METS IGNITED

Engage in our future

Industry Knowledge Priorities

The Mining Equipment, Technology and Services Sector

September 2016

INDUSTRY KNOWLEDGE PRIORITIES

Introduction

The Industry Knowledge Priorities (IKPs) highlight what the Mining Equipment, Technology and Services (METS) sector requires now and moving forward from Australian research providers and innovators.

The METS Ignited Board, working together with the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Austmine has defined IKPs for the METS sector in the following way:

"Industry Knowledge Priorities are those outcome-focussed bodies of information or skills that need to be developed to create sustainable global competitive advantage for the Australian METS sector."

In identifying the IKPs for the sector, the outcomes being targeted include:

- The identification and development of opportunities for significant / step-change improvements in the economic, social and environmental benefits from mining;
- Increased commercial development opportunities to address domestic and global mining challenges;
- Increased input from a diverse range of stakeholders, including those from outside the mining sector;
- The creation of critical mass through identifying and developing clusters formed around either specific expertise / knowledge areas or around natural geographic groupings of complementary skills / knowledge areas.

The IKPs fall into two broad categories:

- The management skills and capabilities needed to make the sector more competitive;
- The research and development required to ensure that the sector remains relevant.

The IKPs have been assembled through consultation with the METS and Mining industries, as well as through input from CSIRO, Austmine, and a VCI report on the sector commissioned by METS Ignited. Further, the IKPs have been shaped by global megatrends (see e.g. CSIRO's *Our Future World: global megatrends report*), as well as current and emerging challenges and technology trends.
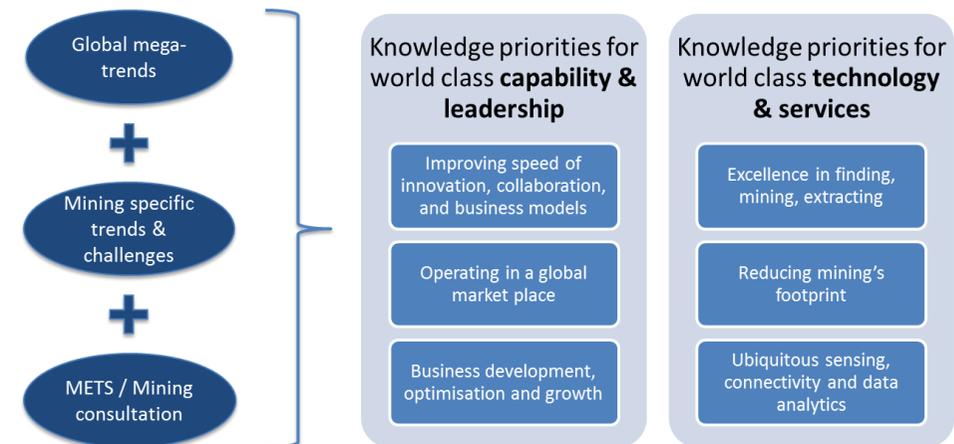
KNOWLEDGE PRIORITIES FOR WORLD-CLASS CAPABILITY AND LEADERSHIP

IKP1: Improving speed of innovation, collaboration and business models

Australians have a strong reputation for their ability to innovate and for the quality of their innovation. However, we have a mixed record for commercialising our innovations. Growing the sector requires reducing innovation cycles and barriers, collaborating for mutual benefit, and the adaption and development of new business models. Two-way education between METS and Capital Markets will provide the fuel for growth.

Priorities for improving the **speed of innovation, collaboration and business models** include:
1. Determining the factors limiting speed and implementation of innovation in the Australian METS/mining/research system.
2. Enhancing methods for METS cluster development, both regional and niche-driven, including soft infrastructure and industry development programs to drive business growth.
3. Advancing knowledge and understanding of models and behaviours of successful systemic innovation and collaboration, and new business models in an Australian METS/Mining context, including understanding of design-led innovation and frameworks to foster these processes.
4. Advancing knowledge and understanding between the METS sector and Capital Markets.

