mipac

Unlocking the power of **digital transformation** to generate value and meet ESG targets

WHITEPAPER | MINING | DIGITAL TRANSFORMATION
AUGUST 2023
2ND EDITION

Mipac is a global leader in operational technology, control systems and engineering services. Our deep experience in the challenges facing miners and mineral processing plants has come from more than 600 projects for the global mining industry for over the past three decades.

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1 The new reality

There's no escaping the fact that the mining and mineral processing industry needs to keep up to date with the latest trends in technology. The Industrial Internet of Things, artificial intelligence, Industry 4.0, big data, virtual reality and the role of technology in achieving the carbon emission targets and Net Zero are hot topics at industry conferences, in the media and online - and have been increasingly so since the COVID-19 pandemic.

But there needs to be a reality check.

As McCoy and Auret asked in their 2019 paper 'Machine Learning Applications in Minerals Processing: A Review', "should the current hype about machine learning be of interest to the minerals processing industry, or is this just another period of unrealistic optimism?"

The reality is that the digital transformation challenge keeps many CEOs up at night.

CEO concerns over the risks associated with digital transformation investments have surged.

Front-line staff are not immune to the concerns relating to digital transformation either. Workforces are often faced with receiving insufficiently scoped and planned deployments or being tasked to roll out programs that have been insufficiently aligned to requirements or lack the sponsorship, ownership and change leadership necessary for success.

2

Why billions of dollars miss the mark

It's not hard to see why the sector is cynical of the return on investment (ROI) from digital transformation. The manufacturing sector has already experienced some well-known disappointments from digital transformation projects that failed to achieve an adequate ROI. In fact, research from McKinsey suggests that 70% of transformation initiatives fall short – despite the huge sums dedicated to them.

For instance, GE spent billions on a whole of company IoT platform only to discover the company was simply too large to transform all at once, especially without a true vision of what it was trying to achieve.[2]

Enterprises are now expected to invest more than US$2 trillion (this year for digital transformation initiatives to improve efficiencies, increase customer value and create new monetisation opportunities. That's because digital transformation can boost throughput, simplify processes, lower costs, improve metal recovery and yield and reduce supply chain complexity.

It can also help companies achieve ESG goals, for example by providing accurate data insights and empirical evidence and facilitating sustainable design.
Sadly, research tells us that 70% - 95% of these initiatives will not reach their stated goals. That equates to over US$900 billion worth of spend that will miss the mark.

"This is mismanagement on a colossal scale," wrote Steven Zobell, Chief Product and Technology Officer for Workfront in 'Why digital transformations Fail: Closing the $900 Billion Hole in Enterprise Strategy'.

Yet, the extraction industry faces similar challenges and headwinds to that which any industry faces.

Operators need to continuously improve operational performance (output, quality, system efficiency, safety, etc.) while simultaneously

creating shared value to satisfy the community, shareholders and regulators. Increasing pressure to meet ESG requirements and hit emission targets as well as the general COVID-induced move toward rapid technology adoption means being afraid of failure isn't going to cut it at your next performance review.

So, what can you do?

You can stop thinking digital transformation is just about technology and breaking down how successful transformations are achieved – usually, they involve a combination of systems thinking, incremental improvement, operational imperatives, human factors, change managment and operational excellence.

> "Understanding where your operation is positioned in its digital maturity journey is the best place to start."
>
> Dominic Stoll - Solutions Manager at Mipac

3 Why digital is inevitable

In the face of critical minerals supply questions, challenges from senior management, ESG regulations, unpredictable commodity prices, activist-investors, tightening regulatory environments and sometimes the press, the industry must deal with declining and variable ore quality, deeper deposits, experience shortages and increasing stakeholder expectations to deliver a better set of performance metrics.

"Australian mining companies must not only adapt to the disruption of industry from a technical viewpoint, but the disruption being brought about by changing community standards and attitudes towards mining," says Ian Sanders, mining lead at Deloitte Australia, of the rapidly changing market.

