Labour Market Analysis of the Western Australian Mining Industry

Master‘s Thesis

by

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Preamble

After having lived, studied and worked in Western Australia for the last two and a half years, I wanted to deep dive into a topic of the mining industry: an industry that I had no previous exposure to. I was struck by the perception that the mining industry, as part of the natural resource industry, has such a big influence on Australian politics, economy and daily life whereas in Switzerland there is almost no discussion about mining topics, despite Glencore Xstrata becoming the largest Swiss company in terms of value after its merger in May 2013.

I wanted to find out what the mining boom is all about and what impact the apparently ending mining boom would have on daily life and for my friends and family still living in Western Australia.

There is much rumour and speculation on the topic of skills shortages. I used the research of this master's thesis to clarify all the undifferentiated and general statements and to build my own opinion.

Although I worked on a huge business transformation project as a change management consultant for one of the diversified multinational mining companies in Perth, it was difficult to obtain access to the relevant data and information not only in this company but also in all the other major ones. People were in general happy to have a coffee and chat about their issues but they did not take the effort to actually provide the necessary and structured data and information.

Another difficulty for me during research was that there is no consistency in statistical data. Not even data from the same info source has been equalised.

My special thanks go to Wojciech Rozanski, my first project manager in Western Australia. He not only introduced me to this industry but also invited me to participate in the Perth Mining Hub, an Accenture internal community. Its target is to up-skill colleagues in mining industry topics and to develop the Accenture mining proficiency in Australia through Australia- and world-wide knowledge exchange.

I would also like to give a very special thanks to my dear friend Marlies Castelberg and her family. They not only offered me accommodation for the last six months but they also encouraged and supported me in every possible way to finalise this thesis.

Finally, it is important to me to state that this paper does not examine the social and environmental damage the mining industry brings with it although this topic would be equally important to my personal values.

Abstract

Over the past decade, there has been a mining boom in Western Australia which has led to massive employment growth. However, mining stakeholders and media exclaimed constant skills shortages and knowledge gaps.

In an attempt to better understand the labour market in the mining industry in Western Australia, I conduct a literature analysis to investigate factors which influence the perception of skills shortages.

My analysis of the current and predicted situation in the labour market in the WA mining industry led to a summary of issues which I catalogued in the following eleven key finding:

- Volatility and uncertainty
- Industry image, culture and work environment
- Demographic challenge
- Talent pool and labour force diversification
- Changing skills requirements
- Productivity challenge
- Legal environment
- Data and terminology
- Social license to operate
- Collaboration and management
- Skills shortage

All of these key findings influence each other but they all impact the perception and severity of the skills shortage in the WA mining industry.

I present a summary of up to date published academic and business strategies to address these key findings. The three biggest iron ore producers in Western Australia, BHP Billiton, Rio Tinto and Fortescue Metals Group respond differently to the suggested strategies but in general have only punctual initiatives are in place (for example for diversity goals or regarding Learning & Development). There is little public information on the processes and tools used today by the mining companies, to identify their workforce need and on strategies to meet the respective requirement.

Finally, I highlight three additional recommendations which have not been covered in academic or business literature but which help to identify the long-term workforce need and to support mining companies to meet the skills gap:

- Contractor Management as more than half of the mining companies' workforces are contractors but these are neither planned nor managed via HR.
- Strategic approach for effective Change Management lead by business leaders, supported by Change Agents, Business Engagement, Communication and Training.
- Stakeholder & Expectation Management to support and professionalise internal and external collaboration.

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1. Introduction

Over the past decade, there has been a mining boom in Western Australia which has led to massive employment growth. However, mining stakeholders and media exclaimed constant skills shortages and knowledge gaps. Industry and governments have argued that demographic changes in Australia have contributed to an increasing uneasiness about the difficulties in recruiting and retaining skilled workers (Bryant and Jaworski 2011).

While a good deal is known about labour market outcomes on economic shocks and the dimensions of economic performance, there is little academic research on skills shortages and potential future scenarios and reactions from the economy and corporations. Also, little has been formally estimated about the loss of opportunities that would occur if projects are slowed down or cancelled in Australia due to labour shortages (Bahn, Barratt-Pugh, and Yap 2013).

In an attempt to better understand the labour market in the mining industry in Western Australia, I conduct a literature analysis to investigate economical and entrepreneurial factors which influence the skills shortages and trends. Therein I focus on the iron ore sector as it is one of the strongest commodities in years and has the best available data.

In particular, my aim is a) to discover the characteristics and the key findings in the Western Australian mining industry which has been indicated by mining stakeholders and media for a long time, and b) to present strategies to address the identified key findings.

The next section provides some brief background information on the mining industry in general.

In section 3, I analyse the recent development and the current labour market including the characteristics of the labour market, statistics, stakeholders and their roles and expectations, a deep dive into special stakeholder groups and potential workforce and a reflection of vacancies in the job market.

In section 4, I examine the outlook and preview of future labour market challenges including previous forecast scenarios, economic outlook and impact on the labour market demand, demographic outlook and job outlook.

In section 5, I discuss the identified issues along eleven key findings.

In section 6, I present approaches and processes that are used by three mining companies in Western Australia to respond to above identified key findings.

