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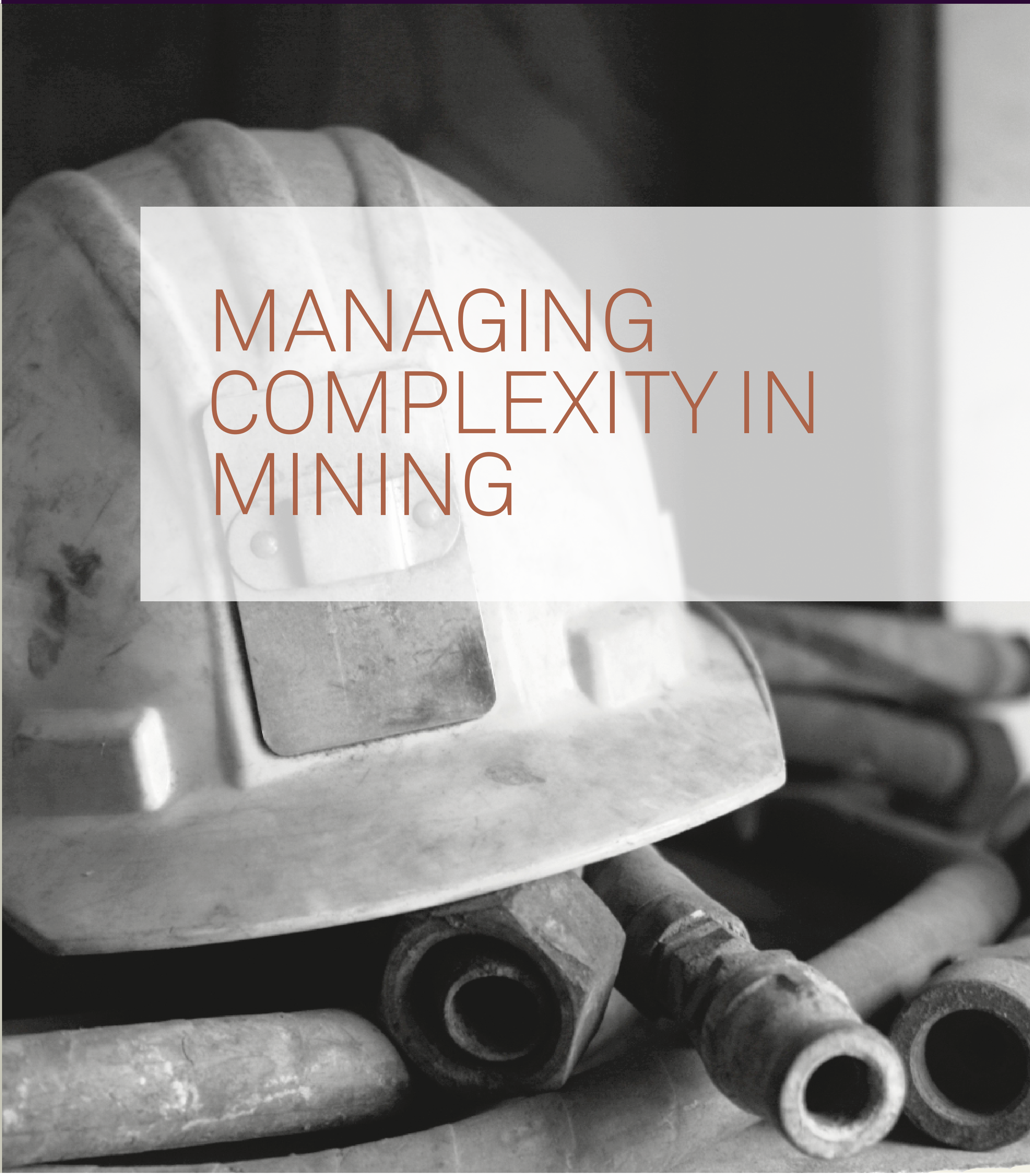
# MANAGING COMPLEXITY IN MINING



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# Managing Complexity in Mining

Operating in mining today involves addressing multiple areas of complexity that create layers of difficulty across the industry and threaten companies' profits and growth.

The challenge of getting mines up and running in remote and less-developed locations. Administering multiple operations across different social, cultural and business environments. Dealing with political instability and taxation. Meeting increasingly tough environmental and safety regulations. Recruiting and retaining a skilled workforce. Keeping up with advancements in technology. Sourcing funds for new projects and exploration.

These difficulties remain a barrier to successful growth – and the level of complexity will only increase as societal expectations and environmental concerns dominate, and the 'easy to reach' resources diminish.

