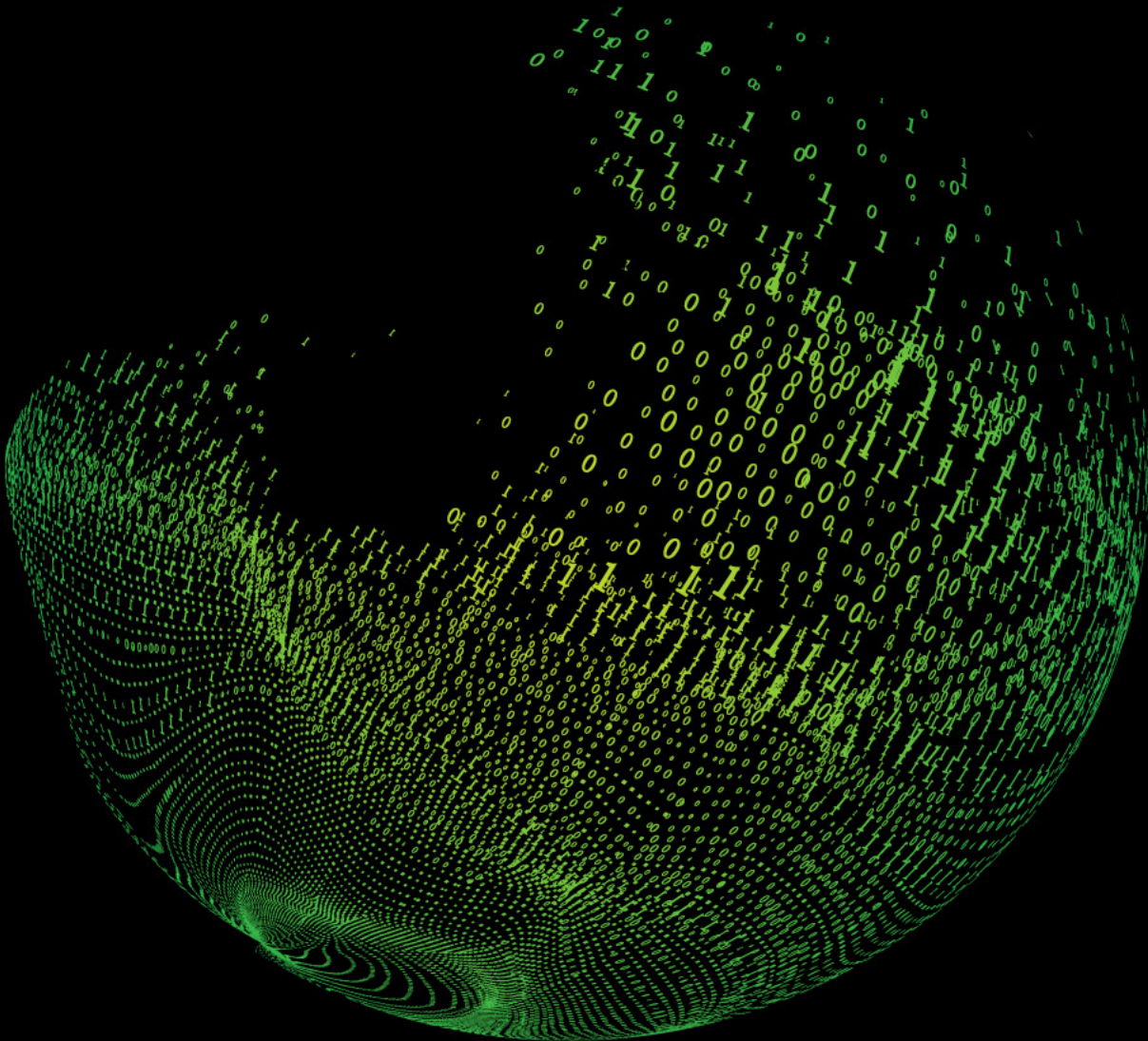