In section 7, I discuss completeness, relevance and limitations of previously presented strategies to address the key findings and I suggest further recommendations.

Section 8 concludes.

1.1 Central questions

- How did the labour market in the Western Australian mining industry develop in the last couple of years and is there evidence for a current skills shortage?
- Which trends can be identified in the labour market in the mining industry in Western Australia?
- Which processes are used today by diversified multinational mining companies in Western Australia to identify the workforce need and to meet the respective requirements?
- Which economical and entrepreneurial approaches could be suggested to identify the long-term workforce need and to support mining companies to meet the skills gap?

1.2 Working methods

- Literature analysis regarding different aspects of the labour market in Western Australia
- Own conclusions

1.3 Restrictions

Three diversified multinational mining companies in Western Australia are willing and able to share their workforce process details.

Focus on iron ore as the main commodity within the Western Australian mining industry.

This thesis does not focus on ecological or socio-economic wellbeing although these are important values to the author.

1.4 Definitions

The term "workforce" includes not only "employees" but also "contractors" of a company.

The term "resource sector" includes both the "mining industry" and the "petroleum industry" respectively.

There is on fixed term for "turnover". Some sources include replacement of retirees, some do not.

There is no fixed definition for "skills shortages" and this issue will be further discussed in section 5.11.1. Further in this paper, I define skills shortage as the mismatch of labour supply and labour demand or the lack of available fully qualified employees in the labour market, which are able to meet the labour demand by employers.

"Greenfield" projects are new major projects. "Brownfield" projects are development projects on existing mine sites which can share existing infrastructure.

1.5 Abbreviations

Abbreviation	Explanation
ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ABS	Australian Bureau of Statistics
AIEF	Australian Indigenous Education Foundation
ALDP	Accelerated Leadership Development Program

AMMA	Australian Mines and Metals Association
Austrade	Australian Trade Commission
AWPA	Australian Workforce Productivity Agency
B-HERT	Business and Higher Education Round Table
BHP	BHP Billiton
CME	Chamber of Minerals and Energy of Western Australia
CSG	Customer Sector Group
DEEWR	Department of Education, Employment and Workplace Relations
DMP	WA Department of Mines and Petroleum
DOCEP	WA Department of Commerce
DSD	WA Department of State Development
ERP	Enterprise Resource Planning
EVP	Employee value proposition
FE	Iron
FMG	Fortescue Metals Group
FY	Financial year
GDP	Gross Domestic Product
GFC	Global Financial Crisis
HSEC	Health, Safety, Environment and Communities
IAP	Industrial Affiliates Program
IDV	Individualism by Geert Hofstede
IMMI	Department of Immigration and Border Protection
LTO	Long-term Orientation by Geert Hofstede
MAS	Masculinity/Femininity by Geert Hofstede
NCVER	National Centre for Vocational Education Research
NES	National Employment Standards
NPI	Non-process infrastructure (eg water, electricity, residential housing, mining camps, airports)
NRSET	Natural Resource Sector Employment Taskforce
PC	Productivity Commission
PDI	Power Distance by Geert Hofstede
RT	Rio Tinto
RTO	Registered Training Organisation
SOL	Skilled Occupation List
SWP	Strategic Workforce Planning
TAFE	Tertiary and Further Education
UAI	Uncertainty Avoidance by Geert Hofstede
VET	Vocational education and training
WA	Western Australia
WAIO	Western Australian Iron Ore
WIL	Work integrated learning
WR	Workplace relations

Table 1: Abbreviations

2. Background information on the mining industry

Prior to diving into the actual topic of this study I present some brief background information on the mining industry.

2.1 History of the Western Australian mining industry

When gold was discovered in Western Australia in the 1890s, a newly developed mining industry began to take shape. European settlement in the region was only 40'000 people at the time. In the 1960s, Western Australia experienced its second mining boom due to the discoveries of nickel and the massive iron ore deposits which attracted more overseas companies. Mines and various industrial and social infrastructures were developed. The 1980s saw the third resources boom caused by the exploitation of diamonds and discovery of massive gas deposits. Alongside the discoveries, the application of new technologies to extract gold enable much lower grades of ore to be profitably treated (Ye 2007).

Since 2003, Western Australia has been experiencing another mining boom, driven by strong export demand. Robust growth in the US and in China in particular has sent commodity prices to very high levels. It has strengthened the Australian currency and improved Australia's terms of trade significantly (Ye 2007).

Previous resources booms were mainly caused by the discovery of minerals, while the current resources boom is sparked by a sustained increase in China's demand for raw materials (Ye 2007).

In 2009-2010, the mining industry was the fourth largest contributor to Australia's gross domestic product (GDP), with 8% of total GDP (Bryant and Jaworski 2011).

2.2 Commodities

Many different naturally solid, liquid or gaseous occurring minerals are explored, extracted and processed throughout the country and especially in Western Australia. For this study I mainly focus on iron ore.

Figure 1 shows the recent development of the Western Australian resources by value. In 2012 the value of all commodities reached a total of 96.9 Billion AUS$, compared to 26.7 Billion AUS$ in 2003. The value of iron ore in particular developed from 5 Billion AUS$ in 2003 to an all-time maximum of 61.7 Billion AUS$ in 2011 down to 51 Billion AUS$ in 2012 (DMP 2013d).