The industry must position itself better to manage complex issues. Every mining company knows what they are, but where is the action, the innovation, the strategies for overcoming them? The skills shortage, for example, has been coming for a decade – yet little dramatically different has ever been done to address it.

Mining companies have been 'dancing to the music' for years. Before the music stops, they need to have developed a long-term agenda, with better strategies and standards for the industry and for Australia – not just their own business.

This has to be done collectively, which means finding new approaches to communicating and forward planning: for instance, while there are forums focused on business, market and sector, there is currently no platform for discussing, as an industry, how to get clever about resolving complexity.

This paper brings together the views of leaders and experts from the mining industry on four critical areas that mining companies should focus on right now to position themselves, and the industry as a whole, to tackle complexity into the next decade.

# Connectivity:

## Engaging with stakeholders, governments and communities at all levels.

Mining has an image problem. By being more responsive, addressing the commonly-held misperceptions and focusing on positive influence, companies can strategically position themselves to better manage complexities and achieve growth.

As David Flanagan, Managing Director of Atlas Iron Limited, puts it: "There's a view of 'what mining is' and the reality, and the gap between them leads to lost strategic opportunities for companies and the nation as a whole. For example, the next couple of years will probably see a deficit of 40,000 to 50,000 people in the industry because not enough people contemplate going into it."

The industry needs to communicate the reality, says David – the world-class mineral assets, technologies and people that give Australia a major strategic advantage. "There's a perception that mining isn't sustainable because the resource is finite, for example," he continues.

"People think when we've mined a deposit it's gone. But typically there is ore left behind that was simply not commercial to mine at the time – and as commodity prices continue to rise, these mines can be recycled and re-mined. This needs communicating."

Communication should also take place at an industry-wide level, Flanagan believes: "Many people feel they get nothing from mining, yet our low level of national debt and unemployment are both down to the mining industry. If we allocated enough resources to connect with every Australian resident and demonstrate the benefits mining brings, people would be proud of the industry."

Public opinion of mining influences the way governments act and draft policy, he points out. If more communities were to demand the approval of a new mine in their region, for example, more projects would get off the ground, faster. "A better-informed public should deliver better-informed long-term policy – improving mining and the nation," he says. "From there, we can contribute to improving the planet as a whole."

### Give the government the money it needs:

*"Ask the government to write out its 'shopping list' – then give it the money it needs to facilitate more mine permits more quickly, for example by pre-paying tax. The value will justify the outlay. This may feel like we're buying our approvals, but that's not the case – making money is simply good business, and we'd be investing now to take advantage of opportunities to grow. Why can't business invest more in the community?"*

*David Flanagan*

Truly connecting with people demands more than simply broadcasting positive messages, however. “We must actively seek to engage – genuinely – with those people who don’t realise the industry is doing something for them,” says Flanagan. “Connect with them and they become advocates, connecting with their family and friends, and so on. For this to happen we need to get into communities. Not through advertising, but with initiatives that make a positive difference. Do something like that, and you’ve got connectivity.”

For Nick Curtis, Executive Chairman of Lynas Corp, this is more than just a tactic – it’s integral to the success of a mine. “When you’re building a company, you’re building an organism that operates within society itself,” he says. “Unless there’s a harmonious relationship you’re going to die. In mining that’s particularly tough because we’re seen as a highly intrusive industry, and the community’s reaction to that – outrage – is a real risk.”

Connecting and engaging requires a new approach, to address a new paradigm. “Fifteen years ago, communities said ‘the government says you’re coming – so tell us what you’re going to do’. Now they expect to be asked permission,” Curtis explains. “The focus is no longer on convincing the government of the benefits of having us there: the change in their economy was our license to operate. Today, we need to engage with communities pre-operations, for example with programmes that prove sustainable shared value.”

Mining companies must be cleverer in how they communicate – helping people to see the wider and longer-term consequences of decisions they make, by being bolder and more progressive. “It’s no longer about ‘spouting facts’,” says Curtis.

“Most companies assume ‘if we state the facts, they will speak’. But it’s not what an advertising company would do. It’s not what a fast moving consumer goods company would do. They deal with perception – so must we.”

This has led companies to start using channels they never have before – for example, advertising in newspapers and on TV. CEO of GPR Dehler, Eddy Solbrandt, says that engaging requires a deeper level of connectivity: “There are so many ways to broadcast what the industry is doing without resorting to supermarket-style advertising. Social media, for example, gives us a chance to connect with people at all levels, reach influencers and engage with government and NGOs (non-governmental organisations) in a meaningful way.”