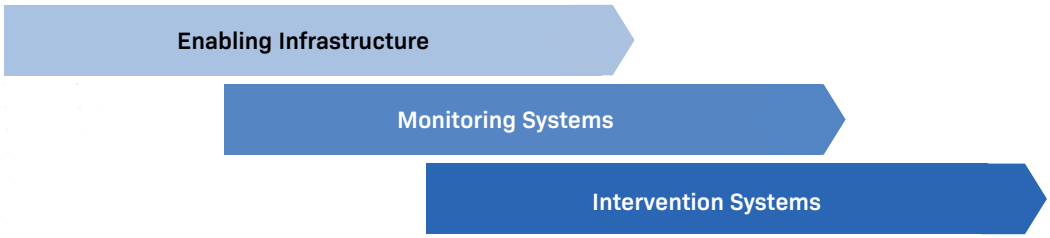
In its 'Tracking the Trends: The Top 10 Issues Transforming the Future of Mining', Deloitte has pointed out that the need to remain competitive requires operators to "push the boundaries on their digital transformation, attract truly diverse workforces and avoid the capital project mistakes of the past. It also requires them to make technology a strategic priority by acknowledging its role as an enabler across every facet of their business".

It's a challenging environment but throwing money and computers at the problem isn't going to guarantee success. There's no denying that there's a digital revolution underway in the extraction industry — or that digital transformation promises a way forward. Indeed, it is unavoidable if your operation plans to remain competitive. But there are traps and it's easy to fall into them.

"Understanding where your operation is positioned in its digital maturity journey is the best place to start," says Dominic Stoll, Solutions Manager at Mipac. For example, there is no point in applying advanced predictive analytics to data sets that are incomplete or questionable. By understanding your operations' digital transformation goals, timeframe and budget, it's possible to develop an actionable roadmap that transitions your operation through the digital maturity journey.

Fig 1: Mipac's digital maturity assessment tool

Regressive	Reactive	Planned	Proactive	Predictive
Insufficient hardware	Limited automation	Automated, measured and monitored	Alerts and notifications	Automated decision management
Limited/no standardisation Limited/no instrumentation Limited/no connectivity Manual operation of equipment	Control system operational No process historian Manual operation of equipment Manual condition monitoring	Operational data informs daily plan/ priorities Online condition monitoring Planned maintenance/ operations	System bottlenecks known and prioritised Performance measured in dollars & in real time Online automated and actionable decision prompts	Upstream operations adjusted to push system bottleneck downstream System performance automatically adjust-ed in real time

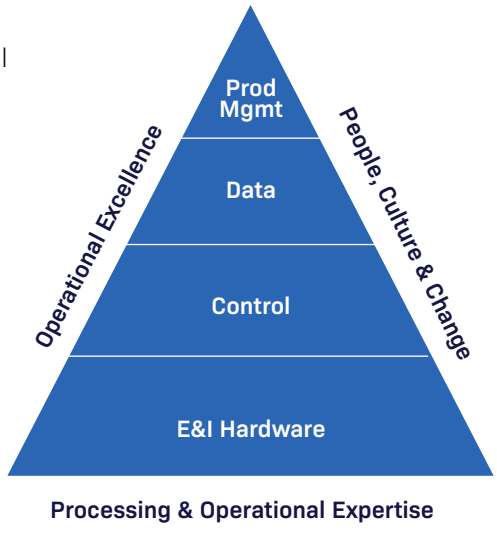


The best place to start?

Your enabling infrastructure level: Can you accurately measure, monitor, and adjust the critical few parameters that are key to your operation? In other words, do you have the right instruments, historians, and control strategies in place?

It's important to remember that digitisation applies to every layer of the automation pyramid, from the field level to the management level.

Fig 2: Mipac's approach to digital transformation across the automation pyramid



4 The ROI can be substantial

According to a report commissioned by METS Ignited and National Energy Resources Australia (NERA), embracing new technologies in the resources industries could add $74 billion to the Australian economy by 2030. Former Federal Minister for Industry, Science and Technology Karen Andrews said

> the use of analytics and robotics provided significant safety and environmental benefits, while rapidly increasing job opportunities.

While there have been some notable failures, these are often caused by a top-down approach, the methodology employed or the human and cultural features of the organisation, rather than the failure of new digital technologies like automated decision enablement, machine learning or process automation.

Typically, the problem starts with the idea that it must be transformation and not an evolution and the fact that greater emphasis is placed on technology's impact than technology's adoption.

Minerals processing is a capital-intensive industry that relies on metallurgical processes that can take decades to evolve into effective, efficient and viable solutions. Many processes remain fundamentally unchanged for generations. When evolving these processes to take advantage of new digital technologies, it is easy to think too big, too soon.