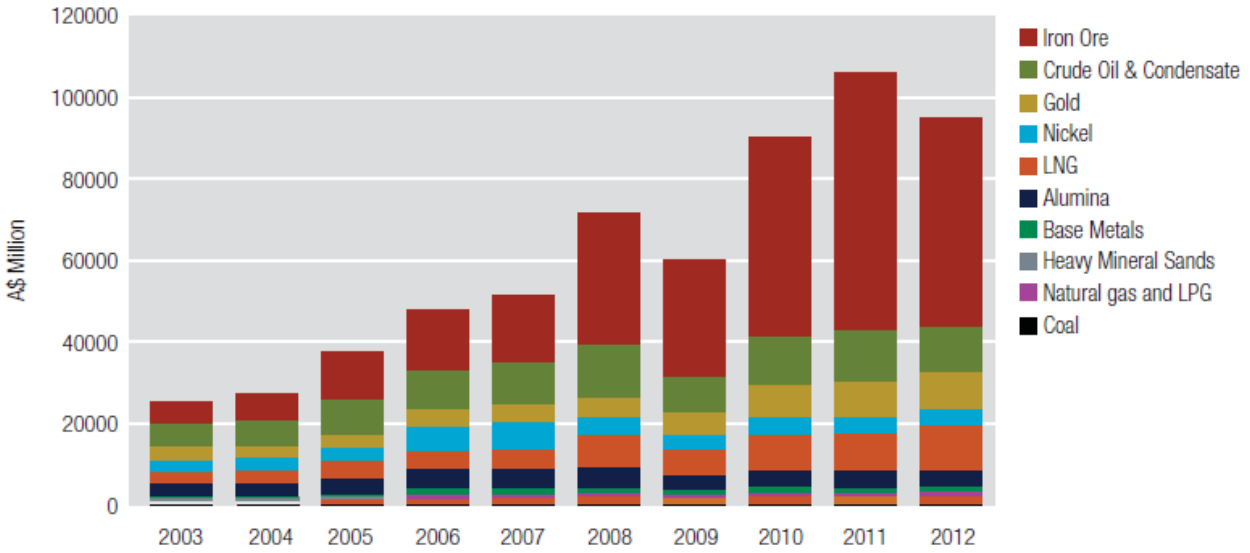


Figure 1: Development of WA resources by value

Figure 2 shows the development of iron ore production since the beginning of mass production in the 1967s. First of all it demonstrates the overwhelming share of WA output compared to the production in the rest of Australia. It demonstrates the unbroken push for limits since the start of the recent iron ore boom and how the output of 194 million tons in 2003 increased to a new all-time maximum of 476 million tons in 2012 (DMP 2013d).

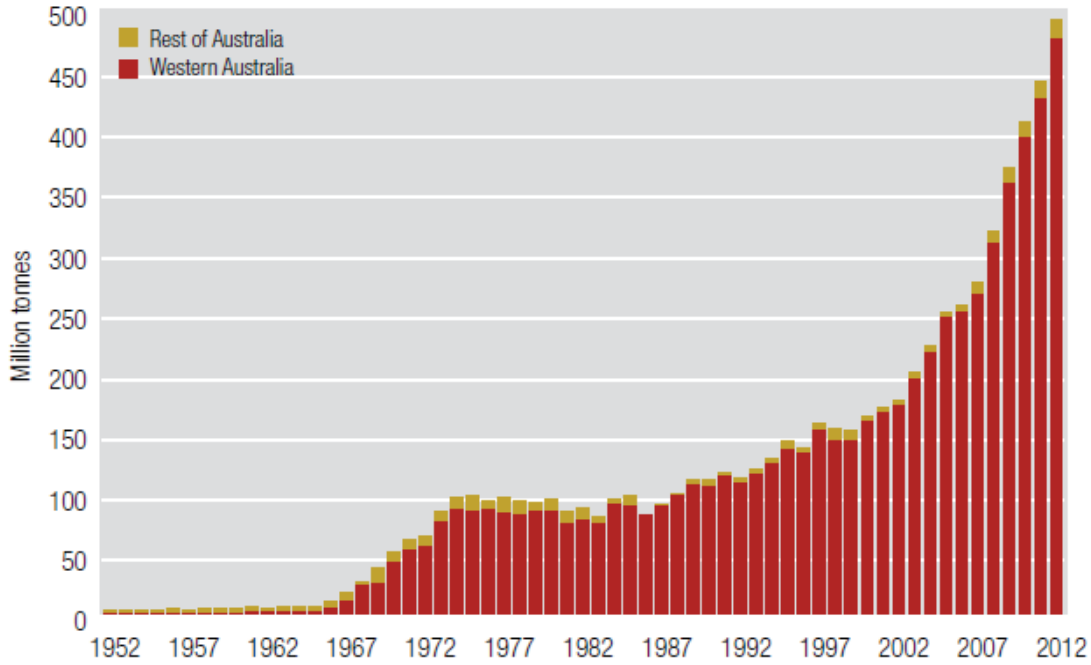


Figure 2: Development of iron ore output in Australia

Comparing Figure 1 and Figure 2, it is remarkable that the value of the iron ore sector dropped by 19% or 11.7 Billion AUS$ from 2011 to 2012 however its output increased by 12% in the same time period. The reason is explained with a high Australian dollar and markedly lower commodity prices (DMP 2013d).