Mining entrepreneur Owen Hegarty agrees. “The current biggest lever for influencing stakeholders is social networking,” he says. “It gives us the potential to make countries more mining-friendly through reinforcing how developing an ore body will be in people’s interests.”

*“When we initiated a growth project or acquisition in Rio Tinto, the funding was always going to be available – provided we returned the minimum hurdle rate, the net present value was more than the cost and it made long-term strategic sense. So we could focus on the business – the quality of the opportunity, the people and the resources. Today, at the smaller entrepreneurial end of the coalface, so much of your life is spent raising money and, having raised the money, creating value with it. Managers of public companies need to spend a lot of time with the market, addressing stakeholder issues and answering questions.”*

*Owen Hegarty*

He recognises that grasping the potential of social media requires the learning of new approaches – and a shift in mindset: "The revolution in communication and information technology has only just begun – who knows where it's going to end up? The more 'mature' leaders need to radically modify the work practices they are used to."

Hegarty also feels leaders have a particular role to play in addressing the negative perceptions of other stakeholders – beyond those who provide the capital – by adopting a 'coaching' approach: "As a figurehead, you can support the industry's reputation in Australia and globally – spreading values and shaping thinking to influence policy and get people to understand the importance of the industry and how it benefits communities."

He also believes coaching is the key to getting government to recognise the contribution mining makes to the country – whether directly, e.g. through taxation, or indirectly, e.g. through a sustainable uplift in indigenous communities. "Legislation is just formalising what is already happening. We need to strengthen influence – corporately and collectively – with initiatives like the Mining Hall of Fame and professional institutes that actually support the needs of their members."

Flanagan believes the industry would be well-positioned if there was a Foundation – a truly independent body – with a remit to challenge and shape policy. He describes this as a committee of "really smart, highly credible people" who behave like a think tank, locally and globally, to help inform opinions.

He continues: "It would need to be completely objective, and not impacted by election cycles or influenced by mining companies – a central source of information and knowledge, and provider of strategic advice on issues facing Australia and the rest of the world. And it must be run for the benefit of the people, not as a pro-mining lobby."

One of the first items on the Foundation's task list, says Flanagan, should be encouraging the government to use Australia's mineral assets to develop a 'strategic option' for the country. He gives an example: "At the moment, it can't divert funding from a hospital into permitting new mines, but it does subsidise a manufacturing industry that produces widgets. Chances are, the same widgets are produced in China – we don't have competitive advantage, so is this industry sustainable? Putting money into infrastructure that enhances our nation's ability to compete is an opportunity to be more strategic and long-term. These are the sorts of projects that can pay for future education and health."

## Your culture meets the community's: conflict or compromise?

*"Cultural sensitivity is important, but you do need to have absolute standards that you don't move from. The paradigms within which people operate are likely to be different to yours, and you can't simply impose on them – but you must have stands on corruption, the environment and social obligations. They are part of your values and culture, and if you debase them you've discredited the whole organisation."*

*Nick Curtis*

*"What we fundamentally need are governments – our ultimate masters – to understand our industry has serious world competitive advantage and continue to nurture, support and help us grow, as opposed to taxing us out of town or killing the golden goose. We will continue to pay our way time after time, but we need a fair go!"*

*Owen Hegarty*

Flanagan emphasises the importance of having a long-term agenda for connectivity. "It can't be governed by a three or four year election cycle. Come election time there's a culture amongst most people, in the way they look at government, of 'what's in it for me': voting for the party that provides the biggest handout. This then promotes short-termism in the government, and a constant requirement to increase taxation to fund additional promises while not cutting back on material expenditure."

Thinking, planning and managing resources, assets and decisions over the long-term is not something mining companies should find over-ambitious, according to Solbrandt. "The industry needs to persistently move perceptions – not just blast people with information," he says. "It's paradoxical that it's not already doing this – working to 8-10 year time horizons is something mining companies are used to, and do well."

Flanagan paints a picture of what 'getting connectivity right' will look like: "We'll have people living in all the major cities and regional centres who understand what mining is, who want to participate in the resources sector, and who can participate in it from where they are. And they know that one of the reasons there's a hospital in their community is because a mining company paid tax to the government."

