



Position Paper #15

ICT, TECHNOLOGY, SKILLS – The Changing Face of Mine Operations and Management

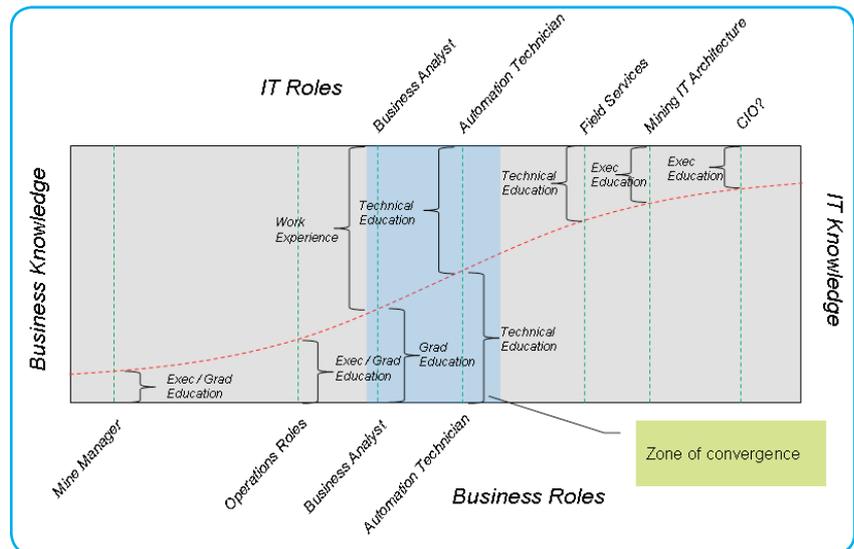
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Background

The Business/Higher Education Round Table with the support of CSC and Curtin University of Technology conducted a round table (06.04.2011) **on the changing face of mine operations and management.**

The resources industry will require substantial investment in specialist training as it continues "on an inescapable and unstoppable march towards automation", Deb Jones. MISC Manager for Research and Development, BRW, July 1-7 2010, p. 29

The looming skills shortage will come as no surprise to keen observers of the mining industry. Some people estimate that there will be a shortfall of some 65 000 skilled workers in the very near future. There will be many things that will be done about this shortfall; training more people, importing skilled labour, etc. These actions will deal with the short-term problem, but with demand for commodities predicted to rise for decades to come, the mining industry needs to consider longer term structural change to the way they do business. The use of information and communications technologies to underpin the automation of mining operations will be a central part of the long term solution, and that



Bridging the Business/IT Divide, Mining IT 2011, Dr Dennis Franklin, Global Sector Leader – Natural Resources, CSC

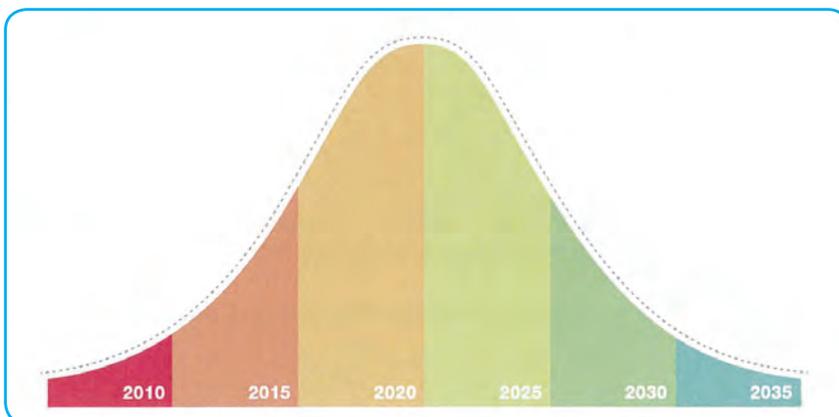
is what is being considered in this paper.