2.3 Mining companies

The 20 biggest mining companies world-wide (according to their market capitalisation) include the Anglo-Australian companies BHP Billiton and Rio Tinto, the Australian company Fortescue Metals and the Anglo-Swiss company Glencore Xstrata (Rio Tinto 2013b):

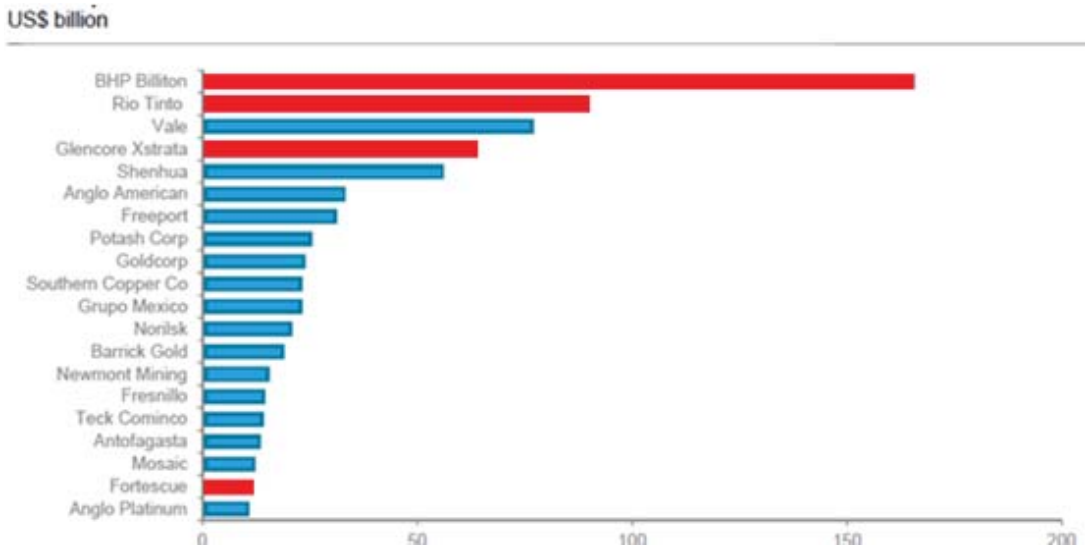


Figure 3: Market capitalisation of major listed mining companies

Diversified multinational companies (such as BHP Billiton, Rio Tinto or Glencore Xstrata) are called "Majors" whereas either non-multinational expanded or not diversified commodity companies are called "Minors" (such as the Fortescue Metals Group).

Bryant and Jaworski (2011) state that in 2011 the mining industry in Australia employed 1.6% of the total workforce. In 2013 the Australian Government publishes the approximate employment with 264'000 full time and part time, which is around 2.3% of the total workforce. (SkillsInfo 2013).

2.4 Locations and projects

The bulk of Western Australia's iron ore industry is centred on operations in the Pilbara region where two of the world's richest ore deposits are located (Ye 2007). Two "Majors" and some minor mining companies and joint ventures currently maintain approximately 25 iron ore mines in the Pilbara region. They transport their commodities via three independent rail systems and export them via ports in Port Hedland, Dampier and Cape Lambert. (DMP 2013d). For an overview of current mines see map in Appendix 1.

In April 2013, WA had an estimated 55.2 billion US$ worth of mining projects under construction or in the committed stage of development. A further 59.4 billion US$ has been identified as planned or possible projects in coming years (DMP 2013b).

Commodity	Committed/Under construction	Planned/Possible
Gold	846	3'090
Iron Ore	29'606	30'360
Nickel	200	3'497
Other Minerals and Infrastructure	24'561	22'484
Total	**55'214**	**59'431**

Table 2: Investment in Major Projects (in Million US$ as of April 2013)

The Department of State Development (2013a) outline in their *Significant Resources Project Report* some of these iron ore projects:

Region	Project	Company	Expenditure	Employment in Construc-tion	Employment in Operation	Status
Mid West Region	Karara Iron Ore	KARARA MINING LTD	AUS$1.975b	1'500	500	commenced
Pilbara	Hope Downs 4 Iron Ore Mine	RIO TINTO IRON ORE	AUS$1.556b	2'100	720	commenced
Pilbara	Port Hedland – Atlas Iron	ATLAS IRON LTD	AUS$500m	n/a	570	commenced
Pilbara	BHPB – Inner Harbour Expan-sion	BHP BILLITON IRON ORE PTY LTD	AUS$2b	n/a	n/a	committed
Pilbara	BHPB – Port Blending and Rail Yard Facili-ties	BHP BILLITON IRON ORE PTY LTD	AUS$1.5b	2'100	720	committed
Pilbara	Jimblebar Iron Ore Mine Ex-pansion	BHP BILLITON IRON ORE PTY LTD	AUS$3.2b	n/a	n/a	committed
Pilbara	Solomon – Chichester ex-pansion and Solomon Mine Project	FORTESCUE METALS GROUP LTD	AUS$9b	7'000	6'000	committed
Great Southern Region	Southdown Magnetite Mine	GRANGE RESOURCES LTD/SRT AUSTRALIA	AUS$2.88b	2'000	600	considered
Mid West Region	Extension Hill Magnetite Mine	ASIA IRON	AUS$2b	1'000	350	considered
Mid West Region	Jack Hills Ex-pansion	CROSSLANDS RESOURCES	AUS$2b	450	350	considered
Mid West Region	Weld Range Iron Ore Mine	SINOSTEEL MIDWEST CORPORATION LTD	AUS$1b	1'000	500	considered
Pilbara	Cape Lambert Iron Ore Project	MCC AUSTRALIA SANJIN MINING PTY LTD	AUS$3.7b	3'000	1'000	considered
Pilbara	Roy Hill Iron Ore Mine & Infra-structure	ROY HILL HOLDINGS PTY LTD	AUS$9b	3'600	2'000	considered
Pilbara	West Pilbara Iron Ore Project	API MANAGEMENT PTY LTD	AUS$7b	3'500	1'000	considered
Yilgarn	Deception Iron Ore Deposit	CLIFFS ASIA PACIFIC IRON ORE PTY LTD	AUS$35m	n/a	n/a	considered

