ENERGY & MINERAL RESOURCES
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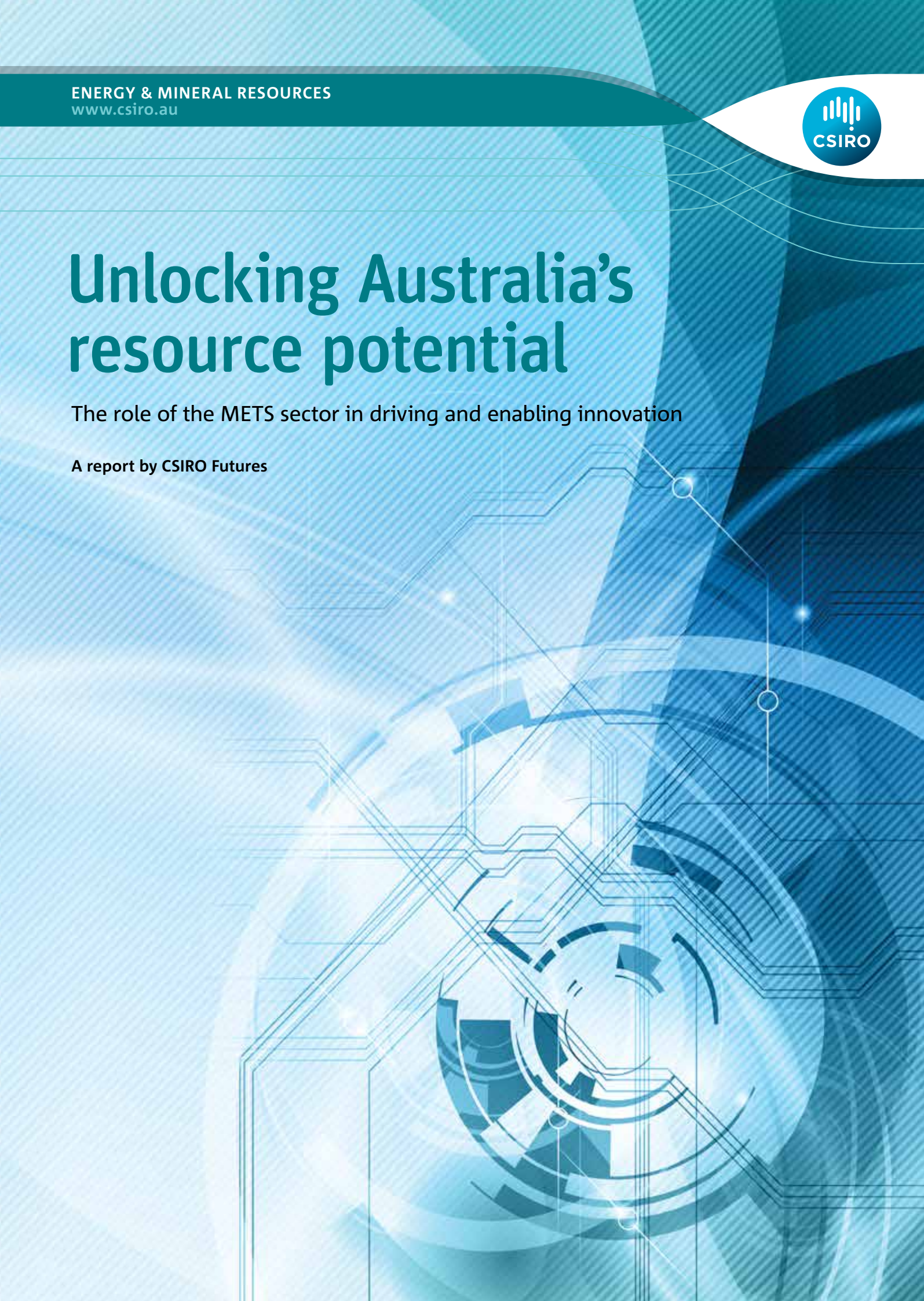
Unlocking Australia's resource potential

The role of the METS sector in driving and enabling innovation

A report by CSIRO Futures



Overview

In a recent CSIRO report, *Unlocking Australia's Resource Potential: Innovation in the energy and mineral resources sectors*, we considered the role that innovation can and should play in creating a sustainable future for Australia's resources sector. Drawing on an analysis of innovation case studies and interviews with 26 senior executives and board members across the sector, this report outlines how the resources sector has historically used innovation to solve some of its largest challenges, why the sector underperforms in innovation today, and what can be done to improve innovation outcomes going forward.