Many organisations are not prepared for the impact automation would have on their businesses. Deb Jones. MISC Manager for Research and Development, BRW, July 1-7 2010, pg. 29

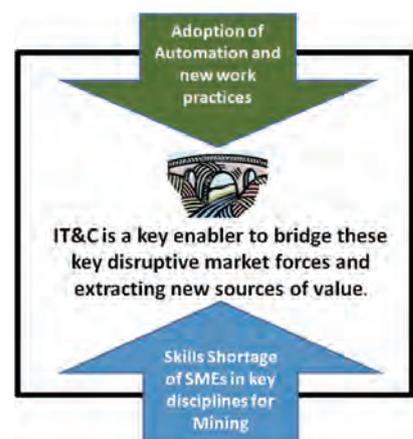
It is discussions such as the round table that can lead to building the right approaches to support the sorts of technologies and systems which are needed; things like machine and business process automation, advanced communications that allow operations to be run from a distance, and advanced analytics that will make sense of the

exponentially increasing flow of data.

If you agree that this is a valid comment, then the question arises about how the mining industry will respond. At best, the mining industry is a late adopter when it comes to taking up these technologies but the sector is moving quickly to catch up in comparison to other industries. IT&C is a crucial and underpinning enabler of this transformation and the extraction of new sources of value.



Progression of Automation Implementation pg 7, Automation for Success, Mining Industry Skills Centre



Mark Nebreda, Principal Consultant, Office of Technology & Innovation, CSC

The biggest inhibitor to technology adoption is that IT professionals do not understand the business of mining nearly well enough,

and mining professionals do not understand the value that IT&C can bring. One group can't speak the business language well enough to convince the other group to invest. Conversely, because they don't understand enough about IT&C, the operators are leaving good proposals on the table because they don't know the right questions to ask.

So the problems that we seek to address are:

- How can we ensure that those graduates, in operational mining disciplines and information and communications technology are properly equipped to have substantive conversations about the value that new technology can bring to the mining business?
- How can the business and higher education sectors collaborate better to ensure more graduates are attracted to the industry?
- How can we keep a dialogue open on the shared challenges faced by the industry?
- Clarifying the issues, the level of implementation risk, and the impediments to change.

Occupation	People employed	Industry employment
ANZSCO	'000	% of total
7122 Drillers, miners and shot firers	34.6	19.6
3232 Metal fitters and machinists	14.9	8.4
3129 Other building & engineering technicians	8.0	4.6
7331 Truck drivers	6.9	3.9
3411 Electricians	6.8	3.8
1335 Production managers	5.3	3.0
2336 Mining engineers	4.9	2.8
7212 Earthmoving plant operators	4.6	2.6
2335 Industrial, mech. & production engineers	3.9	2.2
7123 Engineering production systems workers	3.8	2.1
Total	176.7	53.0

Source: ABS (2010) *Labour Force Australia*, detailed quarterly report, 2009 average of four quarters (Cat.no.6291.0.55.003)

Top ten mining occupations, Industry snapshot 2010: Mining, Skills Australia

Objectives

The following objectives are offered as a starting point.

- Identification of the issues that are the most important for the industry as it moves towards a more intensive technologically enabled future.
- Identify some approaches to how these major issues are likely to be addressed.
- Consider the best way to carry forward the discussions.