Table 3: Overview of major iron ore projects in WA

One reason for highlighting these projects is to draw attention to the estimated workforce needed during the construction and operation phases. Note that employment during the construction phase is on average about three times higher as during operation.

A second reason is that these projects are highly capital intensive and with busting industry since 2012 some of these projects have been cancelled or delayed (BREE 2013; Kates 2013).

The Roy Hill Project is further described in Appendix 2.

2.5 Customers

Iron ore is used in steel production hence in structural engineering applications and in maritime purposes, automobiles, and general industrial machinery. Figure 4 shows the 2012 sales market with China as the largest customer. 71% of the total WA iron ore sales with a value of 36.2 Billion AUS$ goes to China (DMP 2013d).

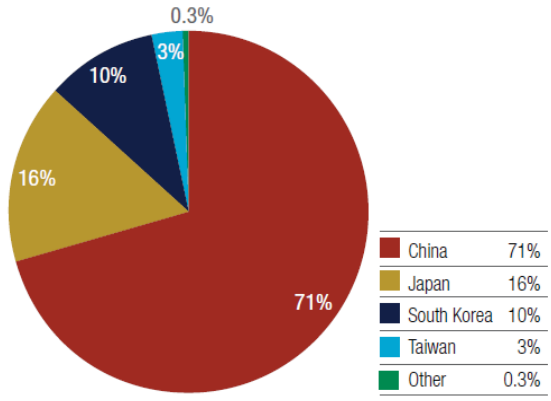


Figure 4: Western Australian iron ore exports in 2012

2.6 Price

The strong performance of iron ore is largely the result of value increases rather than the volume of production. Figure 5 shows the price volatility of iron ore which is traded as "Fines" or "Lumps" at CFR Tianjin port in China (Index Mundi 2013).

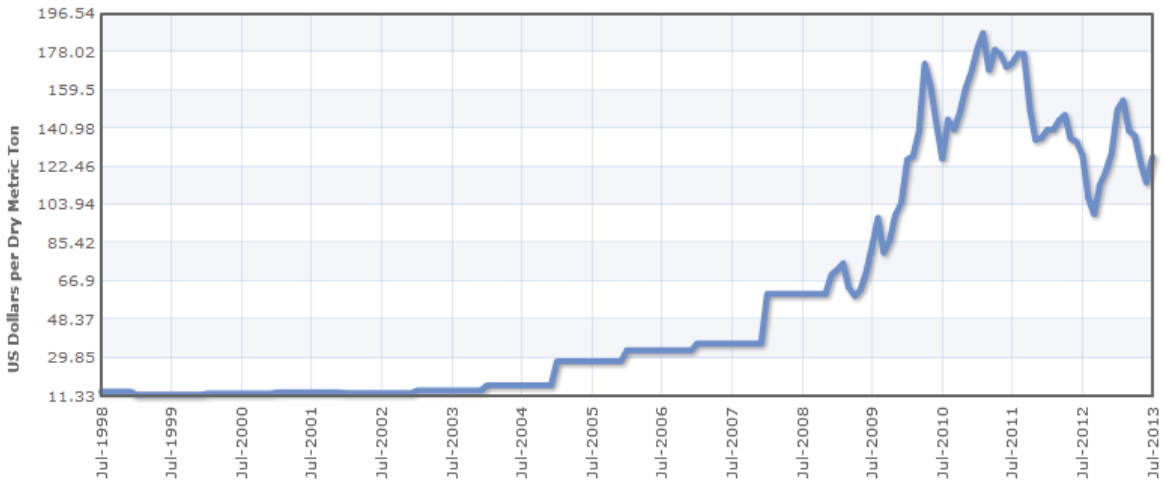


Figure 5: Iron ore price for Fines in US Dollars per Dry Metric Ton from July 1998 to July 2013

The lower trading prices – together with the strong Australian Dollar – were therefore responsible for decreased value of iron ore exports in 2012 (DMP 2013d).

2.7 Business cycle and value chain

It is important to understand the business cycle (AMMA 2013a) and the value chain of a mine (Accenture 2012b) to be able to understand further information in this paper and to break down any workforce need. The main value drivers are named with ore grade, tonnage, energy costs, direct labour costs and recoveries.