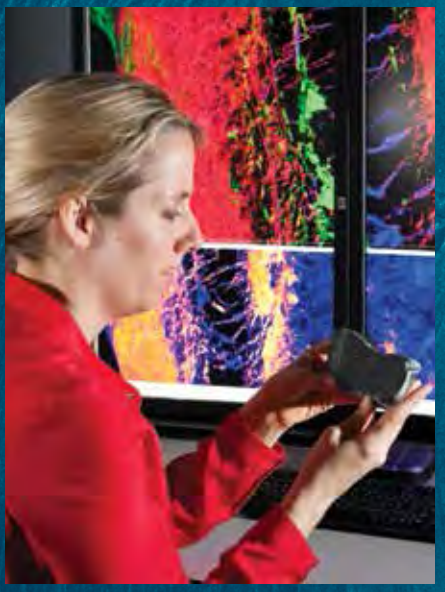
While this report was predominantly focused on primary producers, many of the key learnings and successful innovation practices highlighted in the report apply equally to the Mining Equipment, Technology and Services (METS) sector. In particular, collaboration between the METS sector and research institutions is essential for successful innovation. The METS Industry Growth Centre provides a significant opportunity to increase the level of collaboration between companies and researchers.

Furthermore, as Australia's innovation catalyst, CSIRO has room to improve the way it works with the sector to better meet the needs of METS companies more broadly.

The METS sector is a key driver and enabler of innovation in mineral resources. In Australia, its ingenuity and expertise has led to fivefold growth over the past 15 years,[1] a faster rate than the mining sector it supports.[2] One of the most comprehensive surveys across the Australian METS sector estimated that it generated $90 billion in gross annual revenues in FY2012.[3]

More importantly, drawing on Australia's resources legacy, the METS sector has developed advanced skills and capabilities that are highly differentiated in the global marketplace, making the sector an enormous growth and export opportunity for the nation.

Underpinning this opportunity is the sector's innovation capability. Whether it is the discovery of new resources or the optimisation of existing operations, METS organisations and the enduring partnerships they have formed with miners and research organisations have played a key role in transforming the Australian resources landscape.



METS sector in the innovation process

In fact, an analysis of historic case studies showed the importance of the METS sector in the innovation process. In the case of longwall mining, the sector played a pivotal role across the entire innovation lifecycle, from the invention and development of early undercutting machines, longwall face conveyors and longwall mining machines, all the way to the more recent advancements in longwall automation. In some cases this role has been more indirect, such as with the development of instruments used for mass spectrometry (e.g. inductively coupled plasma-mass spectrometry, ICP-MS) which was key to mineral exploration successes through the innovation of regolith and geochemistry.

The importance of the METS sector as a driver and enabler of innovation has continued to the present day. This view was broadly supported in the interviews we conducted with senior executives across leading resources organisations, as well as in recent analysis and surveys.

In looking to the future, the METS sector will continue to play three important roles in the resources sector. The first is a driver role, developing and bringing new innovations to the mining sector. The second is a translator role, converting leading scientific and technological breakthroughs into repeatable and operational ready solutions. The final role is that of the integrator, bringing together disparate technologies (either new to the world or mineral resources) and making them work together in a unique or novel way.

Success in all three roles – a driver, translator and integrator – will depend on individual METS companies developing successful innovation practices. Based on our analysis and interviews with senior industry executives and board members, we have created a framework that outlines four key factors for innovation success: strategy, investment timing, people and culture, and collaboration.

We have adapted this framework from the full report to include considerations that are particularly relevant to the METS sector, as shown overleaf.

Collaboration with both customers and research partners is particularly important in the METS sector. However, a recent survey suggests there is room for improvement, with less than half of METS companies reporting that they collaborate with mining companies, universities and other organisations on R&D.[8] Although Australia underperforms in collaboration in many sectors, the METS sector is particularly challenging given the diversity of companies, from small start-ups to large multi-nationals.