## Cinderella assets have the biggest potential

*"The key to performing well and achieving growth in restrained economic times is getting the 'Cinderella' assets up to scratch. It's reasonable to expect commodity prices to taper off, looking at the elevated highs we have had; and the reality is that those difficult assets are going to be required to share the load. Lifting the performance of constrained operations is clearly more difficult than unconstrained ones.*

*Equally, however, if one can remove the key constraint these types of operations have the greatest potential for improvement. But knowing when to hold and when to fold is a key discipline. There is no point in having a portfolio that one cannot optimise. Question 1 should be, can we harvest that? If we can't, then Question 2 becomes, should we carry on? Sell it to someone else who might be able to optimise it and move on."*

*Duncan Price*

# Risk:

## Effectively assessing and managing risk

Improving the assessment and management of risk is core to effectively dealing with complexity. Routine under-assessment in the past has led to issues such as the failure to foresee the impact of the global financial crisis, for example. Companies can't predict the future, but it is in their power to position themselves to survive different outcomes by choosing to manage risk. Again, the key is being responsive: accurately defining the risks and setting the business up to manage them.

This is a particular challenge for growing mining companies, according to Nick Curtis. "Deploying a significant asset with limited resources – money, people, policies and processes – in itself embodies a large amount of risk, and a high number of situations in which risk is not recognised or dealt with. In large organisations, the risk profiling is already done, and the resources are there to identify, unpack and resolve them to an acceptable standard. Growing organisations need to learn to identify risks on-the-job."

Eddy Solbrandt believes the challenges are comparable for companies of all sizes. "Setting up a business in a new country involves navigating the muddy waters of obtaining permits, understanding a myriad of legislation issues and managing community, public service and government relations.

"You do the research, evaluate the risks and commit capital, thinking a country is stable, and you're suddenly hit by an unforeseen political, social, environmental or other event. It's not an exact science – the approach to managing those events needs tailoring to the environment you're operating in, for example, and this can be extremely complex. Agility is the key."

Solbrandt suggests categorising risks by breaking them down into environmental and geopolitical risk; risk to safety; transactional and financial risk; operational risk, and geological risk (e.g. exploration).

Curtis has his own formula for defining risk that helps determine whether an asset is a good or bad investment. "There are four areas of risk in mining," he says. "Geological or resource risk; metallurgical risk; financial risk – this could be commodity price risk, or that the mine needs a lot of capital to get up and running – and social/geo-political risk. Be prepared to take two of them on – you won't be battling too many fronts – but any more and the project is just not worth pursuing."

He continues: "Once you know your risks, you can start defining what to do to get on top of them. You have geological risks – get more resources, organise yourself and get drilling. You have political risks – work out how to diffuse them. And you then need to analyse and identify the risks involved in getting on top of them."

According to Curtis, "a culture of imagination" is key in addressing risk. "If you ignore the possible variability of outcomes, you don't have the capacity to build in contingencies. Leaders need to create a culture in which alternative ideas are accepted, and people debate things properly in a way that gives you insight."

However, he says, leaders must also create a sense of certainty. "Certainty of delivery of next quarter's results, delivery to customers, delivery of product… this means defining all the key risks at a very detailed level. It might also mean embedding more process. It involves people understanding their role and what is expected of them, knowing they have adequate resources, and being empowered to do their job. The challenge is achieving the ambiguity: keeping the imagination alive, while allowing people to feel confident they can do what needs to be done to get to the required outcome."

For Curtis, successfully handling risk lies in how an organisation shapes itself. "It's the 'software', not the 'hardware' – the asset – that makes the fundamental difference to your ability to successfully manage and absorb the risk," he states. "This involves building a cultural framework that inspires people with a purpose.

"First, set the values, vision and mission that espouse 'why we're here'. Then the symbols that empower and focus people: the logo and brand identity. Third is the underlying assumptions you operate with: what your business is about, what you want to do, but also how you're going to do it and why; 'just for profit' is not sufficient.

"Keeping the culture alive depends on organising yourself so the vision, values and aspirations are consistent. The structure you put in place is the nervous system of the company. If you can map that structure out, you know what you're aspiring to, and you can start addressing risk by thinking about who you need to solve what problem."

Getting the right people doing the right work at the right level in that structure is equally critical, Curtis remarks. "Leaders can't get caught up in day-to-day operational risk – they have to delegate, and to get clarity of responsibility and accountability throughout the organisation. The only way you can correct risk is to have teams that work really well – they aren't anxious or confused, they are empowered, highly capable and they know their job. They understand the risk profile and the context around what they do."

Jake Klein, Executive Chairman of Evolution Mining, agrees: "Gone are the days of the leadership team doing all the work of managing jurisdictions and their complexities; it's everybody's job. If you can get the right people with the right expertise and skill sets within the right organisational setting and culture, you have the capacity to address the risks."

