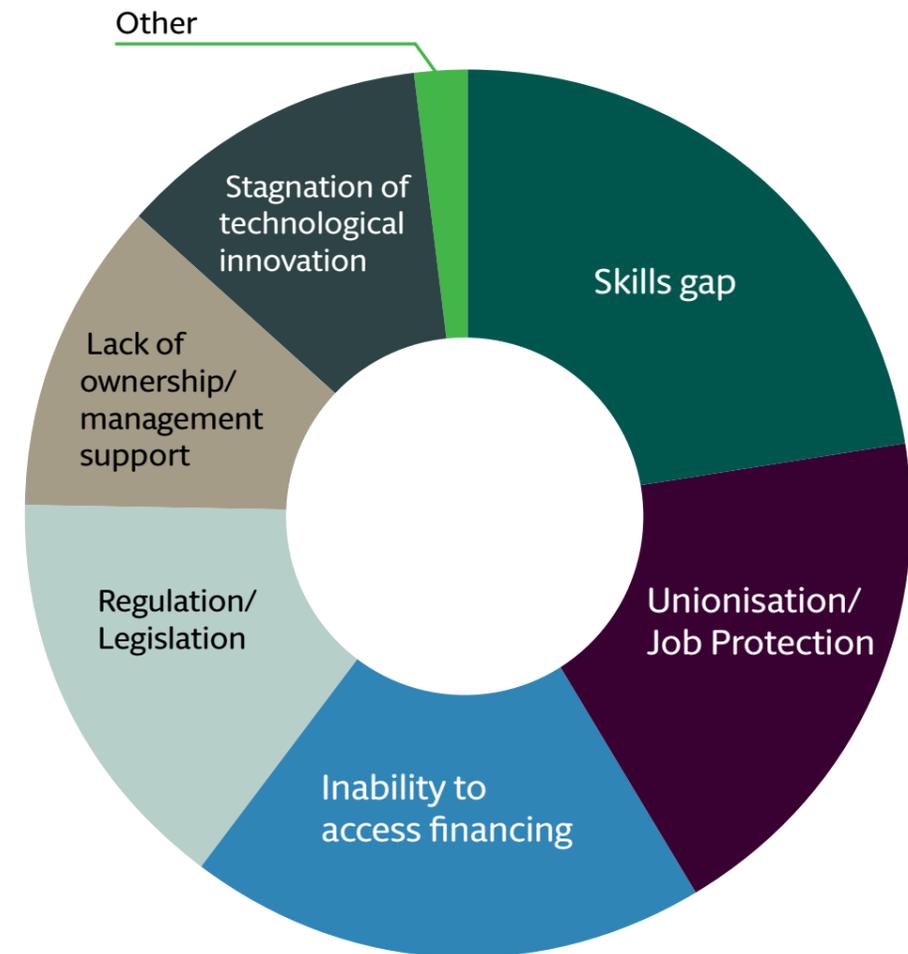
Innovation Bottlenecks

The survey also showed that almost 69% of respondents believe skills gaps are the greatest future risk to further technological integration in the mining industry.

What are the greatest hurdles in ensuring proper deployment and beneficial utilisation of technology in the mining sector?



What are the future risks for further tech integration?



The lack of skills, however, shouldn't be seen as a barrier to adopting technology, says Morgan.

"Technology can create opportunities to upskill the workforce in more technical skills to participate in some of these new technologies," he said. "That doesn't mean everyone has to have a PhD in something, but just to be able to, for example, help deploy and maintain internet-of-things sensors. So there will be new job opportunities, but there has to be a drive to make that case." One way mining companies in Africa can help plug these

skills gaps on the continent is by hiring and training more local people in the communities where those companies are operating. "A lot of these communities have been left behind in terms of advancement, and the only way for them to catch up is through technology," said Setlhare. "Mining companies need to provide basic technology and entrepreneurship training and they also need to ensure that when they are subcontracting work, that those subcontractors employ people from these communities so they can get the skills and start moving up the ladder."



Kevin Pietersen

Partner, Hogan Lovells,
Johannesburg

What are the main challenges mining companies face when adopting technology?

“Mining companies rely on local communities as a labour resource. The areas where most mines are located have an education system that is lacking to cover the new age jobs that are technology

focused. This presents difficulties for on-the-job training for new jobs that would otherwise benefit the local communities. Another issue is that adopting technology will in most instances result in loss of jobs, as current employees are linked to the way the mining company runs. It is easy for emotional and political stances to cloud decision making on adoption of technology, which should be grounded in facts, available data and business needs.”

What steps do mining companies need to take to overcome these bottlenecks?