Analysis and interviews across the resources and METS sectors suggested that collaboration performance could be greatly improved if organisations tailored their collaborations based on the desired purpose and partners in question. In fact, innovation leaders demonstrated a clear understanding that there isn't a one-size-fits-all approach to collaboration, with many effectively creating and managing a portfolio of collaborations much like the portfolio they use to manage innovation projects.

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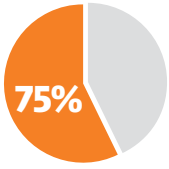
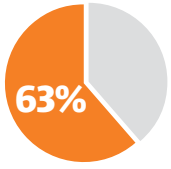
Analysis by IP Australia highlighted that METS organisations accounted for the majority (~75%) of patents filed in the Australian mining sector between 1994 and 2011.[4]



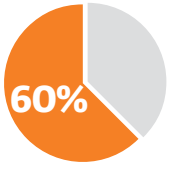
The Australian METS sector spent more than $1.6 billion on research and development (R&D) in FY2012. This survey also found that the METS sector has strong innovation culture when benchmarked against other industries.[5]

$1.6 BILLION

63% of Australian METS businesses say that innovation is core to their business strategy.[6]



It is estimated that Australia develops 60% of the world's mining software with companies investing heavily in R&D.[7]



Collaboration is vital

To explore these different collaboration approaches, a framework was adapted from work by Markus Perkmann and Ammon Salter published in the MIT Sloan Management Review. Their work provides a valuable way of thinking about different collaboration models based on the time horizon of the collaboration and the degree of disclosure of the research results. While this framework takes the perspective of a primary producer, it provides an equally valuable mechanism for METS organisations prompting questions such as:

- Are there regular reviews of tactical collaborations to determine if a more strategic model would deliver greater value? In other words, are you acting as a vendor to your customers when you should be acting as a strategic partner to develop solutions together?
- Are there areas where there could be greater sharing of funding, resources and risk – either with your customers or with other technology and service providers?
- How are you investing in unproven research areas to stay ahead of technology change? How are you anticipating and responding to your customers' needs?
- Are different processes and contractual mechanisms being used for short term and long term collaborations?

Supported by continued innovation and strong collaboration, the Australian METS sector is well placed to address existing opportunities and challenges for both Australian and global resource organisations. Given the pace of technological change it is unlikely that required scientific, engineering and technological knowledge and expertise will reside within any single entity.

However, effective collaboration across the entire innovation ecosystem – miners, research organisations and fellow METS organisations – can allow the METS sector to build on its innovation legacy, creating highly differentiated competencies, business models and partnerships that foster a new level of growth into the future.

[1] Emma Francis, The Australian Mining Industry: More than Just Shovels and Being the Lucky Country (IP Australia, 2015).

[2] CSIRO Futures, The Future of Mining in Chile (2014).

[3] Austmine, Australia's New Driver for Growth (2013).

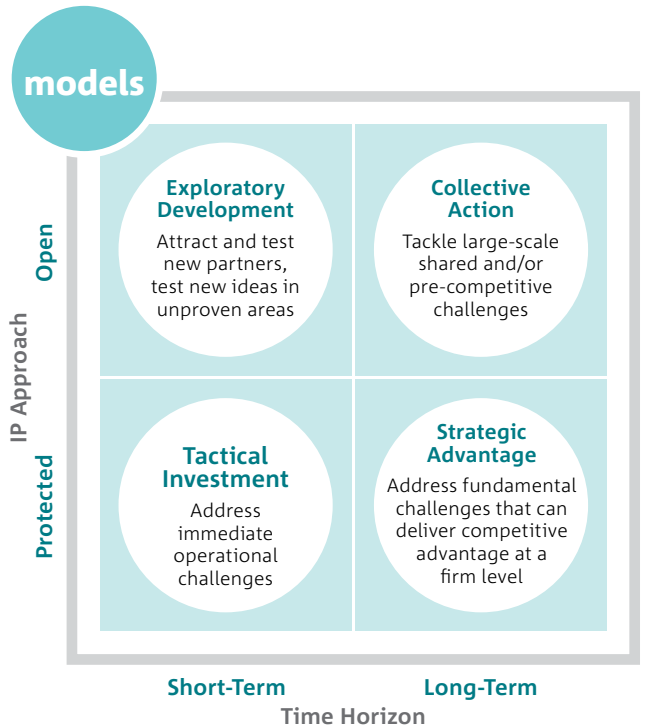
[4] Francis, The Australian Mining Industry (2015).