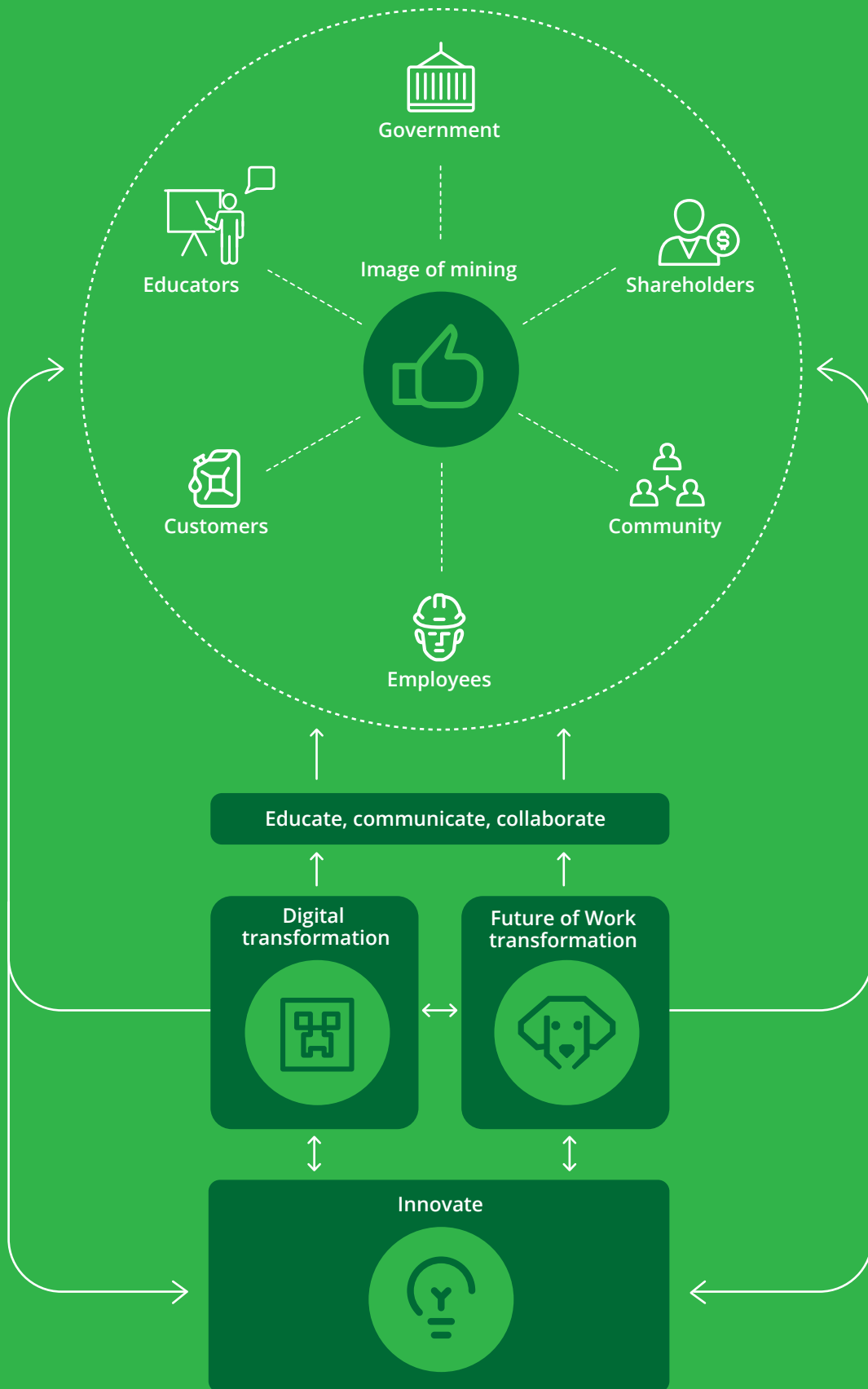


