2022

MAINSTREAM™
C O N F E R E N C E

The State of

ASSET MANAGEMENT

2022

The State of Asset Management

Since 1995, the MAINSTREAM research team has polled our community of thousands of Maintenance, Reliability and Asset Management professionals to glean distinctive insights into the barriers and challenges faced, and the opportunities on offer, in their quest for achieving asset management excellence. The findings from our surveys help leaders, teams, and individuals to understand best practices, compare their companies' performance and working environment to those inside and outside their industry, and make informed and effective decisions.

Rizing's Asset Management Experts Are Also SAP Asset Management Software Experts

When you partner SAP's EAM capabilities with Rizing's team of experts, you get a system perfectly tailored to your needs and processes. Our teams have real-world experience in EAM that allows them to provide recommendations and business outcomes with their unique knowledge of asset-intensive industries.

EAM

We help asset intensive companies around the world optimise their asset management and SAP EAM solutions

Geospatial

Our reliable geospatial services focus on delivering successful projects using the latest technologies

Real Estate

We deliver end-to-end SAP intelligent real estate and RE-FX solutions that align with customers strategic plans

EHS

We empower business with proactive safety measures and enterprise-wide visibility into potential hazards

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ABOUT
THE RESEARCH

The results are an outcome of two research types:

1. Four x 90-minute roundtables between the 1st and 4th March. 81 people participated in interactive discussions, and completed the survey.
2. The same survey was completed online by 174 people between the 8th and 11th of March

MAINSTREAM

The results of the survey directly influence the MAINSTREAM 2022 program. This means that the speakers (local and global), workshops, tutorials, and training courses at the MAINSTREAM Conference on 18-19 August, are relevant to our community's knowledge, capability, and training requirements.

The participants

The most common job titles of participants included:

- Heads of Asset Management
- Maintenance Managers
- Reliability Professionals
- Plant Managers
- Engineering Managers
- Asset Data and Technology Leaders
- Maintenance System and Process Leaders
- Heads of Asset Strategy
- Maintenance Superintendents

The authors

The survey content was designed and written by the MAINSTREAM research team. A big thank you to Peter Dunford, Rizing EAM, and Peter Durrant, Covaris for facilitating and moderating the roundtables. We also wish to thank our research partners, Rizing EAM and GHD.

COMPANIES REPRESENTED

Our research involved 255 participants from Australia and New Zealand representing a range of regions, industries, asset management maturity, and organisation sizes.

ABB Australia
Accolade Wines
Adani Australia
Adbri Masonry Pty Ltd
Adelaide Brighton cement
AFFCO New Zealand
AGL Energy
Alinta Energy Ltd
Allied Petroleum
Anglo American Metallurgical Coal
AngloGold
ANSTO
APA
Aurizon
Australia Post
BAE Systems
Bay of Plenty District Health Board
BE Campbell
Bega
BHP Iron Ore
BHP Petroleum
Bluescope Steel
Boral Asphalt
Boral Bricks
Brisbane City Council
CASG
CBH
Chorus NZ
Citic Pacific Mining
City of Gold Coast
City of Stonnington
Cooperative Bulk Handling
Crystalise
CS Energy
CSBP Chemicals
Delta Electricity
Dept of Conservation
ElectraNet

Energy Queensland
EnergyAustralia
ESS Engineering
FLS
Fonterra Co-operative Group NZ
Fortescue Metals Group
Goldfields
Goulburn Valley Water
GrainCorp Foods NZ Ltd
GrainCorp Limited
GWM Water
Horizon Power
Hyne Timber
Incitec Pivot Limited
Jemena Limited
Jetstar Airways
Keolis Downer Rail – Yarra Trams
Lion
Lyttelton Port Organisation
Macedon Ranges Shire Council
Major Drilling Pty Ltd
MGO Operations
Mid West Ports Authority
Millmerran Operating Organisation
MIT Ltd.
New Zealand Steel
Newcrest Mining Limited
Norco Cooperative Limited
NZDF
OJI Fibre Solutions
Orica
Pacific Steel NZ Ltd
Panpac
Petrofac Facilities Management
Pilbara Ports Authority
Powercor/ Citipower
Public Transport Authority of Western Australia

QANTAS
QSL
Queensland Health
Queensland Rail
Queensland Sugar limited
Rio Tinto
SA Power Networks
SA Water
Saputo Dairy Australia Pty Ltd
Shell
Silver Fern Farms
South 32
Southern Ports
Stanwell Corporation
Sunshine Sugar Harwood Mill & Refinery
Sydney Water
Talison Lithium
Tamroc Mining Services
Territory Generation
Toro Energy Limited
Total Industrial Site Services
Total Marine Services
Total Plant Control Australasia
Transgrid
UGL
UWJV
Vale
Valmet
VicRoads
Vinidex Pty Ltd
VIP Packaging
Visy
Water Corporation
Watercare Services Limited
WaterNSW
WesTrac
Wilmar

CONTENTS

Top ten challenges and barriers to achieving asset and reliability management excellence:

01

Maintenance Workforce Health and Wellbeing

Mental health continues to be a major issue in the workplaces of our MAINSTREAM community. This rated as the #1 challenge in all four of our research roundtables and in our broader online survey. Many companies reported that the issue is greater than it's ever been, and getting worse. Poor mental health can have a significant impact on an individual's health, attendance, performance, engagement, and safety.

Several Causes

The significant increase in mental health and wellbeing challenges over the last few years are a result of job insecurity, high job demand and pressure to perform, lack of empathy and understanding from leadership, and the imbalance between effort and reward. But by far the biggest reasons for this increase are the ongoing effects of the COVID-19 pandemic, and relentless organisational change.

Ongoing effects of COVID-19

During the pandemic, whether it was mining, manufacturing, power generation or transport, almost all companies applied the strategy of having critical operational and maintenance people working on site in A and B teams, whilst non-critical operations, management and corporate functions completed much of their work from home. After two years, the us vs them divide that often existed between operational teams and corporate teams has become amplified.

Due to people being sick from Covid or having to isolate because of close contact restrictions,

the long and sustained hours and overtime required, has changed some organisation's approach to reliability and equipment maintenance. Examples include choosing to run machines to failure because it was a better strategy. Another example, common in booming sectors like food and beverage, logistics and pharmaceutical manufacturing, was the huge expectation by leadership for increased performance to keep up with unprecedented demand.

> *"One of the major impacts on our maintenance staff is the feeling of being isolated. It's all very well working on Zoom or Microsoft Teams to discuss work tactics and tasks, but you miss out on all the spontaneous communication and banter that happens when people are working together all the time"*
>
> **MAINTENANCE SUPERINTENDENT, POWER GENERATION**

Then there are unique issues for people managing assets in sectors like emergency services, defence, and the public sector, who

had to change jobs to assist the government. As a result, over the last two years, entire department's capabilities have changed. People have been doing work that they didn't sign up to do, and are now leaving their industry.