The job of a solutions salesperson is often to sell the Board and the CEO on a vision that a comprehensive re-engineering will deliver a satisfactory return on the investment. However, large scale re-engineering projects can lead to elaborate new solutions that do not represent a positive cost/benefit trade-off while ignoring problems that exist at a more fundamental, operational level.

This can translate to wasted money and little incremental improvement on the plant floor. For example, getting the right information to the right worker in the right context is still a problem, and failing to take your staff on the digital transformation journey is an oft quoted contributor to failure.

Indeed, in unsuccessful projects, the most common pitfalls involve change management and include a lack of employee engagement, inadequate management support, poor or non-existent cross-functional collaboration and a lack of accountability, rather than the technology.

The latter is comparatively easy in contrast to the challenge of knowing what needs to be done. Furthermore, sustaining a transformation's impact typically requires a major reset in mindsets and behaviours – something that few leaders know how to achieve.

5 This isn't Silicon Valley

Australia has one of the most competitive mining, oil and gas industries in the world, which will continue to boost its economy as it transforms. It didn't get to be that way by taking unreasonable risks and there's no reason leveraging new digital technologies should be considered unreasonable.

If done properly, significant operational improvements can and will drive profitability. Successful change is approached from an operational perspective and not a top-down corporate world view that ignores expertise and practicalities on the plant floor.

The Harvard Business Review recommends one of the key approaches that can help ensure a successful project is to recognise that 'digital transformation is not about technology'.

Let's face it, much of the hype around digital transformation is based on white-collar workers or developers building iPhone apps in Silicon Valley.

As Joe Pease, Principal Consultant at Mineralis, said in a MetPlant conference keynote, "fail fast" doesn't cut it in this industry. "The poster child of Silicon Valley, lean start-up thinking, just doesn't apply in the mining industry," he said. "Even the digital transformation arguments that you will see in the information industry are hard to apply in the complex, variable industry of minerals processing where even the raw materials are constantly variable and the processes are extreme."

> "We all know the challenge was never "should we" innovate, but "how" should we innovate.
>
> Innovation in this industry doesn't look the same as in other industries and "fail fast" is not an option."
>
> Joe Pease - Principal Consultant at Mineralis

6 Human factors at the heart of success

In his analysis 'Turning Mining Performance Around: Moving From Efficiency to Effectiveness', Stratflow Australia's Hendrik Lourens reminds us that a production system includes three critical, interacting elements: technology, process and people. "Most productivity improvement efforts have focused on these elements in isolation, and in particular on better technology (automation, big data) or improving on process models. Strengthening and adjusting the linkages from these elements to the people link, and the people element itself have not received much attention," he says.

There is little doubt that human factors are a core success indicator that require separate consideration.

On-site experience shortages frequently place stress on operators and maintainers that can be relieved through automation and real-time decision enablement. Technology solutions must be designed, deployed and evolved to promote acceptance and avoid resentment due to front-line workers feeling the pressure of becoming a human-machine.

Engagement and consultation to ensure technology is enabling and empowering rather than hindering or replacing human capability is key to success.

"Magic happens in the blends of discipline,"

said Peter van den Heuvel, Manager of Shell's PI CoE,

explaining how Shell has put technology into the hands of managers, engineers and operators. Cutting-edge technology and talent are not enough. Companies must break down organisational and cultural barriers that stand in the way, recommends the Harvard Business Review.

How eLearning can be an effective way to upskill your workforce for digital transformation

Did you know that eLearning courses use 90% less energy and make 85% less CO_2 than in-person classes?

eLearning is also said to improve employee performance by 15-25% and increase retention rates to up to 60% (compared to 8-10% for face-to-face training).

eLearning is also:

- flexible and convenient
- more accessible to more people
- customisable
- cost effective
- interactive and engaging

When paired with a simulator, eLearning has even been shown to accelerate commissioning, start up and ramp up times.