“Collaboration is key. Mining companies can work together with universities by making use of the research that the university provides for the industry. Further, mining companies should work with civil society to educate and encourage STEM subjects to attract more of the local community to qualifications in fields relating to mining. The government also plays a key role, especially in developing countries. Oftentimes where there is large-scale mining, the government receives foreign direct investment. The government may then proactively create research and educational opportunities to increase the quality of the local workforce.”

How have you seen attitudes towards technology within mining companies and their communities change over time and how do you see that evolving in future?

“Companies are under pressure to operate in an environmentally friendly manner. This is key in obtaining a social licence to operate. The adoption of new technology is therefore a must have for mines as it presents several environmental friendly incentives including health and safety, carbon emissions and water impacts. Technology also presents efficient production for mining companies. This is a good incentive for them to adopt new technology, and dominant mining companies have already embraced technology in their operations.”



Innovation Bottlenecks

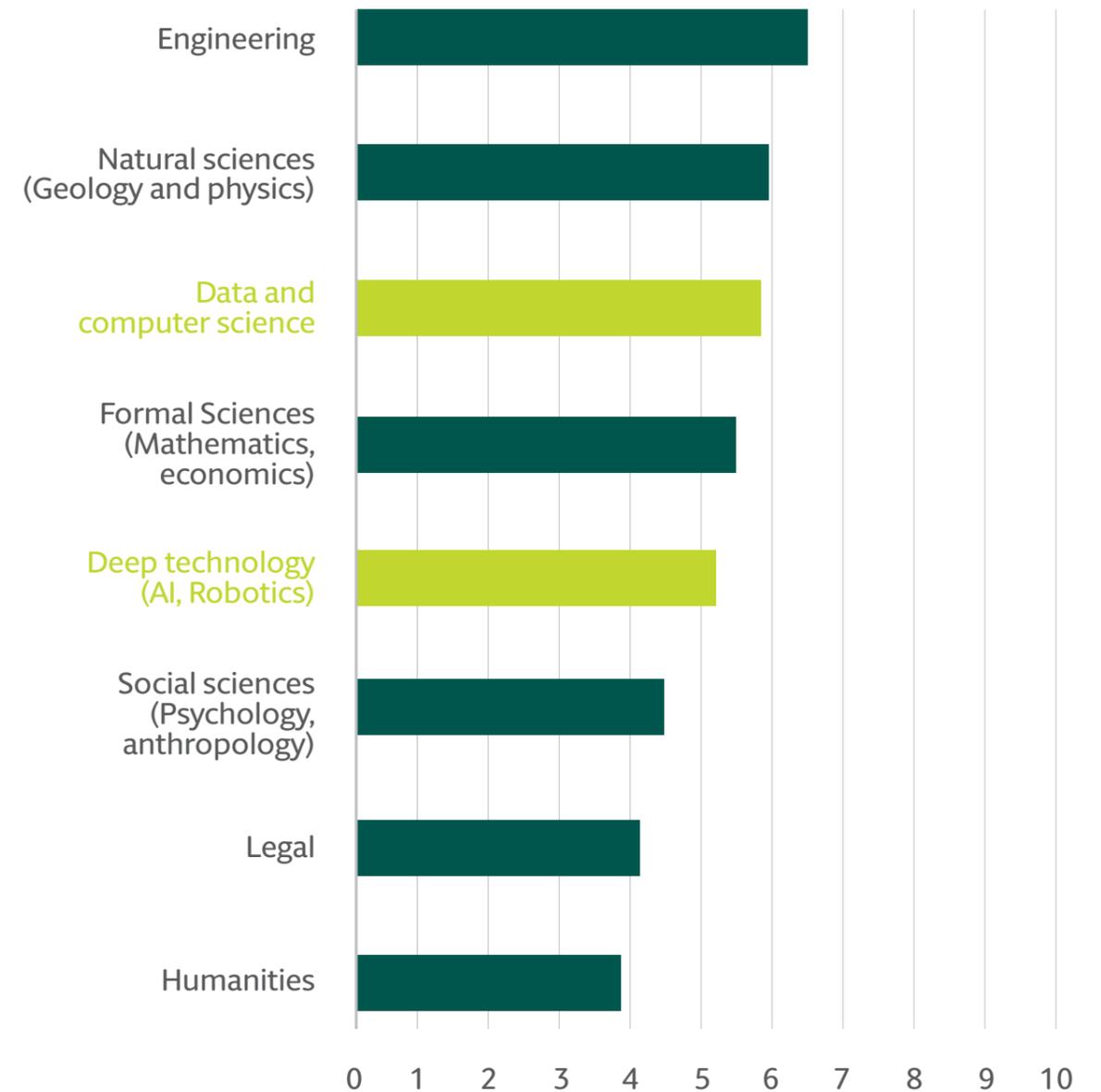
That potential to promote new skillsets can also drive diversity within what has traditionally been a very male-dominated industry. In our previous Future of Mining - Diversity report, survey respondents highlighted the importance of educational pathways and scholarships for driving diversity. By widening the routes into mining, that could potentially open the industry up to a broader range of talent with non-traditional, tech-focused skillsets. While survey respondents reckon engineering and natural sciences are the most important education backgrounds for graduates in the mining industry, there is also a growing need for tech-related disciplines. Data and