Relentless Organisational Change

The extended period of feeling unsettled and overwhelmed through Covid is now colliding with another force – relentless, continuous organisational change. Whether it's a new ERP system, digitizing asset management, restructuring, or improvement initiatives, people's ability to be resilient is waning. Even projects which used to be seen as continuous improvement projects are now seen as major change projects and must be managed and dealt with accordingly.
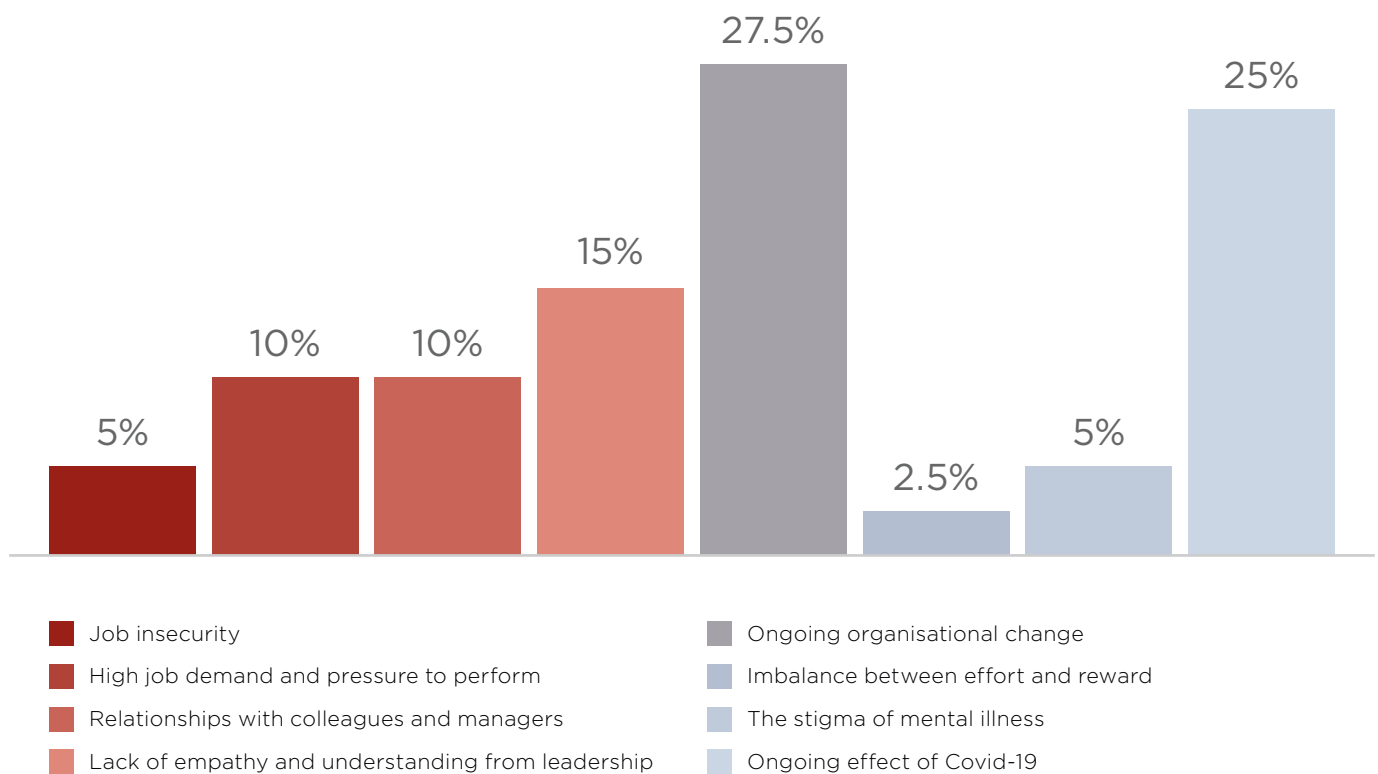
The ongoing messaging from leadership about the move to automation and the adoption of

new technology is overwhelming. A lot of the people, especially the trades, feel threatened and insecure. It's causing stress. This has a direct impact on the organisation's ability to safely manage, operate, and maintain assets, because when operators become stressed, they step away from the process. When they step away from the process, safety becomes a concern.

> *"You know you have a problem when small things that wouldn't necessarily cause resistance or conflict suddenly became magnified and disruptive. Our people have experienced so much stress that their ability to be resilient has been eroded"*
>
> **HEAD OF ASSET MANAGEMENT, TRANSPORT**

What are the three main reasons for the recent increase in mental health and well-being challenges for your Maintenance Workforce?

Legend:
- Job insecurity — 5%
- High job demand and pressure to perform — 10%
- Relationships with colleagues and managers — 10%
- Lack of empathy and understanding from leadership — 15%
- Ongoing organisational change — 27.5%
- Imbalance between effort and reward — 2.5%
- The stigma of mental illness — 5%
- Ongoing effect of Covid-19 — 25%

Poor Change Management

Changing people's perception of major change through communication or training is difficult. Change management is not about the technology or the tool, but rather building resilience and agility in our people, and transforming the way they see change. This helps to alter attitudes and behaviour. Things will go wrong, and goal posts will shift when large process re-engineering and technology projects occur. By investing in understanding our people's perception, and then incentivising them, they will deal with the broader change much more comfortably. Good change management is a risk mitigation strategy.

Erosion of resilience

We're not as resilient as we thought we were. This is a wake-up call. There are lots of other macro-factors confronting our asset, reliability, and maintenance workforce – upheaval in the energy sector as coal mines getting decommissioned, machines replacing jobs, and even war.

Resilience must be taught to leaders, managers, and our workforces. Companies must find the sweet spot between working from home and on site. Because we now have a convergence between people's personal lives and their work lives. There's no going back to what it used to be, but we know we need to connect as human beings with emotions more than we have over the past two years.

The Fly-In, Fly-Out model is breaking

Mental health has also become a real challenge for the FIFO workforce. This workforce is vital for the Australian economy. Mental health, and other issues like bullying and harassment, are not being given enough attention by leadership. Since the FIFO workforce became a phenomenon, separation from loved ones has always been a problem. Add Covid and relentless organisational change to this and you have a FIFO workforce at a higher risk than the general workforce of developing stress, depression, and anxiety.
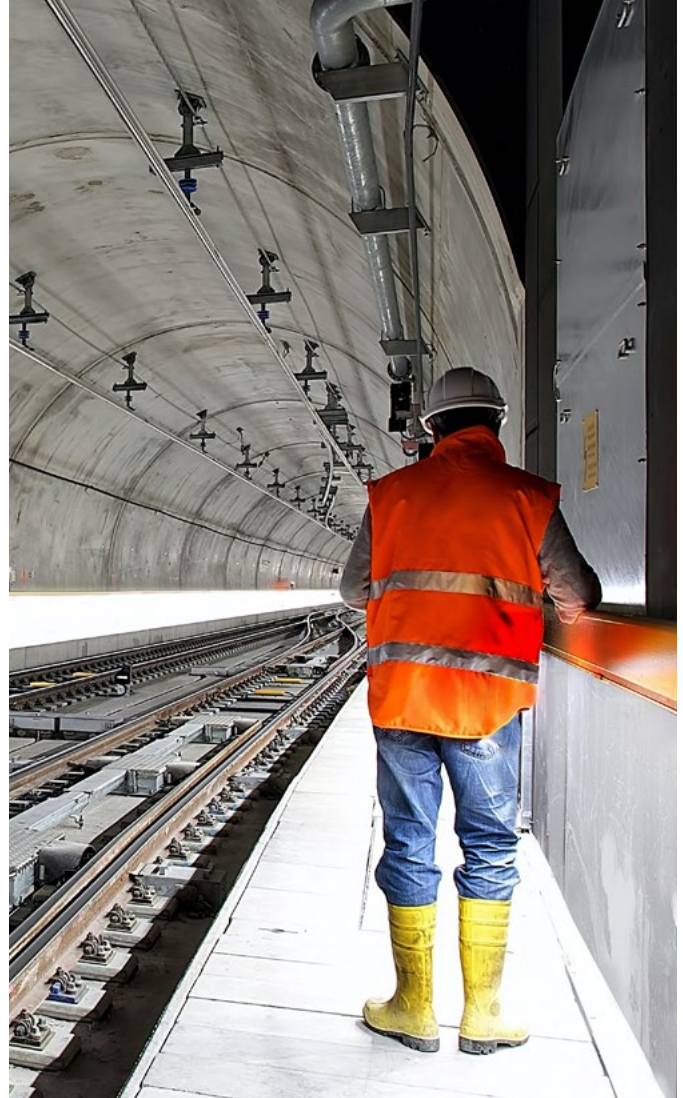
Practical solutions

Several companies have implemented practical initiatives that are working to combat the increase in mental health and wellbeing including resilience courses, implementing work/life plans, counselling services for employees and for contractors, and training around being able to talk freely about taboo subjects such as suicide.

Mental health awareness, good nutrition and exercise are all examples of education being offered as part of onboarding of new people and new contractors.

Finally, there are very practical and easy-to-implement initiatives like working out balanced rosters that continue to allow people to do some of their work from home, insisting that everybody has their cameras on when they are in zoom meetings, coffee catches ups over zoom that address non work topics, and even fun monthly trivia competitions over virtual platforms that foster camaraderie and friendship.

Key questions raised by the community:

- What are companies doing to ensure they manage workforce stress?
- How do we train resilience?
- How do we communicate something so intangible like depression and anxiety to leadership?
- How do we teach listening and empathy skills?
- How do you create change management practises that empower people to drive the change?
- How do you change people's behaviour?
- How do leaders communicate the benefit of change when even they have difficulty articulating it?
- What is the cost of poor change management?
- Should change management strategies be developed internally or from an external source?