Context

The purpose of the round table was to delve behind the current

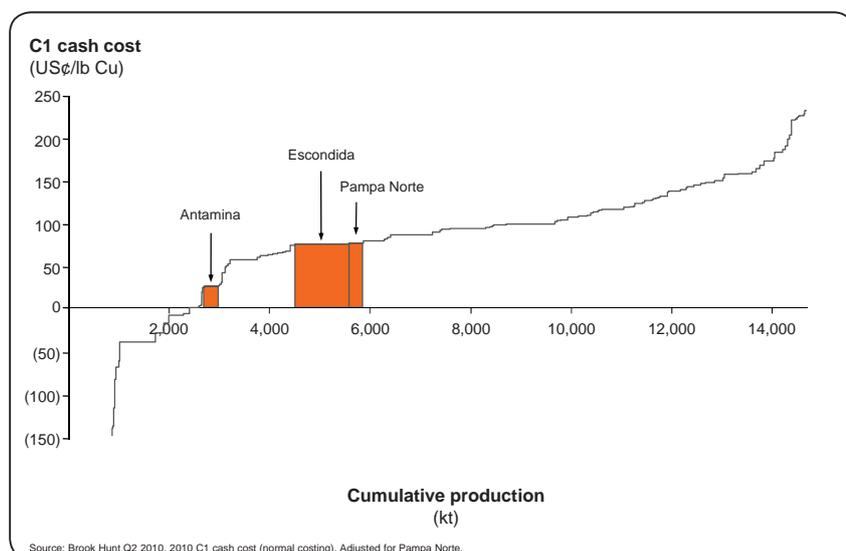
golden age of mining prosperity and to consider, how is the mining industry placed to handle a number of issues which may impact on its economic paradigm?

Other organisations have profiled the mining industry¹, looked at the role of automation², and integrated automation into their operations³.

Our considerations are premised on re-calibrating the level of uptake in automation by mining operators, and the future supply of appropriately qualified/trained graduates/operators/managers.

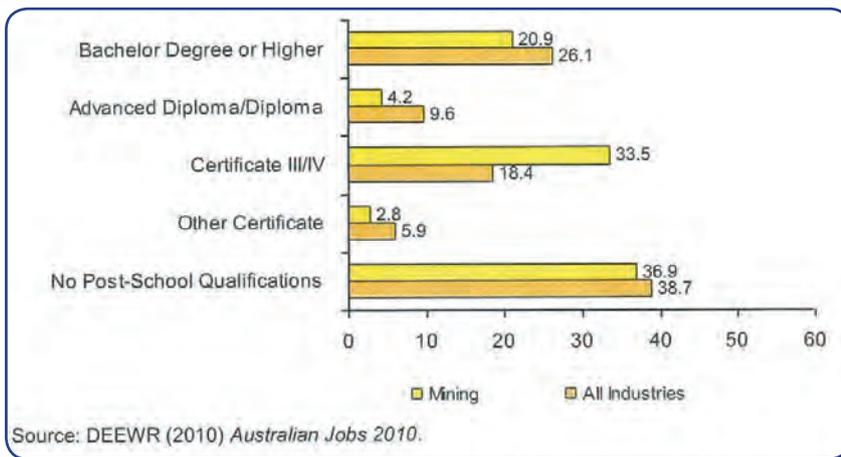
The structure of the world economy is moving, over time, to higher knowledge-intensity employment. Dr Withers CEO, Universities Australia, The Australian, 5 May 2010

The mining industry is currently experiencing a robust economic cycle; especially if you own tier one assets. BHP Billiton, Rio Tinto, Xstrata, Vale, Newcrest Mining and others are producing bottom line results that other sectors can only envy. Where uptake of automation



Source: Brook Hunt Q2 2010, 2010 C1 cash cost (normal costing). Adjusted for Pampa Norte.

1 Skills Australia Industry Snapshot Mining: 2010 www.skillsinfo.gov.au
 2 Mining Industry Skills Centre <http://www.miskillscentre.com.au/publications/automation-for-success.aspx>
 3 <http://www.aga-tic.com/agatic/>
 4 <http://www.aga-tic.com/agatic/>



Education profile of the mining industry workforce (%), Industry snapshot 2010:
Mining, Skills Australia

is considered, does quality of asset and size of operation matter? In short, it would appear so.

But what if a compelling event were to occur. For example:

- Diminishing quality of mine asset and its effect on the business model.
- Changes in the marketplace eg. re-balancing of supply and demand, and the associated impact on the productivity matrix (cost/production curve).
- Statutory requirements re environmental protection, CSR and urbanisation.
- Workforce capacity constraints such as a shortfall in mining engineers and geoscientists.
- Employment trends which impact the supply of appropriately qualified trades people, operators and managers.