computer science graduates were ranked the third most important, with education in deep technology disciplines such as AI and robotics the fifth most important.

“The growing importance of environmental, social and governance (ESG) considerations is also creating opportunities for women in fields such as safety, humanities, environmental engineering and sciences,” said Alex Atkins, Non-Executive Director at Perenti and Strandline Resources. “ESG will become more ingrained into everything from strategy to the day-to-day activities of mining companies thanks to digital technology.”



What educational backdrops are most in need?



Industry insights

Q&A with Alex Atkins

Non-Executive Director, Perenti and Strandline Resources

To what extent can technology help improve diversity in the mining industry?

“I’m a mining engineer, geotechnical engineer and a geologist all in one—my career started on mine sites working in remote places where you had to fly in or drive in. When I had my first child I had to go—there was no flexible option for me. This is one of the misconceptions out there, people think women choose not to remain in their careers in the industry once they have children but it’s not because they choose, it’s a lack of choice—why would women do degrees that lock them into the industry, why do they spend so much time on sites making sacrifices and working hard to progress their careers, and then choose to leave?”

You’re not given a choice. So digital transformation is going to enable the greater inclusion of women and to give them more choice over how they can keep working in the industry once they have families or they have to care for an elderly parent or whatever it might be. Digital transformation is also starting to create a shift for the inclusion of the neurodiverse—such as people on the autism spectrum—as many are talented AI/machine learning and coding experts with potential to add enormous value.”



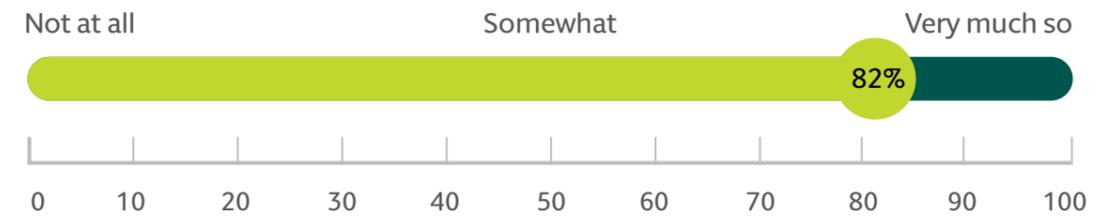
How critical is it for mining companies to adopt technology?

“It’s live or die. If you’re not on the journey you’re at a severe disadvantage because digital technology moves very fast and can completely change the business model. If you’re not positioning yourself as a player on a platform or to become the platform, you’re going to be a dinosaur within the next five to 10 years. It’s also about protecting the value of the organisation because you’re actually getting greater clarity and vision on how much things cost, what your process bottlenecks are, and what your value drivers are. As this information becomes clearer when you pull it all together at a remote operations centre, that enables you to think differently about the way mines can be optimised.”



Future Adaptability of Tech

Do you feel that technology has had a positive or negative affect on the mining sector?



Most survey respondents believe tech has had a positive impact on the industry to date. Now the focus is on what the mining industry will look like in the future—and that will largely hinge on how mining technology develops. For instance, the adoption of autonomous tech and remote operations could eventually allow mining companies to remove people from mines, allowing mining companies to be more aggressive in how they design their sites, says Atkins.