Duncan Price, Executive Vice President, President – Global Operations of Cliffs Natural Resources Inc., feels it's investing in hardware, rather than software, that will address risk. He says: "This means putting more capital into getting machines to do the digging and conveying, instead of people. This will lower costs and make mining innately safer, helping to maintain the social licence to operate."

*"You've got to get serious about automation – don't wait for everyone else to do it first. It should be a journey you take, systematically, over time. When new equipment is developed, take the trouble to test it. If it works out for you and washes its face economically, then get in there. Being last in the queue is not smart: as commodity prices shrink, if your competitors have reduced their marginal costs by increasing automation, guess where you'll be sitting on the cost curve?"*

*Duncan Price*

Solbrandt's view is that managing risks should be integrated into the DNA of an organisation. "Traditionally, for example, mining companies have stated that 'safety' is a value, implying it is somehow separate from the work that has to be done – and this is a sub-optimal, potentially dangerous approach. It needs to be a preconscious way of working, much as breathing is to living. The industry *is* moving in that direction, but in a world that's increasing in pace and complexity it's taking too long. Risks need to be dealt with continuously – and this means building risk management into the organisation's structure and the accountability of every role. It means fundamentally rethinking how we work."

One way of doing this is to 'rehearse' failure in a safe environment. "This creates that disequilibration in the brain which happens when you have to manage a problem you've never faced before, and which you can't solve within your existing mental framework," explains Solbrandt. "It's that struggle which forces the building of a new mental model, enabling you to solve the problem and manage the risk – and this leads to cognitive agility."

## Your five-year plan will only last you three months

*"It's a random walk and things change all the time: markets, macro economics, political systems, legislation, metallurgical processes, the competition… so you can't expect your Day One risk analysis to be the complete solution. You can have the greatest five-year plan in the world – as long as you don't believe it's going to last you more than three months it's okay. See it as a base for further analysis at a later stage rather than what you're going to do in the next five years."*

*Nick Curtis*

# Agility:

## Increasing agility and innovation

Meeting complex challenges requires mining companies to both execute and innovate, on an individual and at a corporate level. This means designing the organisation – structurally and culturally – to be agile.

"The new currency in this constantly evolving world we operate in is cognitive agility; the old bureaucratic forms of management simply can't cope," says Eddy Solbrandt. "And organisations *need* to demonstrate it to attract young people into the industry– they want to contribute to doing things in a new way. Today's graduates are used to doing several tasks at once, for example. How can we harness that? How do we design the work that's to be done around it?"

The industry suffers from what Jake Klein calls "a deficit in breakthrough thinking". He believes companies must learn to have parallel conversations about executing and innovating. "There are competing pressures," he says. "Innovators operate in a different framework to executors, who need to be focused on squeezing the last half a percent out of the asset. Business development, growth and exploration require the innovation capacity, while running good operations and building good projects requires the execution capacity. For them to live together in a mining company is a real challenge."

Breakthrough thinking doesn't come naturally to mining firms, he admits: "People come from paradigms which they're used to; they come *with* paradigms they're used to. I think we're a generation behind the latest thinking in building successful organisations, for example. If you're looking for a VP of Discovery who could increase the worth of your business, no-one says 'let's go out and find the world's most successful explorer and get him into the company'. People say 'let's find out what the (salary) band says we can pay them and then figure out who we can get'. Your gene pool is restricted."

Klein appreciates that mining companies are limited in their ability to direct more financial resources into projects that constitute and foster innovation. "Organisations in high-margin industries run amazing initiatives that allow everyone to spend a certain percentage of their time on work not directly related to their job description, but which supports the business. Some of the best ideas in Google have been generated like that. But it's a hell of a big investment. So what can we actually do to create efficiencies, to change the process? We tend to come at it with a perception of 'we can't change the world so we'll just stick to what we're doing now'."

For Solbrandt, the answer is less about ambitious people development initiatives and more about fundamentally changing the way the industry 'thinks'. "In mining, people tend to think and act alike: who's doing what – and can we do what they're doing?" he says. "Innovative thinking is not generally encouraged in practice, yet those that do break the mould and innovate get the best results and attract the best people."

The required shift in thinking  is impossible without actively identifying and unlearning rigid entrenched cultures of practice  – the way things are around here, says Solbrandt. "Companies need to look at what they do, and determine  through a process of  problemistic search – 'why does it need to be  done in this way?' " he explains.

"Over time, organisations lose objectivity over their cultures of practice, and people grow to look at things in the same way. This results in blind spots. For example, bringing in a project on time and on budget is heralded as a worthy achievement. But when the completed project fails to deliver the promised outcome – say, an increase in production – we use the same process over again to increase capacity. Why? It's not a valid approach but the mindset of 'this is how we do it' has become an unconscious way of operating, and therefore invisible to those who behave that way."