02

Unpreparedness for the maintenance workforce of the future and the current skills gap

The next decade brings with it the greatest workforce challenge we've ever faced. Machines and automation are replacing human tasks. This changes the skills that organisations are looking for in their workforce.

There are two parts to this challenge. What does the right organisation structure look like in the future? And therefore, what do the skills for the workforce of the future look like? At this stage we can't even agree what a reliability engineer does. So how are we possibly going to get our head around confronting big challenges like this?

The overwhelming sentiment is that we are unprepared and ill-equipped for the future.

Thinking versus doing

Companies are thinking about the future in three different ways. The first is the immediate, which is the next 12 months. The second is short to medium term, which is the next five years. And then there is the long-term thinking and planning for the next 5 to 10 years.

There is a good example in the mining industry of companies and competitors working together on a curriculum to look at things like autonomous mining. But apart from this handful of the large miners, all the groups felt that it's difficult to get momentum. We start thinking about preparing for the workforce of the future and then we stop because business-as-usual gets in the way. One energy organisation reported that they have a specific group in the business that is tasked with working on this challenge.

It is imperative that we find solutions to working this out. We don't want to leave things too late before we start thinking about the future. There are real life case studies happening in front of us right now in the energy industry.

> *"We have identified where we need to go to, what needs to be done, and even what skills may be required. But HOW to do this is the bottleneck because without taking our assets offline we do not have the time or resources"*
>
> **MAINTENANCE AND RELIABILITY MANAGER, WATER UTILITY**

New generation workforce versus incumbent workforce

Across every sector, there is a real issue with the way different parts of the workforce are willing to take this on. For example, younger people are curious and excited about potentially being in a role in five years that doesn't exist today. For the older generation – who are used to being rewarded for reactive work – to get them thinking about predictive analytics, automation, robotics, and what the workforce of the future, can be difficult.

It goes without saying that this has a lot to do with digital literacy. During Covid it was

How prepared is your organisation for the knowledge, skills and experience required for the Asset Management workforce of the future?

12.5%

Comparing talent supply/demand: We've assessed how attrition, retirement & tech might impact talent, and understand the demand for future skills.

12.5%

Have a plan for workforce transition: We have a plan to address capability gaps on a role-by-role basis. We have measures, KPIs & timelines in place.

18.75%

Assessed business strategy: We understand the enterprise strategy, how it might impact workforce, and which future roles are required.

56.25%

Started thinking about it: We collated data on our workforce to help us understand skills and capabilities to give us a detailed view of jobs.

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a challenge just to get some of the older, incumbent workforce to use simple technology like Microsoft Teams and Zoom.

> *"What keeps me up at night, is worrying about the mid-career workforce. Our younger workforce will embrace the big shift. The ageing workforce will exit in the next 5-10 years. But our mid-career workforce – they will have to transform big-time to keep up with the speed of change"*
>
> **ASSET MANAGEMENT LEADER,**
> **MANUFACTURING**

Trades and Technicians

Overall, there is a massive shortage of highly skilled trades. Companies are having to make do with less capability. Gone are the days where up-and-coming trades spent 15 years learning from an experienced trade. This part of the workforce is ageing and soon their knowledge and experience will be lost. There also is

no trade industry recognition for many of the jobs that we think will be needed in the future.

Traditional Versus Cool and Hip

Another big issue is attracting people to traditional maintenance and reliability roles in traditional industries. Many young industrial engineers and trades who would usually enter the mining, energy or manufacturing sectors are being lured to other industries. Renewables and battery technology for example are way more 'cool and attractive'.

In regional areas it's even harder. Country towns get smaller and it's difficult to find resources. As a result, maintenance is always trying to catch up, because there is no downtime. This impacts wellbeing, safety, and productivity.

A very interesting concern raised was the 'dumbing down' of manufacturing. This refers to the fact that Australia is being treated like a backwater and there's been a dumbing down of the sector by the Original Equipment Manufacturers (OEMs). Good, skilful, technical people have been replaced with sales and business development people.

Engaging our Workforce

We must have the training programmes that foster high engagement from the very first time the person gets introduced to the organisation. This is done well in the tech industry and even in finance and other services sectors. We need to step up. We're losing reliability engineers because we don't use them for reliability!

After two years of Covid, people are expecting more flexibility at work. One of the barriers to this happening is that there are not enough high-quality leaders. Another Covid-related engagement issue is that we've lost 10% of our workforce due to people being forced to be double vaccinated.

"How do we bridge this gap when it will take eight years to upskill diesel fitters to look after green energy? And management don't really want to confront the problem."

MAINTENANCE SUPERINTENDENT, MINING

"Everybody in our organisation is working in a role one tier below where they should be"

RELIABILITY LEADER, MINING

This is a Workforce Crisis, and We Must Rise

Technology is moving faster than people. Some people love that, and some don't. We constantly talk about a diverse workforce. But at the same time, we also pressure people who are not eager to embrace technology to move as fast as those that do. We must make it okay for it to take some time. Being leading edge for the entire workforce is not sustainable.

As we strategise for autonomous workers and the decarbonisation and electrification of everything, we need to think very carefully about how we build the foundation for this future workforce. It hasn't been built yet. We must also remember that soft skills are as important as technical skills.

What are the immediate skill sets needed to be filled in your business?

Mechanical	Electrical	Boilermaker	Technical	Other
22%	26%	0%	41%	11%
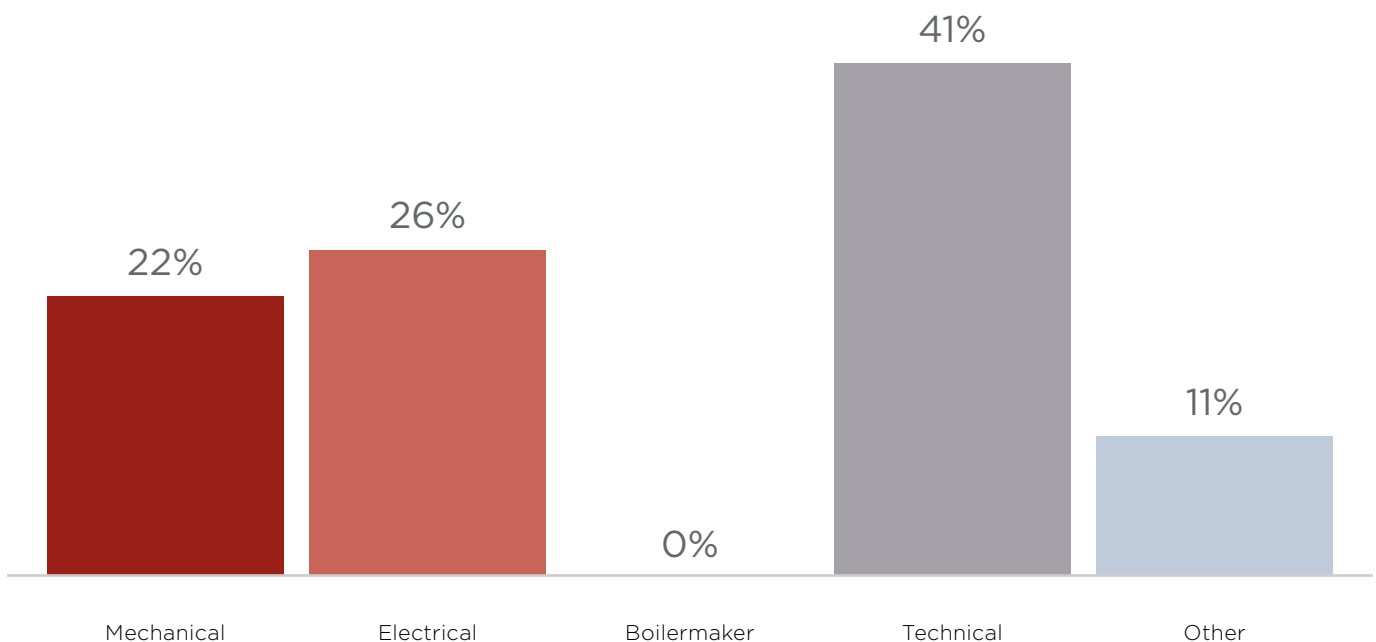
Key questions raised by the community:

- How do we find enough qualified people to meet our business needs?
- How do we develop and task qualify our workforce for not only the current needs of the business, but continuous training for the constantly evolving needs of the business?
- How do we ensure this is all done at a faster rate than that at which technology is impacting the work?
- How do we develop a coaching and mentoring network that goes beyond our organisation / industry?
- How do we move people up a level or two?
- How do we develop our existing workforce without really knowing what they're going to be doing?
- How do we get TAFEs and Uni's to create courses without really knowing what we will be doing?
- How do we wake up the leadership of our organisation who don't want to know that this is a future skills crisis?
- What does the right organisation structure look like in the future?