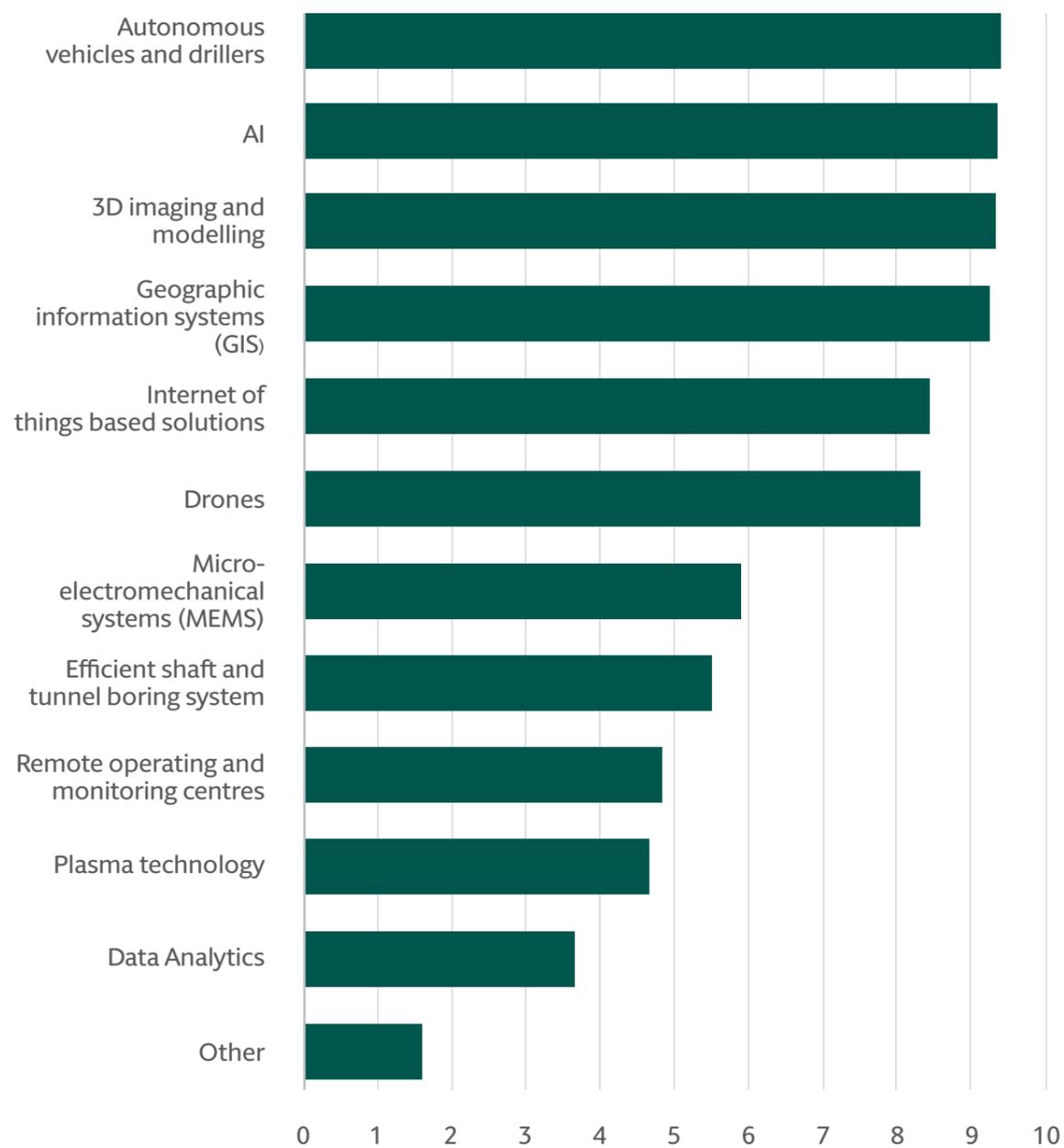
“If there are no people in the mine—and that’s probably more than 10 years away

for underground mining, which is the hardest to make fully autonomous—then we should be able to get more of the commodities out of the ground and not leave so much behind,” she said.

The survey showed that while geographic information systems will continue to have the most impact on mining, advanced technologies are going to play a bigger role. Survey respondents ranked autonomous vehicles and drillers second, followed by AI, 3D imaging and modelling and then internet of things-based tech.

Future Adaptability of Tech

What technology will impact mining most in the future?



Setlhare says Africa has a unique opportunity to become a global leader in mining technology, given that it has a lot of ageing mines that could be extended through tech development and making mines smarter.

“The need to prolong the life of African mines can help create tech entrepreneurs,” he said. “Take open-pit mines—they are possibly easier to mine in the beginning and then more difficult in the later stages. Where Africa has an opportunity to lead and innovate is with the transition from open-pit to underground. Mines have to be more willing to collaborate with young entrepreneurs, but entrepreneurs similarly need to identify the opportunities and understand that the mining value chain has more to it than just PPE (protective personal equipment).”

Another area where Africa has an opportunity to lead on mining is through the adoption of distributed ledger technology, says Setlhare.

“The greatest threat to Africa right now when it comes to minerals is the threat of synthetic substitutes that are being developed in labs,” he said. “Then there is the threat of dilution—there are minerals that are being extracted illegally and in a very unsafe way and it is easy for them to infiltrate the pipeline of authentic products. A technology like blockchain can help companies provide provenance and authenticate that the minerals were sourced ethically.”