Klein argues that true change is difficult because people in mining tend to be comfortable and complacent. "The industry has created a choice for people – even mediocre people," he says. "So you're talking to them about doing things differently, but there isn't that anxiousness that stockbrokers staring down the barrel of big retrenchments, for example, feel. That's what gets good people really focused."

Solbrandt points out that there are other ways to get people focused – without waiting for a disaster to motivate change: "That's a destructive and potentially expensive way to learn! It's more constructive to create a culture in which you can question things, and set challenging non-negotiable goals that compel a change in thinking. There are ways and means to highlight blind spots – giving visibility of where they lie and how they can be uncovered and altered for good.

"Although it may seem counter intuitive, encouraging failure and having systems and processes in place to learn form them can accelerate performance and remove blind spots."

*"It sometimes takes a failure or near catastrophe before industries are able to figure out a better way of doing things. Experts predicted the collapse of the US economy, but no one had a solution to act on in the lead up to it. There is a lack of learning from past mistakes that results in history repeating itself: the concept of global financial markets collapsing is not new. Collectively, industries don't learn. In an ant colony, knowledge appears to reside not with the individual but with the collective. Ants are born and die, but the knowledge seems to grow and the colony never makes the same mistake twice because there's this retention of information. The nation would benefit from better collective sharing, retaining and learning from knowledge."*

*David Flanagan*

The leader of an organisation has a major role to play in its agility, says Owen Hegarty. "Being able to listen, respond and influence is critical. Leaders today have to run the business while raising capital and being answerable to the wider world. This means being more 'coach' than 'captain', in dealing with employees, stakeholders, the market *and* the government. When your people don't understand the concerns driving decisions, for example, you need to explain 'look – I think you should be doing this, and here's why'."

Managers must also coach a marketplace that is asking many different questions, and guide their organisations in answering them appropriately. "You have to get out of the cocoon and understand the market; understand all the stakeholders," states Hegarty. "You have to be out there receiving and listening all the time, two ears and one mouth. You have to listen twice as much."

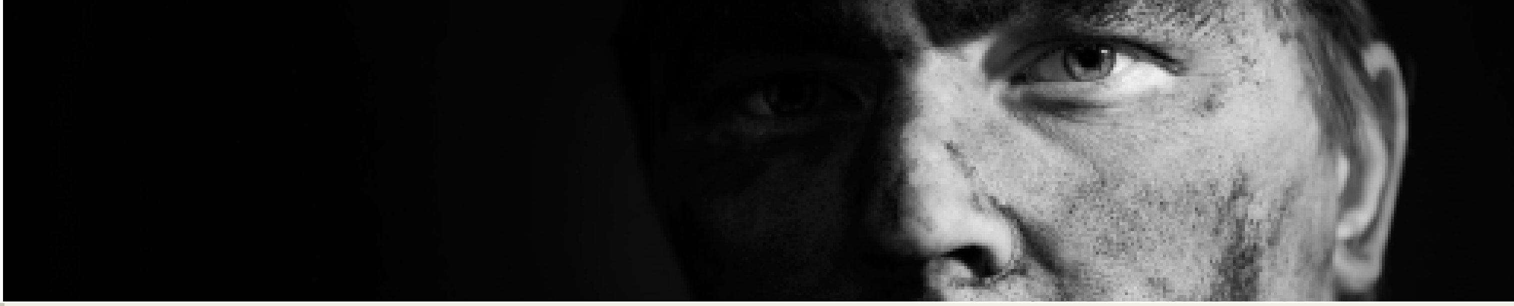
Communicating multiple messages to multiple groups and forward thinking ('What's going to put us in the perfect position in 20 years' time?') requires managers to operate outside and above the business as it currently is – and this means building a capable and functional business around them.

"You can get criticised for being out and about all the time but that's your role, that's what you're accountable for," Hegarty says. "You need to set yourself up with appropriate people and systems so 'the shop' gets looked after while you can do what you need to do."

## What's the biggest barrier to industry growth?

*"Huge opportunities are opening up as countries like Indonesia change their frameworks to give mining more certainty – but our competitiveness is reduced by the entitlements issue. It's yet another imposition. It's not as if it's linked to a wider vision for the country, so we can say 'there's a bit of hurt here, but a bit of a gain there so it's okay'. It is going to impact on us and keep us busy for a long time. Another example: 75 percent of the weight of the annual report is remuneration and policy reporting – and it's all about checking boxes. Then the Two Strikes Rule…it's unsustainable and will disappear but it's debilitating in the meantime."*

*Owen Hegarty*



# People:

## Harvesting the potential within the organisation

Getting the 'hardware' – the machines and technology – in place is essential for managing complexity, but it's equally important to unpack what Duncan Price calls "that more mysterious, less physical aspect of an asset: the way it performs as an organisation".