It is these levers of change as well as others which must be addressed while the 'sun is shining'!

Issues

- Investment Case Skills – what are the skills that are required in business leadership to help them understand the value propositions advanced by IT&C? What are the skills required by IT professionals to help them

frame a business case in 'mining' relevant detail?

- Automation Skills - what do mining companies need in terms of technical skills? The Mining Industry Skills Centre has published a report on this topic which includes a number of valuable suggestions.
- Technology Futures - what are the technologies that exist today or which we could foresee as part of the solution? What disruptive technologies are on the horizon that may challenge current operational best practices and embedded value chain models?
- Industry Needs - do we really understand what the industry needs in the next 10 years to properly position for automation. AngloGold Ashanti's current efforts at open innovation⁴ will provide some insights into their issues, and their approach to innovation.
- Options for up-skilling Industry - this would include educational interventions like executive education, graduate courses, undergraduate courses, etc.
- Acceptance of need (automation) by industry stakeholders, tendency by incumbents wanting to be 'first to be second'.

- What can be reasonably automated, it is not an exact science?
- Every site is different.
- Lack of uniformed standards in hard rock.
 - NB: Good news in long wall coal through ACARP.
- Governance of collaborative IP.
- Automation – lack of advanced models for mining.
 - Linkage to asset reliability
 - Instrumentation of solids (vs Oil & Gas liquids)
 - Low level of understanding of control systems vs IT (real time systems)
 - Massive number of feedback leads required
 - Consumer electronics ↔ Process control
 - Need to define **generic** skills (CEO ↔ Operator)
- Technology
 - Buy-in/risk aversion to innovation from vendors
 - Buyer-Vendor alliances in R&D
 - Lack of communications/data standards
 - 'Practical' technology 'One button'
 - Connectivity/bandwidth to remote sites
 - Robustness, ruggedized
- Clarifying the role of government and its policy settings re incentivising uptake of innovation, productivity agenda and carbon strategy.
- Talent Management
 - Perception of industry attractiveness to generation X and Y
 - Corporate values and culture necessary to attract the next generation of employees

- Access to enabling technologies and collaboration tools to support mobility and working from preferred locations like home to achieve work/life balance.
- Develop and maintain a 'Mining Ecosystem' ie. miners, services/ product providers, research organisations, consultants, HE/ VET providers.
- Industry to develop a business case for universities re new/ modified qualifications and pathways.
- Liaise with other bodies (ie. Mining Education Australia, Australian Council of Engineering Deans, Australian Council of Deans of ICT, Minerals Council of Australia, AusIMM, relevant CRCs) to ensure alignment of interests.
- Collaboration between the mining and HE sector needs to be led by industry. They are the end-users.
- Use the Mining Ecosystem to develop/design the mining career of the future.
 - Curricula design > inter-disciplinarity, multiple entry pathways
 - Skills development/ continuous learning
 - Work integrated learning
 - Post graduate degrees
 - Social/professional networks
- Engage mid-tier mining houses; they are more likely to be open to change.
- Learn from agriculture sector re HE engagement with secondary schools and re-design of entry pathways to relevant degree, uptake of technology by farmers to improve productivity and industry-led mentoring.
- Use the Mining Ecosystem to promote 'open innovation' in the mining sector.
- Source funding for scholarships/ internships which support degree study and work-integrated learning.
- Engage/monitor programmes such as the **Regional Agriculture and Mining Industry Training Project**.

Next steps

We acknowledge that there are already efforts to address some of the issues listed. It is hoped that this paper adds impetus to those efforts and that the following suggestions offer further options for consideration.

We believe it to be critical to build a framework of skills and competences that the industry requires in order to transition their operations towards automation.

No autonomous mine will have a skills shortage!

- Start with 'The Mine of the Future' and work backwards – **collaborative** approach to the definition and long-term vision for the sector.

The round table was presented in conjunction with





MAKING THE CONNECTION

Driving collaboration across business, industry and tertiary education

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