The blue bar of Figure 6 demonstrates the main business cycle of a mine. Value ad happens predominantly in the production phase as shown in the inset below.

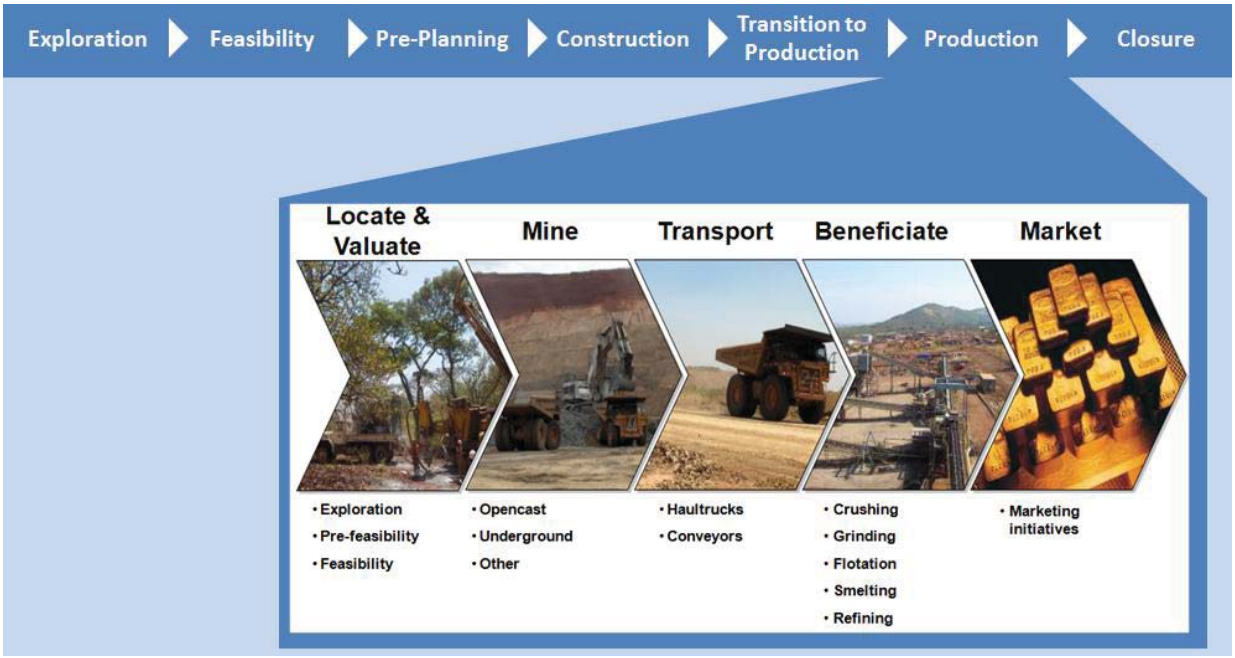


Figure 6: Mine Business Cycle and Mining Value Chain

3. Analysis of the current labour market

In this section, I analyse the recent development and the current labour market situation in the WA mining industry along the following subsections:

- Characteristics of the labour market in the WA mining industry
- Statistics regarding the current labour market and workforce
- Stakeholders and their roles and expectations in the labour market
- Deep dive into special stakeholder groups and potential workforce
- Reflection of vacancies in the job market

I identify emerging issues for each of these subsections which will be further discussed in section 5.

3.1 Characteristics of the labour market in the WA mining industry

Mining companies in general often operate with a finite resource, often in remote locations, require highly specialised skills, deal with high capital intensity and are subject to political, social and environmental issues (Dickie and Dwyer 2010).

Below, I investigate further characteristics of the labour market in the WA mining industry.

3.1.1 Volatile and complex workforce need

Mineral commodities are historically volatile, and boom and bust periods alternate in intervals. (Dickie and Dwyer 2010). Long term charts of most mining commodity prices show a very distinct cyclical pattern. When prices are high this stimulates new mine development, but unfortunately it is the nature of things that the new mines all start operation at or around the same time, production moves into surplus and prices then fall back. Profitability may be decimated, uneconomic operations close down, some never to reopen, global production falls, prices rise and the cycle repeats (Williams 2013). Recent reports and news indicate a slow-down of the current mining boom (DEEWR 2013b; Wright 2013).

Given this cyclical nature of the demand of the global market for minerals, the demand for skilled labour also fluctuates but is not necessarily available on the domestic job market and leaves mining companies with perceived skills shortages (Huang and Austin 2011; Lindorff 2011; Richardson 2007).