**Deloitte.**



From here to where?  
**The Mining Matrix**

# Mining Matrix



# The Mining Matrix

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**Matrix: (n)**

1. *The cultural, social or political environment in which something develops*
2. *A mass of fine-grained rocks in which gems, crystals or fossils are embedded*

Mining is the Australian heritage – the backbone of the Australian and West Australian economic and societal landscape, and yet for the past decade the image of mining has been in decline.

Stock price underperformance relative to other stocks, fractious community relations, legacies of weak environmental practices, and a historical lack of workforce diversity have all tarnished the reputation of the mining industry.

So what needs to happen to improve the image of mining, but also to maintain the focus on growth and increased productivity?

We believe the answer involves a combination of the top four trends in the Deloitte 10th annual *Tracking the Trends* report released earlier this year:

## 1. Innovation

## 2. Digital Transformation

## 3. The Future of Work

## 4. The Image of Mining

We refer to the interconnectivity between these four as the “Mining Matrix”.

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# Innovation

## Why?

The mining sector is embracing technological innovation, but Deloitte research across Canada, Australia, Africa, and Latin America shows the sector still lacks systemic consistency and strategic focus when it comes to innovation.

Innovation includes the adoption of more innovative approaches to engaging stakeholders, re-envisioning the Future of Work, and identifying the commodities that will be in greatest demand going forward, while continuing to push the boundaries harder from a digital perspective.

## What?

Mining companies and the industry continue to face a number of barriers to innovation:

### 1. Risk aversion:

Mining companies are traditionally averse to taking on new risks that may impact their cash flow or licence to operate, reducing their likelihood to pursue transformational innovation.

### 2. Short-term gains taken over longer-term investment:

Mining companies' propensity to favour short-term cash flow generation often works to the detriment of creating longer-term net present value. Potential business-altering innovations are typically not considered given the challenges associated with calculating the lifetime value of new innovations.

### 3. Lack of a clear vision:

Clear vision is essential to guide and enable longer-term transformation so that innovation is focused, and companies can take their vision and align their innovation efforts against a series of key thematic areas as a true portfolio.

### 4. Lack of industry-wide collaboration:

Mining companies have historically operated in isolation due to concern around intellectual property (IP) rights or loss of competitive advantage, and are distrustful of collaboration that hampers efforts to co-create or co-invent in partnership. However, we are perhaps seeing some green shoots emerging with examples of miners collaborating, such as the recently announced skills taskforce <sup>1</sup>.

## How?

The four pillars of broader innovation include:

### 1. Take a systematised approach:

- Define your innovation strategy and focus areas (ensuring they go beyond technology) and rally your people around this.
- Manage innovation as a portfolio of projects to ensure real value is delivered across the business.

### 2. Make innovation a core competency:

- From senior leaders to the frontline, ensure your innovation program is a priority.
- Develop a 'fail fast' culture – agile and flexible.
- Collaborate across industry and your ecosystems of suppliers, competitors, consultants and communities.

### 3. Develop the right resources and skills:

- Fund innovation adequately (including longer-term innovation).
- Create 'space' and opportunities for your people to innovate.
- Create the right mix of diverse talent and skills to drive different thinking.

### 4. Establish metrics and incentives:

- Measure effectiveness and outcomes.
- Incentivise the right behaviours aligned to your innovation portfolio and culture.

<sup>1</sup> WA bid to lift mining enrolment numbers, *The West Australian*, 21 July 2018

# Digital Transformation

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## Why?

In 2017, Deloitte published *The Digital Revolution: Mining starts to reinvent the future*, which explores how mining organisations can take advantage of digital technologies to create value, and describes a future “digital mine”, with reference to real examples of what is possible.

While the majors have been investing in automation and technology innovation for several years, we are now seeing the digital agenda moving into the domain of the broader mining industry. Rapid advances in technology along with decreasing costs overall has meant that harnessing the power of digital has become more practical and achievable – to the extent it is now becoming an imperative for other industry players.

## What?

The *Digital Revolution* report envisages the future state digital mining organisations and how this may transform the core mining processes, the flow of information, and supporting back-office processes, including the following features:

### Core mining processes – automated physical operations and digitised assets

1. Automation and remote operation
2. Real-time data capture
3. Digital twins
4. Drones
5. Wearables

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

6. Improved visualisation, reporting and analysis of historical data
7. Short interval control
8. Future modelling, prediction and simulation
9. Integrated data platforms