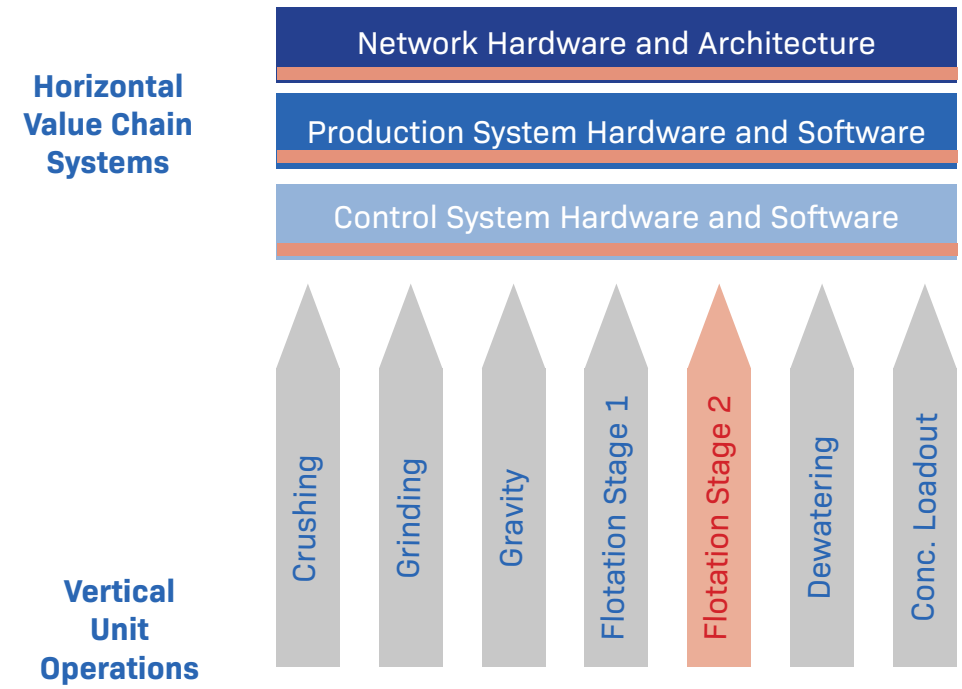
Approaches to data and automated decision management that emphasise and support human decision-making, rather than detracting from it, will find better acceptance and yield more reliable results. A greater focus on technology adoption and a lesser focus on impact from technology will also provide greater long-term benefits.

Change needs to leverage the skills that are present and allow digital transformation to be undertaken in a way that is sensitive to the needs of workers. This means to leverage the skills of those familiar with the plant and processes and who can provide valuable anecdotal support for inferences drawn from advanced analytics.

Simple and proven digital solutions can be quickly deployed to enable real-time monitoring and analysis, but then human expertise can augment this to identify and decide on the biggest constraints impeding efficient operations.

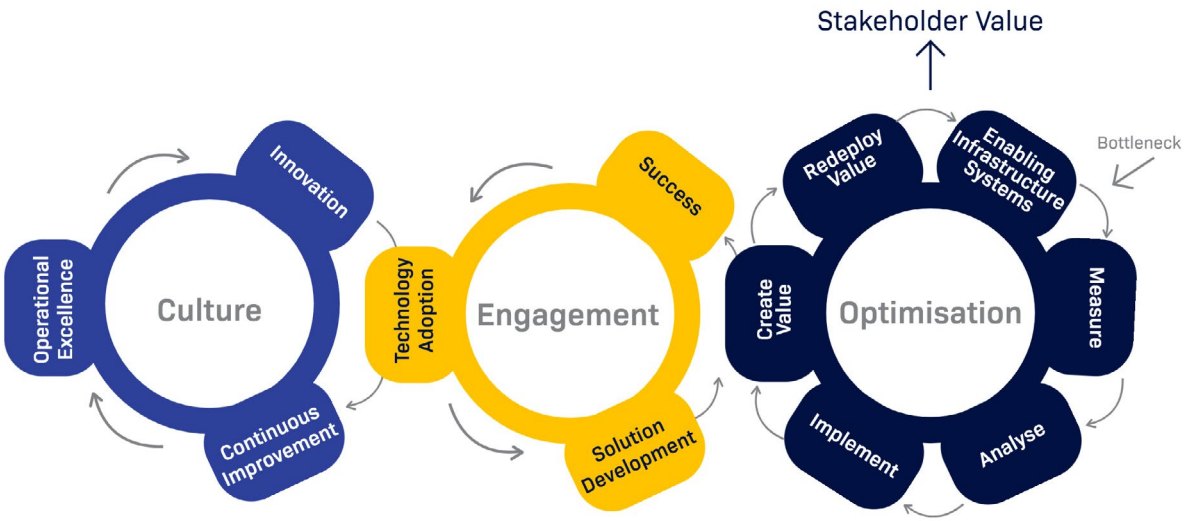
By investing the time and resources to resolving the worst-performing parts of the operation and always targeting the bottleneck first, digital solutions can deliver fast returns on investment to support the ongoing transformation. This is what we call the 'thin slice approach.'