Jake Klein agrees: "It's all about the people. The high resource price environment we're operating in, increasing stakeholder expectations at a country and a local level, and ever more strict environmental and safety regulations…successful growth depends on hiring and keeping the people that can meet these challenges."

That's a challenge in itself – the problems of skills shortages and getting people to go and work in certain areas endure. Price describes the capability gap that often opens up: "You've got a collection of older guys who know what to do but are getting ready to retire. And then there are the inexperienced young guys who work hard and do their best, but they don't have enough background to be able to make good decisions."

And it's not just something that's seen at the lower levels, he says: "One of the greatest limitations to growth is a management team that is not knitted together – especially when their experience and knowledge of the industry is shallow. Spending time on basic management practices to lock together the 'fundamental mental direction' of the team is worthwhile."

Price has also recognised the need for a change in mindset to get the best from people – for example, to ensure managers get the information they need to support tight capital planning. "There's always the possibility of a mentality of feeling compelled to throw up to the light all the good news, even if it isn't strictly accurate, and conceal the bad news. If you're getting inaccurate data from one asset and you add that to good quality information you corrupt it all. Even when your capital estimation and management process is rigorous, you depend on being given realistic numbers and timelines to start with."

To attract better people, and get them working to their full potential, Klein advises companies to create a place rising stars will want to work: "Build an organisation great people want to be a part of – a business they are keen to help make successful, and within which they can be a leader in their field."

He notes that this requires a certain level of capacity: "You have to be able to afford to create a framework that brings in good people and gives them career opportunities." But while the more junior organisations can't always manage this, Klein feels they have a cultural advantage over the larger ones that helps them attract people keen to make their mark on the industry.

"People want to be known; they still want to be

individuals within an organisation," he says. "If you ask people what they don't like about working in big corporates it's the process, the bureaucracy and the fact that you become part of this big machine. What people like in the junior companies is being part of the decision-making process, knowing what's happening in the business, having direct access to the key leaders and making a difference."

For Eddy Solbrandt, getting potential from people is more about developing a culture in which people want to contribute. "Most businesses have the same ratio of 'good, average and under' performers. Getting discretionary effort – harnessing what they want to give, within the context of what the organisation requires – should be a long-term strategic imperative, and a part of how the organisation operates. This is something the industry is able to do today; we know more than ever about how people learn and respond to challenges.

"The best organisations, those with the ability to execute over and over again, have strong, competitive cultures that make it easy to get things done, clearly defined and understood strategies at all levels, and work that is designed so it can be completed creatively. People are working at a level they are capable of performing at – and they understand how to progress beyond it."

Getting the technology and the so-called human capital both moving in the right direction is not necessarily 'job done' for managing complexity long-term. According to Price, "This takes an asset 60 percent of the way up the hill to managing complexity. Everything has diminishing returns, so there needs to be something beyond simple business improvement, management, communications and structure.

"What's your next trick? That's the question that needs answering now – and it's not an easy one. The important thing for managers is to build capability and strength in the levels beneath themselves, to create the space to think about that. Because when you get it right, you start to see the sun come up over the horizon."

*"More automation will lead to a shift in the makeup of the workforce. You'll have more skilled people – they will be more expensive but the fact is if you really want to transform, that's not a trend that should concern you. It's better to have a small management team of highly paid smart people – they will outperform a sprawling organisation. It's pretty obvious which one is more adaptable, and will win the game."*

*Duncan Price*

# Conclusion

According to Duncan Price of Cliffs Natural Resources, getting 95 percent of the way to successfully managing complexity depends on "pulling everything together so all your cylinders fire in unison". What will make the different gears intermesh with each other and run at optimum RPM without making the slightest noise?

The common theme that runs through this paper is the need to unlock the full power of the industry's 'human capital' – within organisations themselves and their circles of influence. Arguably, the only way to do this is as an industry, one company at a time. This may sound like a paradox; but individually and collectively mining companies need to learn to think and work in new ways, to find new approaches to solving problems.

The mining industry cannot continue to solve more and more complex problems using old methods; it must find context-relevant ways to work more productively. The companies that outperform will be those whose people learn, adapt and innovate rapidly. Cognitive agility is the new paradigm for excellence.