However, mining companies do not only need to tackle fluctuating workforce need based on volatile business cycle but also based on the life cycle of a mine (Tonts 2010). As highlighted in section 2.4 there is considerably less workforce needed during production phase compared to construction phase. Figure 7 illustrates this characteristic in the simplified life cycle of a mine:

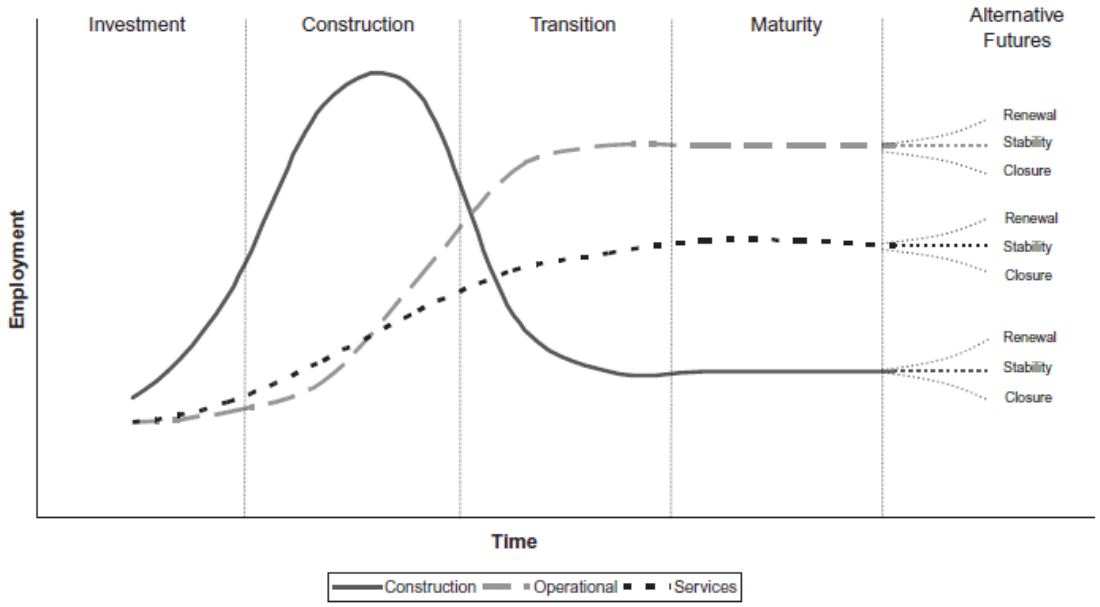


Figure 7: Employment demand in phases of the mining business cycle

Additionally, the skills needed during (rather short term) construction phase vary heavily from the skills set needed during (long term) operation (CME 2013).

The resources investment pipeline is now widely expected to peak in 2013-14, and the construction workforce associated with Mining can be expected to peak with it as mines transition from a construction phase to a less labour intensive operational phase. (CME 2013; NRSET 2010; DEEWR 2013b; Deloitte 2012).

The WA mining industry relies on both employees and contractors for operational success (Dickie and Dwyer 2010).

Emerging issues

- Reliability of future workforce need predictions due to uncertainty in stage of the business cycle
- Productivity challenge in tightening market conditions
- Changing skills set need in transition from construction to production phase
- Contracting employees because of cultural and process alignment with business strategy and otherwise because of social license and communication
- Perceived skills shortage due to mismatch of labour demand and supply

3.1.2 Remoteness and labour mobility

Mine sites are located in remote areas[1] and this remoteness is dealt within a quite explicit way by the mining industry through Fly-in-fly-out (FIFO) and Drive-in-drive-out (DIDO) commuting. Part of the workforce is no longer permanent resident in a remote mining town but live in motel-like in camps close to the mine sites during their roster on-time and fly/drive home during their off-time (Tonts, Plummer, and Lawrie 2011).

Ernst & Young (2013) argue that there is little known about the impact of FIFO/DIDO on productivity and wellbeing. For example *long-term mental health* on the employees on FIFO rosters due to extended periods of separation from families and reduced social and community interaction; *housing* as an increase in demand for housing pushes up prices and affects affordability; or the *local social structure* as FIFO workers drastically change the local demographics.

[1] Perth to Port Hedland approx. 1'600km, Perth to Tom Price approx. 1'500km

Emerging issues
- Dilemma with FIFO/DIDO loss of time while commuting versus life-style while on R&R
- Younger generations may not be willing to have long rosters and be apart from life-style and families

3.1.3 Image and culture

Although mining nowadays is among the most technological advanced of all heavy industries (Dickie and Dwyer 2010), its image still draws the picture of a rough, dirty and dangerous industry with simple tasks for tough workers (Bryant and Jaworski 2011).

Mining industry appears to be predominantly made up for full-time employed workers and the workplace culture policies as a narrow set of masculine norms, intolerant to cultural change and diversity (Van Krieken 2013; Bryant and Jaworski 2011; PWC 2013).

There is this perception of the "survival of the fittest" with anyone who fails to conform to norms is cast as an outsider whose worker identity does not fit (Bryant and Jaworski 2011).

Emerging issues
- Culture perception appears adverse to latent new joiners to the industry and to anyone who does not conform to perceived culture and norms

3.1.4 Health and safety

Compared to other industries, high regulations and control systems try to secure the safety and health of people engaged in mining operations (Government of Western Australia 1994). Mining companies name health and safety in their charters and align processes and indicators to ensure no fatalities (BHP Billiton 2012c; Rio Tinto 2013b).

