Minerals Industry Challenges:
Unlocking Australia's Potential Through Collaboration

UNCOVER Inaugural Biennial Conference - 31 March 2014
Topics to be covered

- The Context
- What does industry want?
- What are the challenges in Australia?
- The burning technical issues
- Why collaborate?
- The collaborative R&D eco-system
- The way forward
The Context
Future outlook for the mineral industry

- Demand for most metals will increase

Bottom right image from McKinsey Quarterly, Stefan Heck and Matt Rogers, March 20014
Future outlook for the mineral industry

- Demand for most metals will increase

- Long term price of commodities will continue to fall because of innovation
Future outlook for the mineral industry

- Demand for most metals will increase.
- Long term price of commodities will continue to fall because of innovation.
- There will continue to be booms and busts.

*Data before 1890 are for NSW, Queensland, South Australia and Victoria.
Sources: ABS; Butlin (1964, 1985); RBA; Withers, Endres and Perry (1985).

Bottom right image from MinEx Consulting Group.
Future outlook for the mineral industry

- Demand for most metals will increase
- Long term price of commodities will continue to fall because of innovation
- There will continue to be booms and busts
- Exploration is going to get riskier & costlier without innovation
Future outlook for the mineral industry

- Demand for most metals will increase
- Long term price of commodities will continue to fall because of innovation
- There will continue to be booms and busts
- Exploration is a going to get riskier & costlier without innovation
- Continued separation between exploration and mining – leading to new business paradigm?
The Top Business Risks for the Minerals Industry

- Capital allocation and access
- Margin protection and productivity improvement
- Resource nationalism
- Social license to operate
- Skills shortages
- Price and currency volatility
- Capital project execution
- Sharing the benefits
- Infrastructure access
- Threat of substitutes

1 Ernst & Young business risk facing mining and metals 2013-2014
Management challenges

- Grass-roots exploration not efficient/effective; expenditures ↑ whilst the number of deposits found ↓

- We are having to look deeper\(^1\); risk and costs ↑

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Far right image from SNL Metals & Mining, World exploration Trends 2014
Management challenges

- Grass-roots exploration not efficient/effective: expenditures ↑ whilst the number of deposits found ↓

- We are having to look deeper\(^1\); risk and costs ↑

- Grades are diminishing\(^1\); poorer quality ore being processed, costs ↑ and recoveries ↓

- Increasing competition for the investment dollar – less speculative money going into exploration, less riskier ways of investing in mining sector

What does “industry” want?
First, a thing or two about the “industry”

- **Needs are different** depending on nature of the company & geography: miners & suppliers, miners & explorers, big & small explorers

- **Very few companies think long-term** when it comes to exploration: at the mercy of the prevailing market sentiment, and type and tenure of CEOs whose KPIs are not aligned with the sort of risk taking required for long-haul grass-roots exploration

- **Appetite for, and capacity to fund, R&D is different**: Juniors simply don’t have the money to provide sustained financial support and never had (Suppliers not much different). But Juniors can provide access to natural laboratories and access to specialist know-how (but so can the Majors)
First, a thing or two about the “industry”

- **Capacity to uptake & utilise new technologies varies:** The resources necessary to embed and utilise new technologies/knowledge etc is much greater at the big end of town, but ironically perhaps it’s the Juniors who are more disposed to apply new ideas and technologies quickly.

- **Certain needs are universal:** access to pre-competitive regional data sets at preferably zero cost.

- **No company has a mortgage on experience and knowledge, competitive advantage is short lived**
What are the Challenges in Australia?
## The challenges

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| **1. Improving efficiency / effectiveness** of exploration. It’s about getting better return on capital employed. | ➢ Management appreciation that exploration is a critical part of the mining business, inherently a very risky business: one must be in it for the long haul  
➢ More effective technologies for targeting  
➢ Smarter interpretation techniques (multi-dimensional large scale inversions)  
➢ More high value pre-competitive regional data sets in areas of deeper cover (UNCOVER)  
➢ New business models |
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| 2. Finding top quality deposits at increasing depths/undercover | - More effective technologies, pointing to large high grade systems: Vectors to ore (AMIRA – CODES); deposits signatures through cover (AMIRA-CSIRO)  
- Novel technologies: Faster, better, and safer drilling (DET CRC); Airborne IP (AMIRA-RMIT), PGNA (CSIRO), Magnetic gradiometer (CSIRO)  
- More high value pre-competitive regional data sets & information in areas of deeper cover (UNCOVER) |
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| 3. Increasing head grades              | ➢ All the above leading to discovery of more tier 1 deposits  
➢ Mine/process the right stuff: Geometallurgy decision support (AMIRA-UQ-CSIRO-CODES); Au deportment (AMIRA-CODES)                                                                                       |
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- Mine/process the right stuff (Geometallurgy decision support (AMIRA-UQ-CSIRO-CODES); Au deportment (AMIRA-CODES)  
- Get rid of the trash reserves/resources |
| 4. Convincing management that Australia is an attractive investment destination: perceived prospectivity declining wrt to some other jurisdictions; licensing and land access still an issue; high cost of doing business | - Reduce risk by accessing new high quality data & information (UNCOVER)  
- Governments developing more investor friendly policy settings  
- Application of innovative business models |
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<td>**5. Stemming the loss of research (&amp; teaching) capacity: lack of funds,</td>
<td>➢ Nurture &amp; sustain local research capacity to help develop tools &amp; information (and provide well-trained geoscientists) to improve the odds</td>
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<td>schools /departments closing/amalgamating</td>
<td>➢ Taking the UNCOVER initiative to a new level will help</td>
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<td>➢ More funding support from governments and industry</td>
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The Burning Technical Issues
The burning technical issues 18 years ago