03

Aligning Asset Strategy with Enterprise Strategy

All activities and functions within a business need to be aligned to the business vision and strategy. Asset management is no different. This involves defining the value that an organisation's assets need to provide, to meet the overall business objectives.

It's fair to assume that an organisation's strategy should underpin the 'why' for any asset management strategy, forming the true north for the asset team to operate by. This creates a 'line of sight' from the daily activities to the overall business strategy. But this doesn't mean that things are set in stone. Should organisational strategy change or evolve due to internal or external factors i.e., market conditions, changing business priorities etc. then so the asset management strategy should be reviewed to ensure it remains reflective in its objectives.

This may feel like a new concept to those working in organisations where asset management has traditionally sat in a silo. At the ground level, asset leaders need to raise commercial awareness with their teams, highlighting how maintenance practices can impact revenue generation and value creation. Everyone in the business needs to have a shared goal and understand the total cost of ownership for the work they do.

Defining the Value of Asset Management is Difficult

One of the most complex challenges that asset managers face is driving strategic change from a partially empowered position within an organisation. This involves both managing upwards towards executive management and downwards through the mid-level and shop floor, without having all the levers to jockey.

Managers and decision makers across industries continuously challenge asset management practitioners to define the value contribution from an asset management investment. This is complex as there is not a simple linear relationship to value, and organisations have different perceptions of what value is as it pertains to their strategic needs.

However, for asset management to succeed at a strategic level, it is important to create a model which is both credible and reflective of what an organisation is endeavouring to achieve.
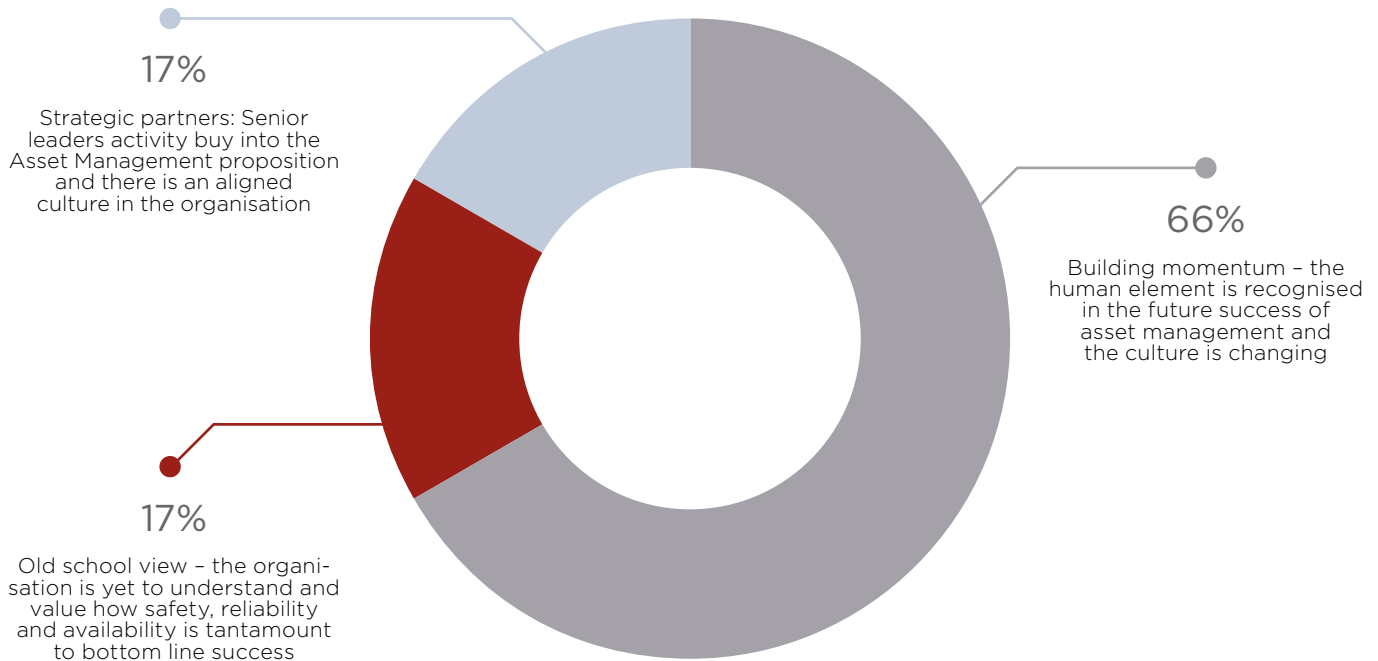
> *"The best available mechanism for measuring contribution from an asset management investment is ROIC (return on invested capital)"*
>
> SENIOR SOLUTIONS ADVISOR, MANUFACTURING

How to Communicate with Senior Leadership

The first step is to simplify the messaging. We need to take complex asset management plans and distil them into easy-to-digest communication like one-page visual diagrams. These can range from hand-drawn charts through to intricate graphic designed models. One organisation

How does the leadership of your business (CEO, CFO, COO) view the asset management function?

17%

Strategic partners: Senior leaders activity buy into the Asset Management proposition and there is an aligned culture in the organisation

66%

Building momentum – the human element is recognised in the future success of asset management and the culture is changing

17%

Old school view – the organisation is yet to understand and value how safety, reliability and availability is tantamount to bottom line success

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shared how they got attention from C-level by using 3D Modelling to communicate the negative impact of selected incidents in the plant.

> "At the bottom of the one-pager, you outline the current state and, at the top, what your vision is. Between the two are the steps needed to create the change."
>
> **DIRECTOR OF ASSET MANAGEMENT, PUBLIC SECTOR**

Getting the CFO's Attention

Asset Management plans must be created so that CFOs can understand it. Whenever you communicate your plan, consider the language you are using. A big problem we face is that we build asset management plans using asset management language that not everyone understands. The first thing we need to do is put our feet in our CFO's shoes as they live in quite a different world.

That CFO world usually includes competing

demands. We might think our asset management plan is the only priority, but CFOs have marketing teams saying invest in new media and IT teams saying invest in cybersecurity. No matter how great the plan is, you need to be mindful of what phase the business is in overall. You might be passionate about your plans but, if times are tough, your CFO won't be receptive.

Working With Consultants and Advisors

A common theme is the value that specialist asset management consultants bring to assist with this important communication. These types of companies understand how to build good asset management transformation plans. They have the time and expertise to look at your business and operating environment independently. If you choose the right partner, they'll have skills to fill a gap and help you build a solid and sellable plan. They are also very good at providing the type of data, insights, and analytics that senior leadership and C-level understand.

Finding Quick Wins

Because there is always time delay between investment to benefit delivery, you need to find something meaningful that can deliver quickly. This will demonstrate your proof points and help secure stakeholder support. Select one area for a quick win to get buy-in for future asset management plans.

> *"In my organisation, the word 'asset management' is only used by people in the maintenance and reliability function. I have never heard anybody from corporate use the word 'asset management'".*
>
> **DIRECTOR OF MAINTENANCE, WATER UTILITY**

Case Studies and Success Stories

Although slow, there are some good examples of asset and reliability teams achieving breakthroughs in their ability to closer align enterprise and asset strategies and objectives. A few include:

- Doing quarterly executive briefings for the leadership of our organisation
- Lobbying from the maintenance teams using safety as a lever
- Using surveys

- We formed an asset management committee to represent the operations and maintenance teams at senior leadership meetings
- Changing our language in the way we communicate reliability and maintenance with less technical, more financial language
- Using ISO 55000 as a framework

ISO 55000

The use of a framework like ISO 55000 enables this communication piece to take place effectively. A framework means the intent can be implemented even if you are not completely compliant. Alignment often leads to the correct behaviours, rather than just getting certified. The framework also helps if you have a change of senior leadership. This is important because often when there is a change of leadership, alignment between asset strategy and enterprise strategy can be threatened. It must stay consistent even if a cost cutting or turnaround strategy is implemented.