Fig 3: Sequencing a modernisation roadmap via "thin slice" improvements in the systems and unit operations - commencing at the first bottleneck



As knowledge and understanding of the system increase, more sophisticated analytics and automated decision enablement techniques can be applied to better enable front-line workers. In doing so, operations can transition through a digital maturity journey and shift to a predictive environment leveraging what machines are good at (event detection, database queries, etc.) and empower front-line workers with what they are good at (complex reasoning, intuition, field inspections, etc.) – in other words, ensuring that your staff aren't just monitoring the outputs of machines but continuing to undertake meaningful work.

Fig 4: Mipac digital transformation flywheel



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Roadmaps as a proven methodology for change

The mining and minerals processing industries have the potential for significant operational and production benefits when digital solutions are applied with a strategic, iterative approach, aligned with change leadership principles and tailored to workforce skills and behaviours.

Embracing digital change as an evolution, rather than complete transformation, can solve a range of operations-wide challenges efficiently and effectively.

Identifying where you can unlock value before you begin is crucial. As Paul Mitchell, EY Global Mining & Metals Leader writes, "We take the view that digital initiatives should only be commenced where there is a demonstrable link to productivity and cost benefits. Sometimes this will require a long-term view; but organisations should avoid doing digital without this link to exploiting clear business opportunities". Again, technology adoption is pivotal for long-term, sustainable impact to happen.

The key to digital transformation then is to first assess a plant's digital health (e.g., enabling infrastructure and technology, processes and people) and then develop a roadmap with clear actions that unlock value and engage the workforce.

Six insights to avoid failure

1. Where are you now and what is your ambition? What is your plan to close the gap considering your timeline and budget? Digital transformation is an enabler to creating value not the goal.

2. Is the problem either insufficient advanced analytics capability or insufficient enabling infrastructure preventing you from obtaining hindsight, insight, foresight and control of your operation?

3. Does your plan focus on unlocking the system bottleneck then redeploying that value to consistently shift the bottleneck downstream via small successive improvements?

4. Are your partners technology independent with a history of co-operation and capable of collaborating with other vendors to deliver a holistic solution that unlocks value for redeployment?

5. Is your workforce engaged and are staff culture, behaviours, daily practices and mindsets aligned to your organisational purpose? Have you allocated appropriate project ownership and change leadership resources?

6. Have you ensured your workforce is enabled and equipped to maximise the value of digital innovations? Have they been provided sufficient upskilling opportunities, such as eLearning?

8 To conclude

The mining industry must keep up with digital transformation trends to remain competitive in the post-COVID world and receive the many benefits this sector can bring to delivering our ESG targets.

With such a high failure rate for digital transformation projects, resulting in wasted money and little improvement on the plant floor, digital transformation strategies should focus on enabling infrastructure, human factors and operational excellence to ensure they are successful.

To ensure success, companies should have a clear plan, focus on unlocking system bottlenecks and ensure employee engagement and ownership.

9

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About Mipac

Global leaders in operational technology, control systems and engineering services, Mipac is the perfect partner in driving your operational performance.

From control systems with robust software and engineering foundations to the latest innovative advancements in digital technology, Mipac delivers high-quality, intelligent solutions to drive performance.

We understand the complex challenges operations face through our depth of onsite experience and have developed a reputation for solving complex problems.

Operating globally, we provide an extensive range of services to realise the total value of your mining operation and have developed a suite of products that will help you increase productivity, reduce costs and optimise operational performance.

From solid software and engineering foundations to the latest innovative advancements in digital technology, Mipac are your trusted advisors for all aspects of your mining operation.

Our solutions

We work across various industries to realise the total value of your operation and recommend solutions and services that produce optimal outcomes and increased performance.

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- Industrial Software Solution
- Data Visualisation and Analytics
- Electrical and Instrumentation
- Process Optimisation
- Cybersecurity
- Operations Support and Procurement
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