Knowing that we need to think differently does not help us do so. Developing new modes of thinking and applying them to the way we work can be a very long and painful process, hindered by the old ways of looking at problems. Perhaps the industry suffers from an 'entrenched' culture – everyone tends to look at problems in the same way and wait for someone else to make the big bold moves, or mistakes.

The key to developing and delivering new strategies and solutions is understanding how individuals and teams develop the way they do their work, and using this knowledge to change. Reframing and modifying individual knowledge, mindsets, thought patterns and routines leads to a shift in collective organisational knowledge and culture. This will then shape the industry as a whole.

Fear of failure keeps us in check; keeps us doing what we've always done, even if it becomes dysfunctional. However, experience gained from failure compels us to critically review and adapt our approach to find new models of working that serve us better. The intensive reflection and complex thought processes triggered by failure drive us to alter our cognitive frames, tap into hidden reserves of knowledge and find a solution.

Managing and effecting individual and collective unlearning is challenging: entrenched ways are difficult to leave behind, and people can be hindered by anxiety or resistance. The question is, does the mining industry really have a choice? The systems, processes and structures it currently operates within are designed to avoid mistakes; they need re-designing to allow the agility and innovation that will enable it to effectively manage complexity. The industry simply can't have it both ways.

# Contributors

## Nicholas Curtis

*Nicholas is the Executive Chairman of Lynas Corporation Ltd. He is also Chairman of Forge Resources Limited and of the private corporate advisory firm, Riverstone Advisory.*

Nicholas has more than 25 years' experience as a professional in the finance and resources industries. He was a Non-Executive Director of Conquest Mining Limited from May 2010 to October 2011 prior to the company's restructure to become Evolution Mining. Nicholas also serves as a Director of the Asia Society Australasia Centre and as Chairman of Faces in the Street Urban Mental Health Research Institute at St Vincent's Hospital, Sydney.

## David Flanagan

*David is Executive Chairman of Atlas Iron.*

He is a geologist with more than 20 years' experience in mining and mineral exploration in Australia, Indonesia and West Africa. Prior to founding Atlas in 2004 he was Exploration Manager with Gindalbie Gold NL where he led the geological component of the company's gold mining and then iron ore development projects. Since 2004, Atlas has grown from a 9 million dollar exploration company with one employee to a 3 billion dollar top 100 ASX listed company with mining operations employing in excess of 600 people.

## Owen Hegarty

*Owen is a developer and manager of minerals companies across Australia, Asia and Latin America.*

With some 40 years' experience in the global mining industry, Owen had 25 years with the Rio Tinto group, before becoming founder and CEO of the Oxiana Ltd Group. He later founded the private company Tigers Realm Minerals Pty Ltd, which is seeking to build a global portfolio of resource interests. He is currently Executive Vice Chairman of G-Resources Group and CST Mining Group, Chairman of Tigers Realm Minerals and EMR Capital Pty Ltd, Director of Tigers Realm Coal Limited and Non-Executive Director of Fortescue Metals Group.

# Contributors

## Jake Klein

*Jake assumed the role of Executive Chairman at Evolution Mining Limited in November 2011 following the merger with Conquest Mining Limited where he had been Executive Chairman. He is also a non-executive director of Lynas Corporation Limited.*

Prior to joining Conquest Mining, Jake was President and CEO of Sino Gold Mining Limited and managed its development into the largest foreign participant in the Chinese gold industry. The company was purchased by Eldorado Gold Corporation in 2009 for over $2 billion. Jake is a past President of the NSW Branch of the Australia China Business Council.

## Duncan Price

*Duncan is Executive Vice President, President of Global Operations of Cliffs Natural Resources.*

He has operating responsibility for all operations at the company's global portfolio of controlled iron ore and coal interests in North America, Asia Pacific and Brazil, as well as leading operations for emerging assets. He joined Cliffs in 2007 as chief executive officer of Portman Limited, the third largest iron ore mining company in Australia. Duncan has an extensive minerals management and operating background spanning more than 20 years, including serving as project director for the Sinosteel/Midwest joint venture and managing director of Rio Tinto's HIsmelt reduction technology project.

## Eddy Solbrandt

*Eddy is CEO and founder of GPR Dehler.*

With an international background and global orientation, Eddy has been consulting to Fortune 1000 companies since 1983. He started his career in Germany working for an international management consultancy specialising in productivity improvement systems and management training. Eddy has managed and directed consulting assignments in Australia, New Zealand, Indonesia, Thailand, Malaysia, China, Canada, USA, Mexico, UK, Germany, Holland, Denmark, Ukraine, Kazakhstan, Russia, South Africa, Mozambique and Namibia.

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