> *"The new CEO of our organisation is an engineer. Since he has come into that role, asset management has become a priority to understand across the whole organisation"*
>
> **MANAGER, MAINTENANCE AND RELIABILITY, MINING**

Key questions raised by the community:

- Does your organisation C Levels and Board understand TCO for Assets?
- Do you understand the Total Cost of Ownership (TCO)?
- How to recognise end of life in a dynamic market?
- How do we compare the cost of an aging portfolio against replacement?
- How can asset leaders nurture a more collaborative mindset to working with the broader business and strategic needs?

04

Making Use of the Enormous Amount of Data Collected

We are drowning in data. If it's agreed that assets are important for the business and that data is important for the business to optimise these assets, then it follows that capturing, storing, and making data-led decisions should be of equal importance. However, organisations are now generating enormous amounts of data from their plants and assets. Many of us feel overwhelmed.

> *"While we have the data, we lack insight. This gets us stuck, and instead of being fast and agile, we don't move at all. Then we think that if they wait for more data, we'll get the answer. This paralyses us further, which kills any possibility of innovation".*
>
> **HEAD OF ASSET INTELLIGENCE, ENERGY TRANSMISSION**

Generally, data quality is poor. Master data governance needs to be maintained, but this is easier said than done. A clearly defined problem should inform the kind of data that is captured. This helps when faced with the question of 'how much and what type of data do we need to capture?'. Thereafter, data needs to be cleaned and standardised. Only then can we run analytics over it to generate meaningful insights.

OEM Data

It's not surprising that companies have challenges with OEM data. In today's digital landscape, data is the new gold, and the value of an organisation's data and intellectual property has been elevated.

Data generated by sensors on a plant or equipment are automatically sent via the cloud directly to the OEM, who then, driving an aftermarket revenue stream, sell the insights from this data. OEMs believe that access to this data is important for them to keep providing an improved product to the market and take advantage of benchmarking information. Customers are demanding open data sources.

Interpretation and analysis

Another challenge is that people in the business with the analytical skills often do not have the asset management knowledge and experience to help make context-rich decisions. Unless analysts are fully integrated into the asset management function, they are just one view based on the data. This problems extends to aggregation because it is the combination and aggregation of EAM system data, safety data, weather data, production data, IoT data, etc. that will provide you with the insights that you so desperately need to make good decisions. Areas of friction can develop when data and systems are not common and 'owned' by different functions or departments.

Visibility and Visualisation

The power of visualisation cannot be overstated. The goal is having access to an interface that is easily accessible, collaborative and integrates information from multiple sources or perspectives.

> *"We have a really big problem with collecting and using good data because much of the data collection is outsourced across several contracting companies"*
>
> **HEAD OF ASSET RELIABILITY,
> INFRASTRUCTURE AND CONSTRUCTION**

Consider Uber as an example. There's very little difference in the fundamental people-moving principles of Ubers and taxis. A person still needs to get from A to B by car and a driver still collects and deposits them to their destination. The power is really in the visualisation of the service, the ability to see where your car is and access information about the person that will drive you. It's simply visualisation and workflow that has changed. And what a difference it makes. Now imagine the impact of overlaying failure data on a GIS enabled map to gain insights you otherwise wouldn't see.

Many corporate systems are monolithic, spanning the entire business. Some have more agile point solutions which interface between several best-in-breed solutions. The leading-edge thinking is that a data lake should house data from several systems, including all asset and reliability data, which then applies an analytics engine over the top to aggregate data from the disparate sources. A front-end (mobile enabled) completes the utopian system with a user interface or experience that makes viewing it a visual treat.

How mature is your organisation when it comes to using the enormous amount of data collected?
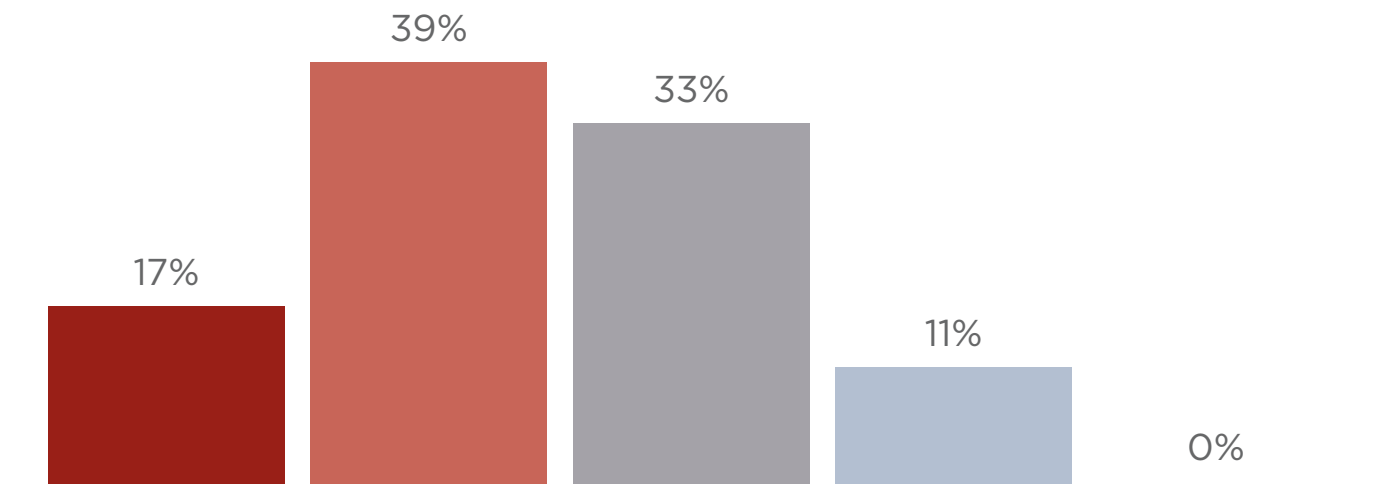
- **Lagging:** Quantity and source of data required for analytics not fully understood. Data analytics returns inconsistent versions of the truth.
- **Basic:** Data quality and accuracy is starting to be addressed. At the initial stages of identifying, collecting, and storing big data.
- **Intermediate:** Starting to store data centrally with meta data. Data collection is returning content rich and high-quality data.
- **Advanced.** Single data point is established to collect and cleansed data. Data is being aggregated and analysed into actionable information.
- **Leading.** All data collected is used. Big data has high integrity. Big data is used for meaningful and critical insights.

Some examples of encouraging results were shared across the groups:

- We are using Power BI and machine learning for condition assessments.
- We used to use a Ute with a scanner that drove around to identify gas leaks on our pipelines. Now we're trialling this via satellites and the data we are getting is proving to be much more accurate.
- We have a data warehousing system to capture data from 3 disparate systems: ERP, Safety, and HR. We pull all the data into the data warehouse for aggregation and better decision making.

- We use a plant data collection tool for anomaly detection. This is high precision data collection taken from a whole lot of big data. And what we find is that we are picking up issues a whole lot sooner than we used to.

"The great thing about big data is it throws up questions for us that we haven't thought of asking before".

GROUP ENGINEERING MANAGER, MANUFACTURING

Key questions raised by the community:

- How do we avoid information or data overload?
- Who should manage, govern, and own the data?
- How to best enable data transfer from capital projects?
- Who has worked out a way to get the data that your OEM is getting from your machine?
- What data standards do you put in place?
- Should we just choose an industry accepted data standard and get on with it?
- Does the business have the specific resources to clean or fix data issues?
- Are maintenance teams aware of the cost to the business of making decisions based on inaccurate data?
- How to best monitor older assets?
- How can operators or maintainers be trained to utilise the huge amount of machine data?
- What user-friendly apps can help technicians capture data correctly?
- If you are using a data lake, who should have access to it and who can make changes?

05

Underappreciating and Misunderstanding the Reliability Engineer

> *"In our organisation, Reliability Engineers are not utilized properly. Leadership don't understand what they should be doing, and they end up doing almost everything across the maintenance function, except what they should be doing – thinking about reliability and preventing failure"*
>
> **HEAD OF MAINTENANCE AND RELIABILITY, ENGINEERING AND CONSTRUCTION**

Strategic vs Tactical

Research suggests that the predominant Myers Briggs personality for a reliability engineer is ISTJ. If you're not familiar with Myers Briggs, this definition can be simplified as someone who is analytical, practical, reserved, direct, dutiful, insensitive, and not naturally drawn to people.