IKP2: Operating in a global market place

Global competitiveness is a function of a broad range of complex factors and generally takes considerable time. Growth in the sector will require Australian METS to have a clear understanding of key markets, competitors, and how to engage globally.

Priorities for developing the body of knowledge on **operating in a global market place** include:
1. Developing knowledge and tools for determining trends/growth in key markets for Australian METS.
2. Understanding Australia's global position (incl. brand) and competition.
3. Developing knowledge and tools for profiling key customers/markets and the impact of new mining and METS entrants (e.g. from emerging markets).
4. Advancing knowledge and understanding of global supply chains and how they are best accessed.

IKP3: Business development, optimisation and growth

Mining is a cyclical market. Growing strong mining and METS businesses requires advancing the body of knowledge around value and supply chain theory and application, and managing the significant cultural changes which may be required to foster innovation for driving business value. Further, skills attraction and the need for skills to evolve with new technologies is a body of work which needs careful consideration, with particular reference to robustness to changing markets and conditions.

Priorities for improving knowledge and capability in **business development, optimisation and growth** include:
1. Advancing knowledge and understanding of business optimisation methods (e.g. lean manufacturing, theory of constraints, systems theory) in METS and Mining.
2. Advancing knowledge for managing businesses in cyclical markets.
3. Change management, leadership capabilities and transformative business models to deliver and capture value from new technology.
4. Advancing knowledge and understanding of skills attraction and retention in changing markets, as well as how skills requirements will evolve with emerging technologies.

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IKP4: Excellence in finding, mining and extracting

Ore bodies are becoming scarcer, deeper, lower grade, and more complex. Further, there is an increasing need to improve return on capital invested for new and installed assets. For Australia to become more globally competitive and take new ideas to the world, we need to leverage strengths in developing, and exploiting, excellence in METS.

Priorities for **excellence in finding, mining and extracting** include:

1. Advancing exploration knowledge, tools and technologies, including for deep and unconventional resources.
2. Advancing mine autonomy, equipment/process mechanization and automation, including operator-assist systems, and maintenance.
3. Advancing mining and beneficiation technologies (e.g. selective mining, comminution, classification, reducing tailings/reject streams, in-situ recovery, small scale robotics for continuous mining, bio-leaching and nano-technology).
4. Advancing knowledge and understanding of modular solutions, standardisation and interchangeability (e.g. for provision of mobile or incremental processing and materials handling capacity, plug & play capability, etc.).

IKP5: Reducing mining's footprint

In an increasingly connected world, social license is more important than ever. Just as importantly, despite continued focus and effort, keeping our people, and the environment, safe remains a continuing challenge. As a further motivating factor in addressing the environment, increasing energy costs will drive reductions in energy usage. Finally, and linking back to the social license issue, excellence in remediation and mine closure will be an increasing requirement.

Priorities for advancing the body of knowledge around **reducing mining's footprint** include:

1. Energy efficiency including closed energy loops, application of renewables, hybrids, and the "electric mine".
2. Improving remediation and rehabilitation techniques and take-up for old, ongoing and future workings.
3. Adaption and application of leading practices in social license and sustainability.
4. Fast tracking adoption of, and advancing, leading practice in all aspects of health, safety and the environment.

IKP6: Ubiquitous sensing, digitisation and data analytics

Data analytics and connectivity is yet to truly take hold within mining. A key to this is interconnectivity and interoperability of data, information and systems. Another enabler may be establishing a "mining ontology" for natural language processing. Expertise in data science needs to be complemented with mining domain expertise, and ensuring the systems are useable. Technical elements are necessary but not sufficient – cultural, organisational and change management capabilities are critical for success.

Priorities for progressing **ubiquitous sensing, digitisation and data analytics** include:

1. Advancing sensors and connectedness, e.g. for improving asset health, productivity, environmental and safety performance.
2. Advancing data/information/systems interoperability.
3. Advances in data analytics applied within and across the mining value chain (e.g. predictive/prescriptive asset health monitoring, numerical optimisation, etc.) towards truly integrated operations including addressing cultural, organizational and educational challenges.
4. Developing more effective human/machine interfaces and systems for providing remote presence, augmented reality, and situational awareness.