Future Adaptability of Tech

Morgan reckons climate change concerns could force mining organisations to accelerate their use of technology.

“What is likely to happen is that the scrutiny the energy sector gets now on emissions is likely to shift to the mining sector as it’s activities become more in focus,” he said. “So the technology and innovation that is going on to help energy companies reduce and monitor their carbon emissions, that will move on to mining and there will be more investment in technology such as sensor tech, internet-of-things, drones and satellites to measure emissions coming off smelters and mining sites and so on.”

Technology could also potentially play a much greater role for improving relations with mining communities and other local stakeholders.

“How technology is going to help is primarily through communication—you can manage risk better and you can bring people along on a journey better if you’re

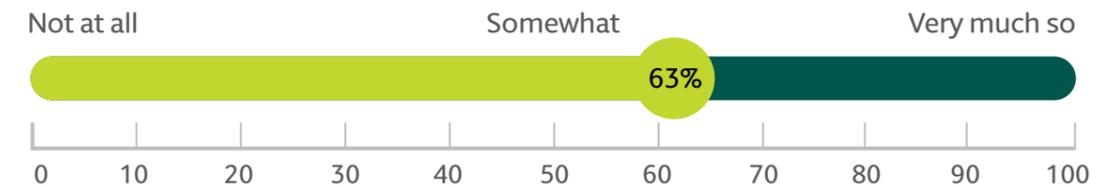
more transparent,” said Atkins.

“Processing and visualising data from all the operational technology can help paint a picture for the community to understand what is going on at a mine site or within a mining company or their supply chain, so it can help build trust.”

Mining investors are also expected to pay closer to attention to technology, with survey respondents saying they think it is more than somewhat likely that investment decisions will be driven by the rate of tech adoption at mining companies. That is likely to create winners and losers, says Atkins.

“A lot of investors will be working out which companies are on a journey to become zero carbon, fully autonomous with a fully optimised value chain and possibly putting bets on those,” she said. “They’ll also be looking to see who isn’t on that journey and potentially avoiding them—or shorting them.”

To what extent do you feel that the rate of technology adoption by mining companies drives investment decisions?





Ansie Menezes

Senior Associate, Hogan Lovells,
Johannesburg

In what ways will the adoption of deep tech change the way the mining industry operates in the future?

“Deep tech will impact on a number of aspects of mining. Two areas that are top of mind are labour and safety although

tech will likely have an even broader impact on the industry ranging from production volumes to cost per tonne mined. In South Africa mining is labour intensive currently with a combination of different skillsets required depending on the type of mine (opencast vs underground). If tech is properly deployed, the necessary labour complement should reduce dramatically and the skillset of miners will likely need to adapt. Another area that will likely be impacted positively will be safety. Although fatalities have reduced in the last few years, safety remains a top priority for the mining industry. Tech should be developed to ensure that mining becomes an even safer industry that is able to avoid placing miners in dangerous situations and still extract product from the ground.”

What will be the long-term impact on mining companies that don't invest in technology?

“With the world agenda driving a greener tomorrow, mining companies that do not invest in tech, not just in the greener space, will be left behind. Investors globally are looking to mining companies to mine responsibly, which includes not causing irreparable harm to the planet. Mining companies that do not adopt tech in the future will fall behind other mining companies and may lose any attractiveness to investors they may have possessed. One cannot expect better results—more with less—if they are unwilling to adopt tech. Properly deployed tech can reduce emissions, will make mining safer and tech could even enable mining companies to mine previously inaccessible areas.”

How can mining companies use tech to drive more diversity across the industry?

“As a result of the changes in the required skillset to utilise the deployed tech, women will no longer have a disadvantage entering into employment in the mining industry as the physical requirements can be levelled. If tech is properly deployed, the gender bias gap that exists in the mining industry can be narrowed. Further to this, one would expect that youth may well possess some of the skillsets required in the future and this may also bridge a gap in respect of youth employment in the industry.”



Conclusion

For the future of mining, technology is everything. From boosting diversity by making it easier for female participation in the workforce and attracting different skillsets, to improving the sustainability of mining operations, technology has the potential to change the industry for the better. Now with the advancement of deep tech such as AI and robotics, the industry is on the cusp of a digital revolution that could radically transform how mining companies operate.

Satellite imagery and machine learning tech can scout remote locations for potential mining sites. A future with robots entirely replacing humans mining underground is now a distinct possibility. Yet as this series of reports on the future of mining have outlined, much work still needs to be done to modernise the industry and embrace new ways of thinking—on diversity, on sustainability, and investing in technology.

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