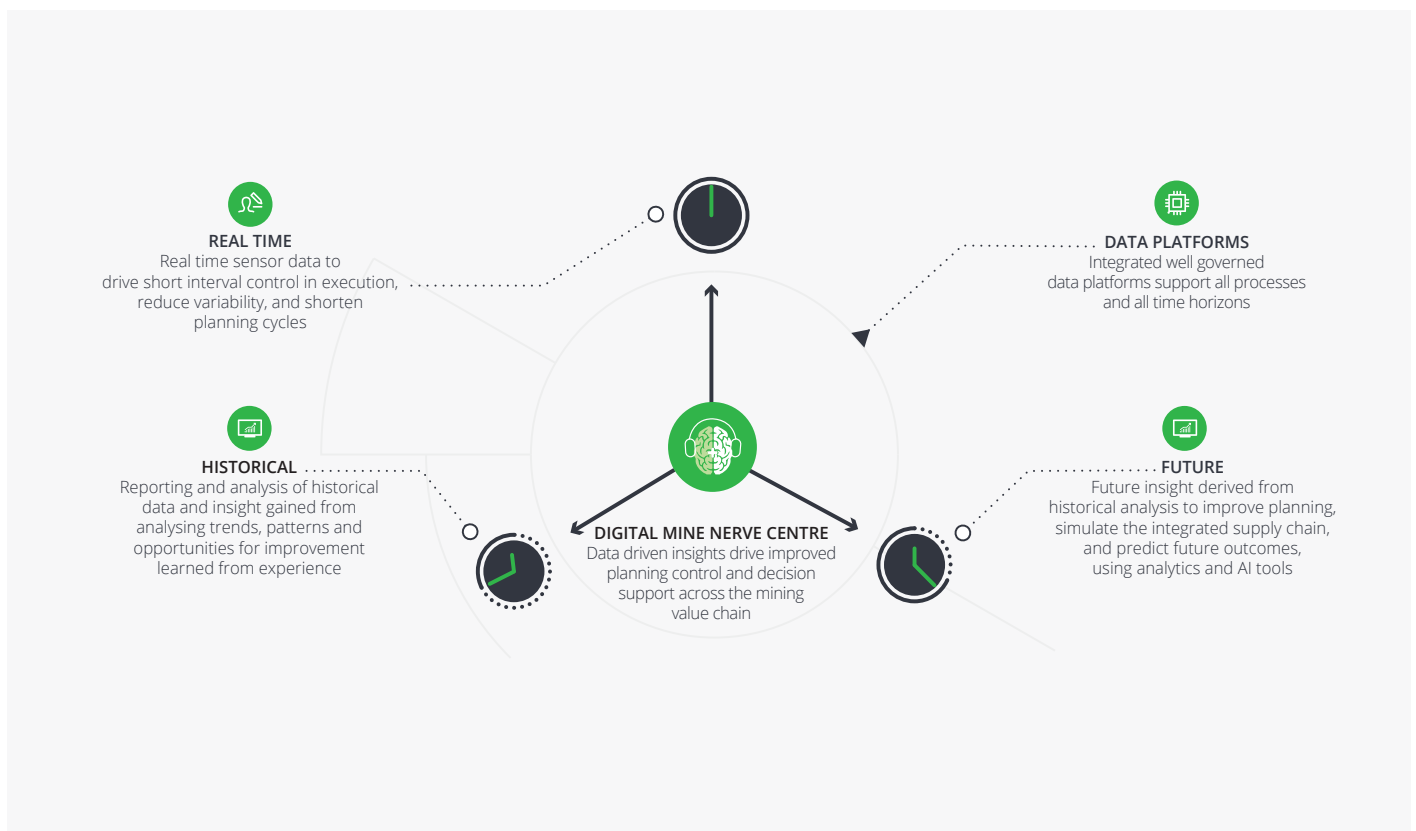
### Re-imagined ERP and automated support processes

10. “Re-imagined” cloud-based ERP
11. Robotic process automation (RPA)
12. Network connectivity and bandwidth
13. IT OT Convergence
14. Cyber security

The greatest value comes from unlocking the insights within the data collected in a digital mine. The ‘nerve centre’ brings 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.

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## Integrated operational planning, control and decision support



### How?

#### 1. Develop a digital strategy:

Digital initiatives are often focused on technical solutions and are not always driven by a well-articulated strategy or a direct link to business value. Properly conceived, a digital strategy can enable organisations to quickly test new approaches in a pilot or sandbox environment, and either roll them out in phases or shelve them easily.

#### 2. Start small:

Delivering on the digital mine nerve centre does not need to be an all or nothing proposition. Organisations can start small by investing in improved visualisation tools, integrating data from multiple sources, and reducing reliance on fragmented systems to enable better analysis of data. For example, real-

time data captured from processing equipment and machinery sensors can help identify drivers of process variability to enable operational improvements, and RPA can replace some tasks currently performed by humans, presenting an opportunity for cost reduction.

#### 3. Consider the impact on people and jobs:

The people implications of the digital mine should not be under-estimated. As the digital mine becomes more of a reality, our interpretation of what work is and how it is delivered is changing rapidly. For example, to become more of an insight-driven organisation, miners must embed data science and analytic skills throughout the organisation, by either hiring or partnering with scarce analytic talent.

# Future of Work

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## Why?