Reliability engineers are more process driven than results orientated. They are required to think, design and be strategic. Their skills are not utilised effectively when they are asked to be tactical.

The value we get from our reliability engineers is misunderstood. During down cycles we often move reliability engineers elsewhere in the plant to do work that is not their core focus. It's a big job to convince leadership and C-level to invest in reliability as a key focus.

Not Understood by Leadership

Generally, leadership do not understand the value of reliability engineers. In fact, because leaderships' focus is so short term and quarterly based, when it comes to things like asset utilisation, the whole notion of understanding what a reliability engineer does is quite intangible. As a result,

reliability engineers are often deployed to do other things across maintenance and operational functions. Everything but reliability engineering!

> *"Our senior leadership do not see reliability programmes or reliability engineers as full-time projects or full-time roles. Their view is that their focus is too narrow. In fact, a lot of our reliability programmes get stopped before they even have the chance to add value"*
>
> **DIRECTOR OF ASSET CAPABILITY, PUBLIC SECTOR**

The issue is that they are specialists, not generalists. They need to be given the freedom to spend time designing and thinking. Because they are not doing what they naturally should be doing, they are often disconnected and misunderstood. The opposite is also true. There were several examples of the reliability engineering role being given to an engineer with maintenance experience. Because the reliability discipline requires an analytical approach, and less to do with fixing and maintaining, you end up with the same outcome. A misunderstood, unhappy engineer in the wrong role.

Universities Don't Teach Reliability

The problem starts early with the universities. Reliability engineering is hardly taught. And when it is, there is more emphasis on statistics than on design. Unfortunately this creates more friction. Young and ambitious (talented, but not experienced) reliability engineers with a background in either mechanical or electrical engineering are expensive to hire. But companies want a return on their investment from expensive hires. The reliability engineers don't really get to achieve what they want and are easily misaligned with the business. Churn and staff turnover is high.

> *"Reliability engineers work on the system. Maintenance engineers work in the system"*
>
> **HEAD OF ASSET MANAGEMENT, TRANSPORT AND STORAGE**
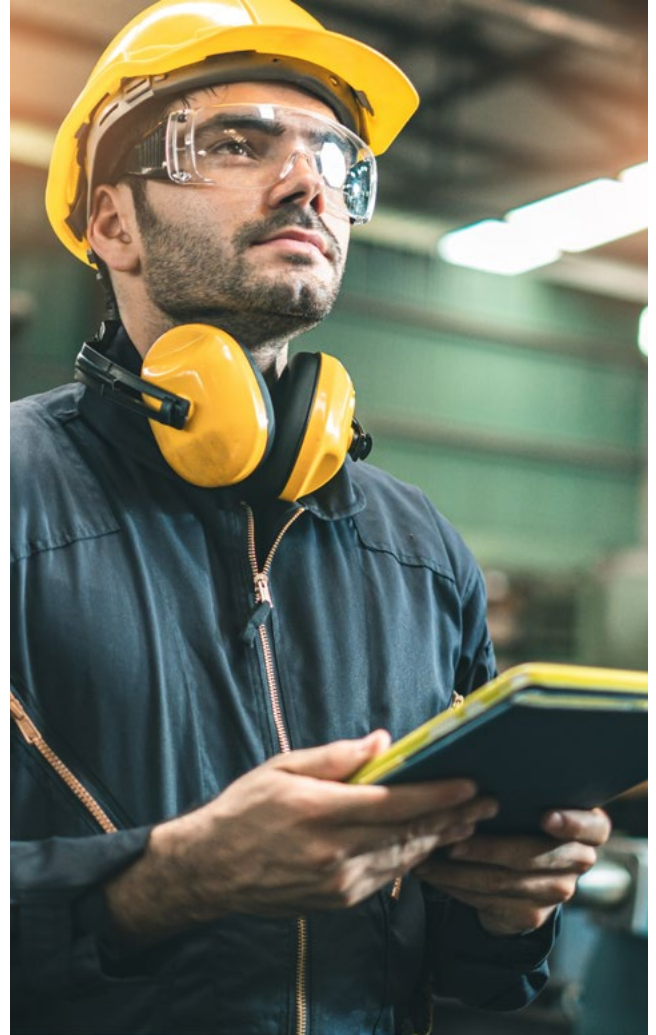
Key questions raised by the community:

- What is the core role or standard, accepted job description of the reliability engineer?
- What data does a reliability engineer need?
- When and how should this data be provided?
- How does the digitisation of asset management & IoT affect the activities of a reliability engineer?
- Where in the org chart does the reliability engineer fit?

06

Using Predictive Analytics Tools and Software

The early adopters of Predictive Analytics Tools and Software might be burning their fingers, but they are setting themselves up for long term success and competitiveness for the long haul. Can your organisation overcome the fear factor of a digital future by scoping correctly and piloting projects to demonstrate value? Does your organisation have a clear business case to invest? Do you understand the impact that Predictive Analytics Tools and Software can have? Does your organisation have the basic foundations in place to enable the digitised future?

Predictive Analytics and PdM

Predictive Analytics assists in the move from pre-scheduled plans to real-time maintenance. The purpose is to get insights from data that allows us to make decisions to do a repair or replacement before a breakdown occurs. The main components are some form of condition monitoring sensors, IoT, and predictive algorithms. Despite the game changing benefits of Predictive Analytics done well, most companies have or are experiencing similar challenges.

> *"Most people in maintenance do not really understand advanced analytics like artificial intelligence and machine learning. Personally, I think advanced analytics have a lot to offer maintenance professionals, but I am an analytics geek. Eventually analytics will be used across all maintainable assets and perhaps even on run-to-failure assets."*
>
> **MAINTENANCE ENGINEERING SYSTEMS SUPERVISOR, MANUFACTURING**

Building the Case for Investment

Selecting a solution requires a substantial upfront investment. Companies are seeking case studies from others that have been able to get their business cases over the line, and then demonstrate a return on investment. It requires leadership support. Very few leaders charged with five-year tenures have the commitment and fortitude needed to create the kind of long-term change that is required to equip organisations for the digital future.

Many companies have worked out that small wins are their best sales tool. A pilot study or POC that delivers a win, enables advancement, and gets runs on the board. It's certainly hard work, but if you can keep paying your way, investment will continue. With the relentless speed of technology change today, consider carefully how you keep the workforce up to date; today you are an early adopter and in twelve months the tech could be obsolete.

Achieving a level of data integrity allows us to focus on analytics, predictions, and decisions. The linking of field-gathered data from machines to the action we think we will need to take in our work management system is all about correlating the data. It's a difficult journey. Especially as multiple data sources are required to help us make better decisions. Another barrier to predictive analytics is building trust in data outcomes. After all, you can't wait for something to break to prove that the prediction was correct.

If you do not have good data practices in ERP or CMMS, from your asset master data to your maintenance history, you will need to invest a lot of time and energy for your legacy data to add value to your new analytics.

"While advanced analytics offers a lot to be excited about, be wary of claims that artificial intelligence and machine learning can overcome poor data"

HEAD OF MAINTENANCE, AVIATION

Security

Another key reason companies are hesitating is due to information security concerns. Suddenly we have processes and equipment that is now vulnerable to ransomware attacks because of the openness in the relationship of IoT, sensors and PdM.

Key questions raised by the community:

- Do you have a clear business case to invest?
- How do we scope correctly and pilot projects to demonstrate value? What KPI's and measures do we use to secure investment for predictive analytics and a PdM program?
- How do we manage security with immediate access to data and processes?
- How do we empower and train our people through transformation projects?

07

Operational Readiness

Almost every person that participated in this research felt that their organisation's operational readiness model is not good enough. In fact, many companies, including large household names, do not even have a framework for implementing operational readiness.

Budgeting Underdone

Operational readiness budgets do not get enough attention and are often inaccurate. This makes selling the value of operational readiness difficult. For operational readiness projects to succeed this is not a good outcome. It is vital that there is strong link between business as usual and operational readiness.