• **Area selection:**
  - The continental-regional characteristics of prospective target areas and the special characteristics which distinguish world class target areas from weakly mineralised areas
  - Recognition of critical characteristics in areas of deformational and hydrothermal overprint

• **Recognition of ore bearing systems:**
  - Recognition of the special characteristics of the geological environment (other than ore itself) which distinguish significant ore environments from weakly mineralised environments, and how to detect/measure such characteristics
  - Definition of the characteristics which indicate proximity to ore, aureoles and vectors to ore.

• **Understanding and dealing with the regolith**
  - Recognition of critical ore body characteristics in the weathered zone, including the discrimination of alteration and weathering products
  - Measurement of critical ore body characteristics under the regolith (weathered zone and/or transported cover)
  - Characteristics of ore in the regolith

• **Data management, integration and interpretation**

• **Availability of basic geoscientific data**
The burning issues now?

- **Characterising Australia’s cover**: new knowledge to confidently explore beneath the cover.

- **Investigating Australia’s lithospheric architecture**: a whole-of-lithosphere architectural framework for mineral systems exploration.

- **Resolving the 4D geodynamic and metallogenic evolution of Australia**: understanding ore deposit origins for better prediction.

- **Characterising and detecting the distal footprints of ore deposits**: towards a toolkit for minerals exploration.

- **Risk and value analysis of exploration**: understanding the value proposition of exploration (*added after stakeholder engagement survey*).
Its about collaboration stupid!
“94% of technology executives believed that alliances were becoming critical to their (research) strategy”

“Why Too Much Trust is Death to Innovation”, Francis Bidault et al, MIT Review, Summer 2010, vol.51, no 4 – ref 4
Collaboration: the way of the future

“94% of technology executives believed that alliances were becoming critical to their (research) strategy”

Why do technology executives believe this?

- Reduce R&D costs
- Decrease development times
- Increase R&D flexibility
- Access to unique competency
- Access to new markets

“Why Too Much Trust is Death to Innovation”, Francis Bidault et al, MIT Review, Summer 2010, vol.51, no 4 – ref 4
91% of Australia’s CEOs believe that technology will be the biggest transforming trend for their businesses\(^1\)

“We need to think more intelligently and strategically about the future needs of Australia’s most important export earner. This is a matter of industrial survival, so let’s make sure we share – and embrace – the intellectual load”\(^2\)

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\(^1\)Securing Australia’s future – capitalising on global trends pwc Jan 2014

\(^2\)Paul Dowd, Non-executive Director of Oz Minerals March 2014 CSIRO Resourceful Magazine
The Collaborative R&D Eco-system
The collaborative R&D eco-system: the actors & roles

Turning knowledge/technologies into money

Research providers

Fundamental knowledge / solution providers

Mining / Exploration companies

Turning money into knowledge/technologies

The end users
Source of funds & access to natural laboratories

Turning knowledge/technologies into capital assets

METS Suppliers

Know-how / technology providers
Route to market via IP licensing/commercialisation
The collaborative R&D eco-system

Governments → Research providers

METS suppliers → Mining / Exploration companies
So where to from here?
Uncovering Australia: The way forward

✓ Success in this type of endeavour will require a new collaborative partnership: a whole-of-industry approach:
  • Majors, mid-tier, juniors & suppliers need to be involved
  • Geological Surveys and Governments need to be involved
  • Critical mass of resources needs to be brought to bear

✓ There is a significant public good element
Uncovering Australia: The way forward

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  • Geological Surveys, and Governments need to be involved
  • Critical mass of resources needs to be brought to bear

✓ There is a significant public good element

✓ An enabling platform is required:
  • ARC - Industrial Transformation Research Hub
  • ARC - Research Centre of Excellence / Co-funded Centre
  • Cooperative Research Centre (guidelines updated to permit priority public good funding mechanism but...)

Or perhaps
  • Novel type of research centre based on a broad collaborative partnership: Uncover Australia Partnership!
Unlocking Australia’s Hidden Potential

The Partners

➢ Many researchers are eager
➢ Geological Surveys will no doubt play their part
➢ Government funding may be possible, but only if
Unlocking Australia’s Hidden Potential

The Partners

- Many researchers are eager
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- “industry” is prepared to take a leadership role and play its part!

A challenge to industry
Unlocking Australia’s Hidden Potential

- Many researchers are eager
- Geological Surveys will no doubt play their part
- Government funding may be forthcoming, but only if
- “industry” is prepared to take a leadership role and play its part!

AMIRA International stands ready to assist to make things happen: *but industry must be the principal driver and must stand ready to invest*
LEDGER INDUSTRY INNOVATION

WITH COLLABORATION

GREAT THINGS HAPPEN

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