The nature of work is poised to change dramatically, at both the mine site and in the back office, driven by technological and social trends impacting every industry across the globe. Significant strides have been taken across the industry over the past five years in areas such as automated equipment, remote operations centres, RPA, and the creation of new organisational operating models that deliver greater agility and flexibility. New talent models are also following suit.

Deloitte holds the view that, as history has shown, when a new industrial premise has emerged, this has the effect of reducing some job types, whilst significantly increasing others in new areas. The total number of jobs has generally increased. As we move toward greater automation of roles across the mining sector, this has the potential to impact the social licence to operate for mining organisations and the reputation of the broader industry.

According to Deloitte's *Global Human Capital Trends 2018* report, the industry still rates artificial intelligence (AI), robotics and automation as a relatively low priority, despite robotics in particular taking a significant foothold in the industry over the past 12 to 18 months. Until the industry redefines the way work is being done and delivered, many across the industry automating processes will not necessarily reap the rewards in a fundamentally different way to drive greater productivity.

## What?

Deloitte explores the Future of Work from the perspective of:

1. **Work:** How and where work gets done
2. **Worker:** Re-envisioning talent and talent models, reskilling and retraining in areas of need
3. **Workplace:** Collaborative and highly connected spaces that enable diverse work teams to come together physically or virtually to solve problems and uncover opportunities.

**Work:** As the digital mine becomes a reality, the nature of work will change dramatically at both the mine site and in corporate functions. Fully adopting the digital mine would mean that corporate processes will be augmented by RPA, by autonomous equipment reducing labour intensity and enhancing safety, and by AI supporting knowledge workers. These technologies will enable core mining activities to be performed from locations such as remote operations centres that can support a more diverse and inclusive workforce, including primary caregivers, part-time workers, and people with physical disabilities.

Knowing what roles are predicted to decline, and what new roles may be created will help both the industry and each organisation make decisions of cross-skilling, retraining and talent acquisition, and retention strategies that need to be developed.

**Worker:** Automation and digital solutions can position companies to achieve greater diversity by attracting workers from historically under-represented populations. As more work moves to shared service centres, centres of expertise and remote operations centres, the available pool of labour will also expand as companies begin to employ a mix of on-shore, off-shore, and robotic workers located anywhere in the world.

**Frontline workers:** With sensors, maintenance workers can receive alerts and data insights before equipment breaks down, allowing them to improve scheduling and increase equipment availability.

**Skills and hiring:** Mining professionals now need to be more digitally literate, along with having strong problem solving skills and the ability to think creatively. When it comes to hiring, this means mining companies will require access to a broader array of systems experts to operate and monitor autonomous machines, and data analysts to turn growing volumes of data into meaningful insight.

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The starkness of the issue of talent attraction for the mining industry has been highlighted following the creation of a cross-industry taskforce in Western Australia. The skills taskforce <sup>2</sup> will focus on ways to attract the best and brightest students to mining, and to prepare for and adapt to commodity price cycles.

"We are trying to get collaboration between industries that wouldn't always collaborate but one thing we have in common is the need for future skill in the workforce."<sup>3</sup>

*Raleigh Finlayson, Managing Director, Saracen Mineral Holdings*

<sup>2&3</sup> WA bid to lift mining enrolment numbers, *The West Australian*, 21 July 2018

## Future of Work continued...

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**Workplace:** The workplace of the future is about the structures and practices to enable people to create and deliver value. The workplace becomes a network of high performing and diverse teams coming together to solve business problems or deliver on opportunities; nimble, innovative cultures create engaged and interesting workplaces; and personal rather than positional leaders rise to the top.

The workplace of the future is a collaborative and highly connected space that enables diverse work teams to come together physically or virtually to solve problems, uncover opportunities and deliver real value for their organisation.

### How?

#### 1. Adopt new attraction and retention strategies:

To attract and retain scarce and diverse talent, miners could place greater emphasis on nurturing and developing their people, creating interesting and purposeful work, and building an environment with career flexibility and tools that enable employees to collaborate and exchange ideas transparently.

#### 2. Retrain and upskill:

The mining sector, mining organisations and individuals need to be ready to reskill, retrain and upskill by understanding which roles will significantly change, and what new roles will be required in the industry in the next five years. Each organisation will need to make different decisions based on their business strategy, social licence to operate and level of automation predicted.