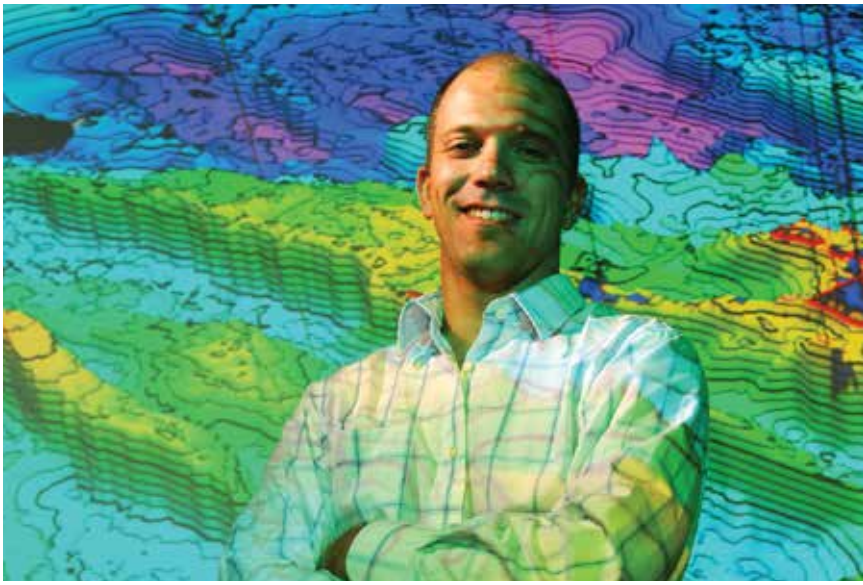
[5] Austmine, Australia's New Driver for Growth (2013).

[6] Austmine, National METS Survey 2015 Results: New Realities, Bigger Horizons (at www.austmine.com.au).

[7] Australian Trade Commission, Mining Software and Specialised Technologies (2013).

[8] Austmine, National METS Survey 2015 Results.





Key factors for innovation success

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Strategy

Alignment

How well is your innovation strategy aligned with your customers' business needs?

Innovation priorities

What innovations are you leading and why? What is your competitive advantage in these areas?

Investment mechanism

Do you have a mechanism to direct innovation investments? How are you seeking input from your customers?

Horizon scanning

How do you assess long-term opportunities and challenges and how do these shape your innovation priorities?

Investment timing

Risk reward posture

What is your appetite for risk and expectations for returns? Does this align with your customer's willingness to take risk?

IP strategy

How are you protecting your IP? Does your IP strategy align with your customers' IP stance?

Through the cycle mindset

Are you and your customers willing to maintain innovation investment through the business cycle?

Competitor analysis

Will your competitors or customers out-innovate you?

People & culture

Leading from the front

Who in your organisation is leading the charge? Are senior managers seen as champions for innovation?

Right mix of skills

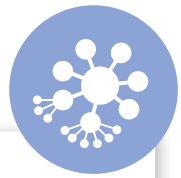
Are your innovation teams designed to succeed and grow?

Structure and incentives

Is your governance and structure designed to support innovation?

Risk appetite

Does the environment facilitate the appropriate level of risk taking? Are you sharing and learning from your failures?



Collaboration

Customers

How are you collaborating with your customers? Are you partnering or acting as a vendor?

Partner selection

Do you have an explicit framework to determine which research partners to work with?

Collaboration models

How do you select appropriate collaboration models to achieve innovation outcomes for individual partners and projects?

Interoperability

Could you benefit from standards that allow interoperability between your products and other vendors?

What to prioritise? **When to invest?** **Who to engage?** **How to deliver?**

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