> *"We do not have a good operational readiness model. It is an afterthought a lot of the time. And most people, including leadership, are focused on business as usual"*
>
> **MAINTENANCE PROJECTS MANAGER, RENEWABLES AND ENERGY**

Cross Team Communication and Alignment

Specialist project engineers typically have little operational experience. Therefore, getting input from operations and maintenance that do have that experience is important. Operations teams need to be involved and consulted within the design and construction of the plant. Another challenge is that projects team are driven by targets, and this doesn't set up the operational team for success because although the project team will deliver, the maintenance and

operations team is left with the problems.

There is usually not enough change management done for operational readiness. When change is taken seriously, the entire team can be aligned. This means scoping together, planning together, and executing together. This process is invaluable in instilling a culture that continues to take operational readiness seriously.

> *"The solution to best practise operational readiness is to poison the project team with people with a maintenance background."*
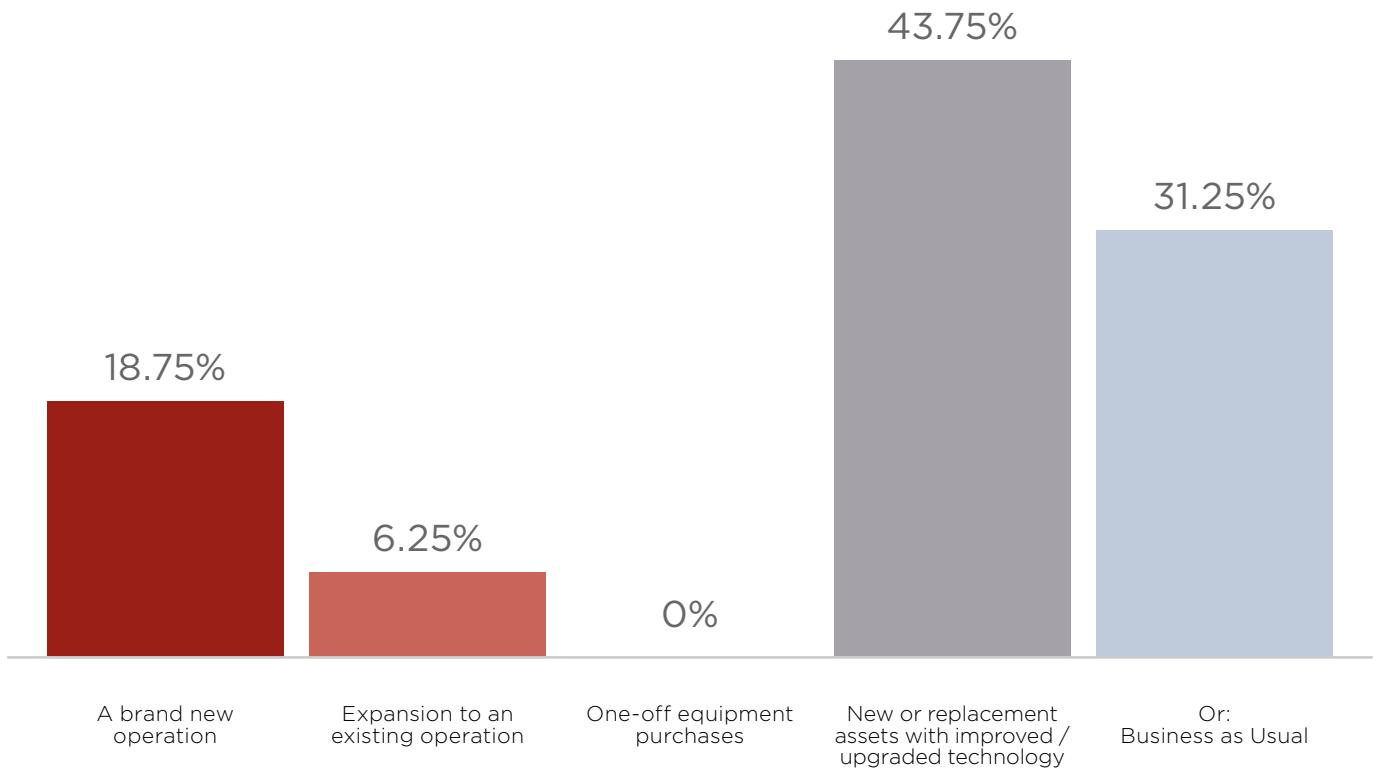>
> **MAINTENANCE MANAGER, MINING**

Dedicated Operational Readiness Skill Sets

Best practice is for operational readiness to be delivered by a specific function. Larger projects in large companies usually have the luxury of a dedicated operations readiness team They tend to have more success transitioning into operations than smaller brownfield projects.

The Role of OEM's and Vendors

There is an important reliance on the equipment suppliers providing the drawings and documentation early enough. Companies make the mistake of not contracting their OEMs ear-

In your role, does Operational Readiness primarily refer to your organisation's preparedness for managing, operating and maintaining:

Category	Percentage
A brand new operation	18.75%
Expansion to an existing operation	6.25%
One-off equipment purchases	0%
New or replacement assets with improved / upgraded technology	43.75%
Or: Business as Usual	31.25%

ly enough in the project to develop the equipment structures, maintenance strategies, tactics, operational procedures, and training.

The 3D models used in designing the plant are also beneficial to developing the maintenance procedures and preventative maintenance routes. Regular meetings with OEM's and vendors should be specified to discuss performance during early operations.

> *"Unfortunately, when you work in an old plant, the focus is only on high level strategies. Leadership do not pay attention to details. As a result, there is no retraining, no focus on neighbouring equipment, and risk analysis is not done well enough."*
>
> **PLANT SYSTEMS MAINTENANCE MANAGER, MINING**

Key questions raised by the community:

- How much time and money should we spend on operational readiness?
- What is a best practice operational readiness framework?
- Should we align with ISO 55001?

08

Supply Chain Disruptions

Equipment, spare parts, and labour can rise or fall on the efficiency and resilience of our supply chain – one look at disruptions on both sides of the supply and demand equation through the Covid-19 pandemic can tell you that. More than 75% of our community reported experiencing major supply chain disruption over the past 18 months.

Climate Change

While it's tempting to look at the pandemic as a once in a lifetime catastrophe, a big challenge for our supply chains is the threat of increasingly common and unpredictable disruptions from factors like climate change.

> *"We were 120 people short for a shutdown. That is the biggest labour supply chain problem we've ever had"*
>
> HEAD OF MAINTENANCE PROJECTS, MINING

Last year, McKinsey published a study identifying the ways that climate change could expose weak links in an organisation's supply chain. The report cited a changing climate and, with that, more frequent or more severe weather patterns or natural disasters, as potentially interrupting production, labour supply, raising costs, or hurting revenues.

Drought affects the mining industry – and way beyond just on-site activities. An example is the Panama Canal shortens an 8,000-mile journey around Cape Horn to just 48 miles, but in drought conditions, ship operators are having to reduce the weight of their cargo due to the reduced water levels in the canal.

Geo-Political Factors

Our supply chains are now under geopolitical pressure: a war in the Ukraine impacting supply of oil and gas everywhere; tensions between the US and China, bringing potential problems for Australian companies that rely on Chinese suppliers, or supply to China themselves.

> *"We are forced to be creative. And focus on only the critical stuff. We've done a lot of work understanding exactly what our most critical spares are"*
>
> MAINTENANCE AND RELIABILITY MANAGER, TRANSPORT

Cyber Security

As our companies become increasingly digital, the number of potential doors for cyber breaches increases too. For several years, asset-intensive industries have been threatened by cyber-attacks that aim to exploit the wider industrial supply chain.

Attacks are two-fold: metals and minerals play a key role in national economies and hackers can gain leverage over supply chains by

targeting mining and energy companies and their service providers; plus, the uptick in reliance on digital or automated systems means that their operations can be more exposed.