#### 3. Source and integrate talent across networks:

Attracting new skillsets from other industries may be a particular challenge to mining organisations. As a result, there is a growing need for miners to partner with organisations that have deep technology expertise. Companies will need to design and evolve their partnership networks (ecosystems) to access the best talent for specific work and cultivate a continuum of talent sources—on and off the balance sheet, freelancers, the crowd, and knowledge workers.

#### 4. Redesign work for technology and learning:

As the Future of Work becomes a reality, companies must move beyond process optimisation to find ways to enhance machine-human collaboration. This includes identifying areas where digital technology can augment worker performance as employees shift to more productive work.

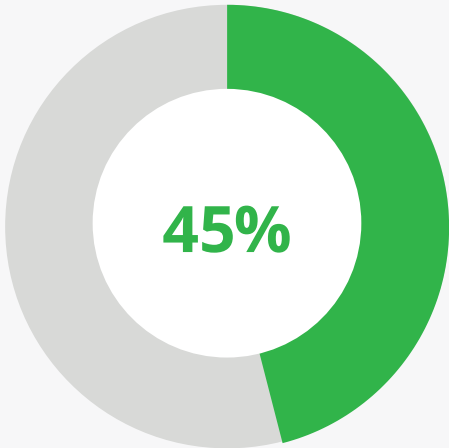
A suggested first step in rethinking how to approach workforce planning is a strategic workforce planning assessment to understand the impact of automation on your organisation, and the various sources of talent.

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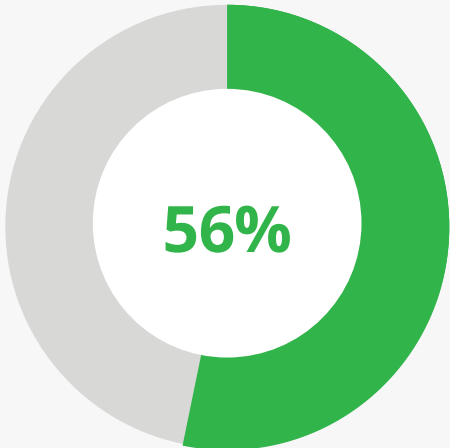
Deloitte has developed a Future of Work workforce planning solution which helps our clients to understand the impact on specific roles across the industry and specific to their organisation. This has the effect of moving the Future of Work conversation from conceptual to reality.

Initial Deloitte analysis has identified the following aggregated figures across 31 jobs\* in the mining and oil & gas sectors to have the potential to be:

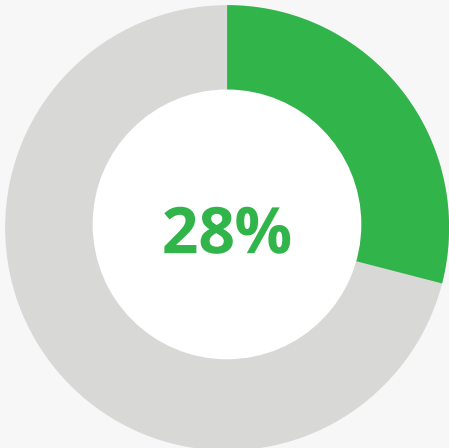
Automated



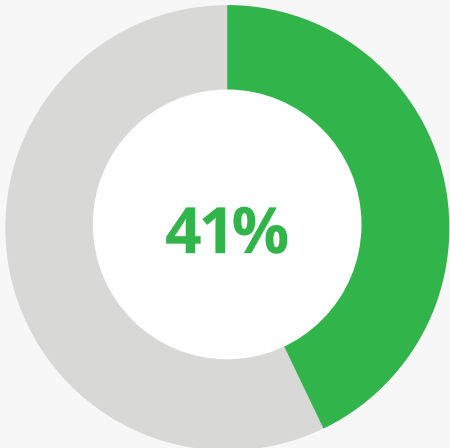
Outsourced



Done remotely



Offshored



\* Note: These are preliminary numbers from the Future of Workforce Planning data model. Aggregated numbers are based on 31 distinct roles as categorised by the Occupational Information Network (O\*NET) developed under the sponsorship of the U.S Department of Labour / Employment and Training Administration.

# The Image of Mining

## Why?

Despite the significant contribution of the mining sector to the world's economy, the industry's reputation remains tarnished in many countries, including Australia, because of perceptions that mining companies contribute to environmental damage, cause a negative impact to the community, engage in dubious practices abroad, and do not engage a diverse workforce.

As mining companies know from harsh experience, negative perceptions can do more than damage reputations and affect stock prices. They can also spill over into community protests and violence, and result in the loss of a social licence to operate. In a world increasingly influenced by round-the-clock news cycles and opinions aired in the court of social media, this type of backlash is only bound to spiral out of control. This mandates mining companies to take proactive steps to address, and change, their reputations.

As a result of the mining industry's negative image, young people are eschewing pursuing a career in this industry. And that is not good news for anyone.

## How can we rekindle the pride in our industry?

### What?

**Educate:** We need to start at the bottom – school children hear a lot about careers and jobs that have found a place in their curriculum, like emergency services and health professionals, but they hear very little about the careers and jobs that power the mining industry, like engineers and geologists, or that technology skills will feature large in future mining jobs. We also need to share knowledge about the mining industry more broadly so the broader community understands the positive impact mining has on society as a whole.

**Communicate:** The industry has the opportunity to reframe the conversation across society on the importance of mining as a sector – not only the economic importance to Australia but also the daily importance to a society which depends heavily on products that would not exist without mining, from smartphones to bridges to health technologies and electric vehicles.

**Collaborate:** The mining industry can achieve so much more if companies work together to solve areas of critical importance. The image of mining is clearly one such area where we should not expect any one company to do it alone – we need to work together collaboratively and intelligently to make it happen.

## How?

**Working across ecosystems:** To change the image of mining, we need to understand the broader ecosystem in which we operate. Government, educators, the community, employees, customers and other stakeholders will need to play an important role in turning around the image of mining.

**Work directly with governments and communities:** Most large mining companies already do this, but all miners should meet regularly with key stakeholders before, during, and after a mine is operational. This is about more than good optics. It is good business—and it will provide companies with confidence in the face of criticism when they know they are actively respecting and incorporating the views of the communities they operate in.

**Communicating social benefits:** Mining companies need to more clearly demonstrate the role the industry plays in supporting and sustaining economic growth, remediation of environmental damage, and proactively share the impact they make, in terms of employment, infrastructure investments, improved access to education, and areas such as the development of healthcare programs. Leading companies are increasingly taking more decisive public stances around corporate social responsibility. Several mining companies have begun adhering to voluntary sustainability standards, including those set out by the Taskforce for Climate-related Financial Disclosure, the Global Reporting Initiative, and Modern Slavery.

**Re-engaging employees:** Efforts to regain trust are also happening internally, as companies work to create a new culture to support their visions for growth and re-engagement of employees. One indicator of this shift is the mounting focus on mental health and employee wellness as mining organisations work to address the pressures many employees face both within and outside the workplace.

**Attracting young people:** The industry acknowledges it has “dropped the ball” when it comes to promoting mining careers and it has now pledged to “win over the hearts and minds of teenagers”.<sup>4</sup> The skills taskforce is a great step in the right direction. Some of the work being done by the Gold Industry Group to include mining-related content in the school curriculum, to provide fun and innovative ways to learn about the industry is also a great start to engaging young people and the broader society with the mining industry.

<sup>4</sup> WA bid to lift mining enrolment numbers, *The West Australian*, 21 July 2018

# How can we rekindle the pride in our industry?

“We need to see the mining sector profiled positively in the news, hear about its positive impact and contribution on the radio and be talking about it in an informed manner over coffee. Regulators need to hear about these things. So, too, do employees and stakeholders.”<sup>5</sup>

*Warrick Hazeldine, Managing Director, Cannings Purple.*

<sup>5</sup> *Miners must dig deep to sell a success story, The West Australian, 18 January 2018*

## In summary

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In order to turn around the *image of mining*, we need to **educate, communicate and collaborate** across the entire ecosystem of government, educators, the community, employees, customers, shareholders and other stakeholders.

We need to **communicate** clearly the extent of *innovation* across the mining industry in Australia, the value that *digital disruption* is already delivering in the sector, and the positive impact of the *Future of Work* on roles and jobs across the mining value chain.

We need to **educate** society of the value that the industry delivers, and what more it can deliver in the future; we need to educate our potential employees of the future – the young students of today - in what the industry can offer; and we need to educate ourselves on their desires, needs and wants.

As a mining industry we need to **collaborate** more in areas of critical importance across the industry – areas such as skills/reskilling; the image of our sector; development of IP to bring about positive step change for the industry; maintaining and enhancing our social licence to operate.

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# Let's rekindle the pride in our industry.

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