With most of our companies undergoing digital transformations – bringing in autonomous vehicles and equipment or advanced analytics software – third party vendors can become targets themselves, presenting hackers with a means to target the supply of commodities and parts that disrupt operations.
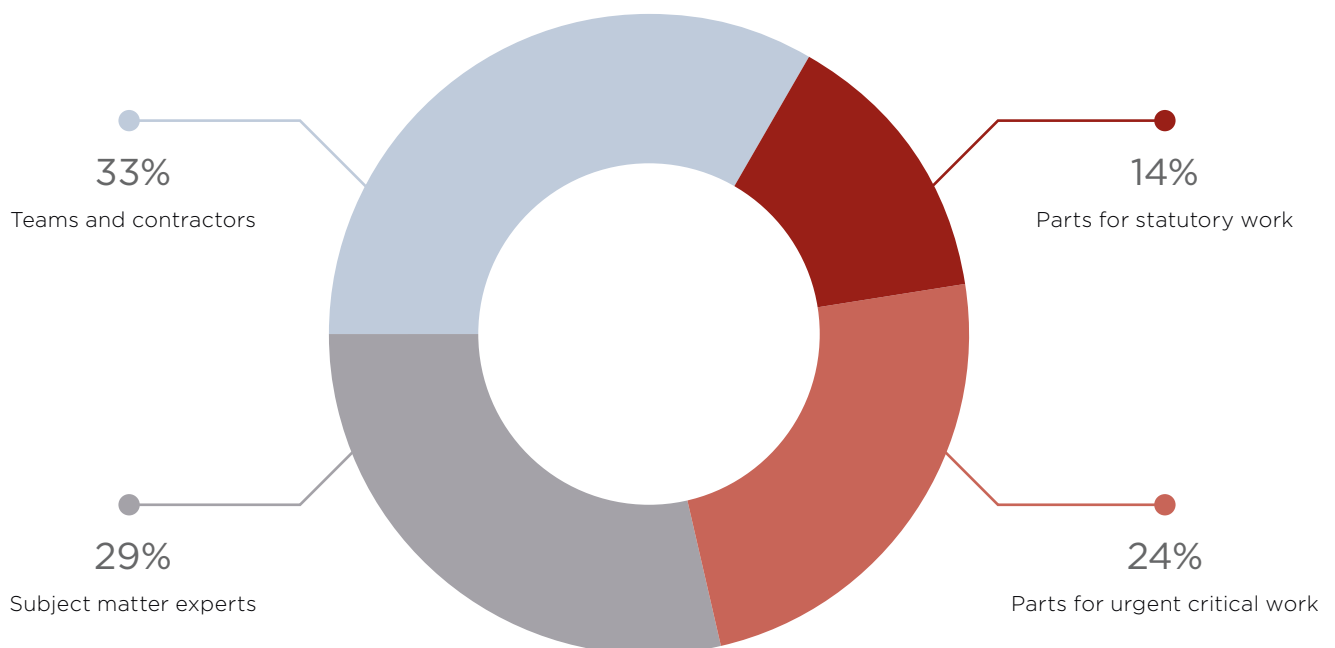
> *"It is a supply chain nightmare. The only thing we can do is improve our planning and improve our forecasting because it's a fact that we just cannot get the parts and the labour that we so desperately need"*
>
> **MANAGER, ASSET MANAGEMENT, POWER TRANSMISSION**

Key questions raised by the community:

- How does planning and scheduling link into the logistic and supply problems?
- Do your planners understand your supply chain?
- How do we ensure our supply chain is robust?
- What alternative supply chain scenarios should you consider?
- How do we do reverse engineering to overcome supply chain problems?
- Do companies have good examples of securing subject matter experts and using them virtually?

As a result of Covid, and related challenges, which parts of your Supply Chain are most affected?

33%
Teams and contractors

29%
Subject matter experts

14%
Parts for statutory work

24%
Parts for urgent critical work

09

The Proliferation of Asset, Reliability and Maintenance Tech and Innovation

> *"If a self-maintaining, self-healing, and autonomous smart asset is the Holy Grail, then a digital smart enterprise with end-to-end automation is what is required"*
>
> **HEAD OF ASSETS, MANUFACTURING**

There are advances all the time in technology that can be scaled to an enterprise level. In some cases, we need to respectfully temper the enthusiasm for the next shiny object and focus on getting bang-for-your-buck or solving a pressing business need. Your organisation might have a digital transformation agenda in place, yet it appears apparent that no catalyst has had as big an impact on the speed of adoption as Covid-19.

Everywhere we look, there is a new list of tech platforms and services that will change the game. Here is a list of those that got the most airtime form our participants:

- Augmented reality for maintenance teams
- Robotic Process Automation (RPA) for maintenance planning
- Integration platforms to bring multiple sources of data into a single view.
- Machine Learning for reliability engineers
- Geo Enablement Framework (GEF) used in conjunction with planning and scheduling
- Drones and robots for inspections
- IoT and sensors for condition monitoring
- Innovation platforms used to collect team ideas
- Digital twin technology
- Virtual Reality for remote workers
- Artificial Intelligence
- Image recognition for analysis of defects, i.e., finding objects on a video

- 3D printing
- Autonomous vehicles

It was generally agreed that great use cases and good business outcomes are the exception rather than rule. Most companies that have implemented digital maintenance and reliability solutions and platforms are yet to see measurable impact.

> *"To get our IoT implementation over the line we brought the data scientists from IT, the diagnostic engineers, and the maintainers who operate, maintain and love their equipment, together into the plant to align everyone around what we were trying to achieve"*
>
> **MAINTENANCE SUPERVISOR, OIL AND GAS**

The most successful examples have three things in common. First, there is vision for transformation across the whole organisation that is supported by leadership. Secondly, their initial focus is on two key areas to deploy new tech: predictive maintenance (PdM) and tools to support improvements in work management.

Thirdly, they have robust change management programs, and the end users are supported from the beginning.

10

Impediments to Executing Work Management Fundamentals

Manual work management processes can often be labour intensive and ineffective. Many organisations have adopted systems to digitally capture the information required. These systems are making decisions on how you go about your work to ensure that the right work is done the right way at the right time.

Implementing a new system can be inhibited by several factors like cultural issues, poor change management, and lack of leadership support. All impede efforts rather than the actual technology itself.

How do you go about driving the cultural change and behavioural change that is needed to enable effective data capture and the use of enabling technology? What is the road map to stitch together disparate systems? Is it better to have one integrated into a system or should we bring together several best-in-breed solutions that are specialists in their respective disciplines?

Planning and Scheduling Well

A common pain point shared is that before any new tech or continuous improvement programs are even considered, good work management fundamentals need understanding and adherence – identifying work, maintenance planning, reporting, KPI's, scheduling, work execution, spares management, transitioning from breakdown maintenance, and performance assessment and management.

These must be done well before we introduce work management support, the reliability department, using measurements for plant improvement, condition monitoring, defect elimination, maintenance strategy improvement, and operator driven reliability.

Examples like this render the plan somewhat ineffective. One of the causes is that there's no formal qualification for a maintenance planner and scheduler. A mindset change is required from planning and scheduling to planning, then scheduling, to reinforce that both steps have value in that both need to be done well.

> *"We don't fully understand the function of the maintenance plan. Often the work can get done and that then breaks the system. Or rightly so, the scheduler will adjust based on their experience. But that is then not included back into the plan!"*
>
> **MAINTENANCE MANAGER,**
> **POWER GENERATION**

The next challenges are setting up metrics or KPIs in this area. Too often we want the lights to turn green rather than achieve the best outcome. Sometimes it feels like schedule compliance is more coveted than doing the most efficient work.

Balancing Risk and Cost

When planning within a major hazard facility, a licence is required to prove to an organisation such as Work Safe that you're compliant. Companies need to consider the cost of failure within this context, the cost to reputation, to people safety, and the loss of production. The scrutiny of regulatory bodies is getting tighter. Soon these facilities will have to record all their data to show trends, expectations within the community are on the rise, and full transparency is now given. One could call it the social licence to operate, and this takes place in the context of increased sensitivity to risk.

An example of this changing world around risk can be seen in the isolations required. In some instances, double isolations are now required when it's deemed that the safety risk is too high. Organisations must balance risk and cost. Furthermore, carefully managing the risks associated with the pandemic have added an additional layer of complexity, and increased costs when it comes to running major outages, overhauls, and shutdowns that require large numbers of employees or getting specific expertise to site.

Key questions asked by the community:

- Do we fully understand the function of the maintenance plan?
- How do we define set up and measure metrics or KPI's?
- Do your planners understand the supply chain?
- What industry best practise exists to help you with work optimisation?
- How do we improve labour utilisation for planning and scheduling?
- How do you work with understanding conflicting priorities when planning?
- How do you overcome the challenge of not being able to bring subject matter experts in from interstate or overseas?

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