Emerging issues
- Dilemma HSEC and productivity
- Need for processes and inspections

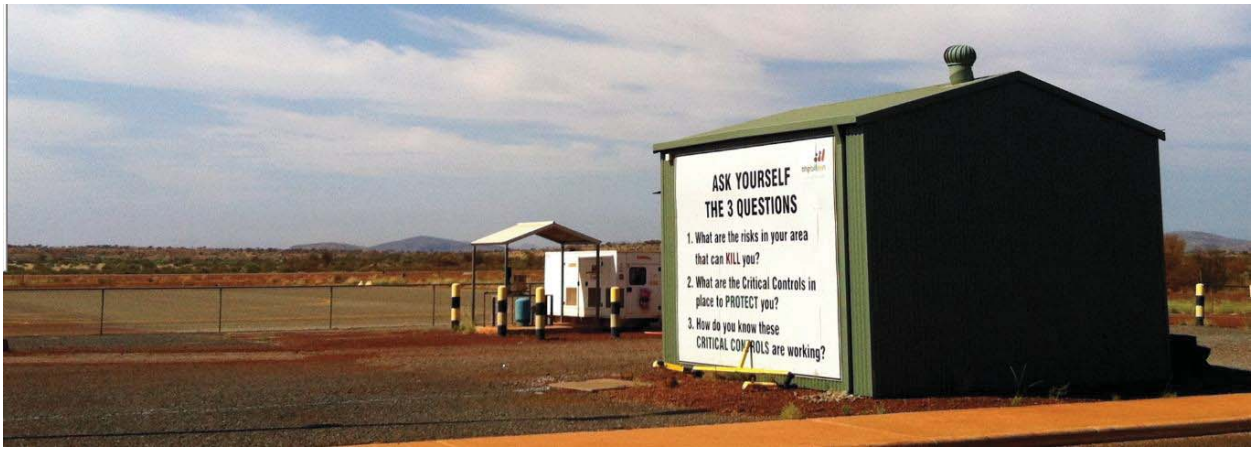


Figure 8: Health and Safety at BHP Billiton operated Coondewanna airfield in the Pilbarra

1. What are the risks in your area that can KILL you?
2. What are the Critical Controls in place to PROTECT you?
3. How do you know these CRITICAL CONTROLS are working?

3.1.5 Interstate labour migration

Ye (2007) states that the national level of labour supply is determined by demographic factors but that willing employees can follow companies' labour demand and cross regional borders in seek of work. That this is actually happening is reflected with Queensland and Western Australia, the two resources strong states with the strongest employment growth and the highest interstate in-migration (Debelle and Vickery 1999).

Interstate migration decisions are affected by relative labour market conditions between states, and, in particular, that individuals are more likely to migrate from a state with a high unemployment rate to a state with good economic prospects (job certainty, wages, working hours) and good noneconomic factors (image, life-style) (Debelle and Vickery 1999; Lawson and Dwyer 2002; Tonts, Plummer, and Lawrie 2011).

Lawson and Dwyer (2002) say that especially younger and/or educated people are willing to relocate. On the contrary, unskilled employees are often "locked in" to particular places and regions due to a lack of transferable skills (Tonts, Plummer, and Lawrie 2011).

WA mining companies assist and pay relocation costs for skilled people who want to migrate to Western Australia (NRSET 2010).

Emerging issues

- Mining companies bear increased recruitment efforts due to interstate marketing and relocation costs

3.1.6 Overseas labour migration

Dickie and Dywer (2010) describe that in the recent mining boom, Australia has required the increased use of foreign skilled labour - on the one hand to mitigate any skills shortages and on the other hand for innovation reasons. A senior manager from a resources company is cited on this account that "[migrants] bring new skills not available in Australia, and support our international operations with their knowledge and language skills" (Bahn, Barratt-Pugh, and Yap 2013).

As a result of the global economic crisis, the Australian government has taken steps to reduce the number of foreign workers entering Australia. People who want to apply for any skilled migration visa in Australia (both temporarily and permanently respectively), must nominate an occupation which is on the *Skilled Occupation List* (SOL). As highlighted in Appendix 3, most occupations relevant to the mining industry are listed in the SOL.

Currently heated discussions are taking place regarding the *Temporary Work (Skilled) visa (subclass 457)*[2] - going forward cited as *457 visa*. "In Western Australia ... despite the boom ... youth unemployment continues to be a major issue while big mining companies use claims of a skills shortage to bring in temporary foreign workers for the mines," argues the secretary of WA Construction Forestry Mining and Energy Union Mick Buchan (Mining Skills Australia 2013). In contrast, CME Chief Executive Reg Howard-Smith argues in a media release (2011) it was "important to remember WA was facing a skill shortage, not a labour shortage" and that "people in areas of higher unemployment in Perth do not necessarily have the skills the resource sector requires". However, some companies have started sourcing skilled labour from developing countries and have been heavily criticised by national worker's unions and governments.

[2] Employers act as sponsors for workers on temporary 457 visas. The sponsors have a number of specific responsibilities. 457 visas workers are constraint by being permitted to work for a maximum of four years and must remain with an employer for that time. They can change employers while in Australia and are allowed a max of 28 days out of work before they must leave the country, however at the end of their stay can apply for permanent residency for themselves and their family (Bahn, Barratt-Pugh, and Yap 2013).

Fact is that 457 visas are capped by the Australian Government at 113'850 and will be capping 467 visas at 125'000 in the coming year (Bahn, Barratt-Pugh, and Yap 2013). It is the intent of the 457 scheme but there is (still) no general requirement to demonstrate that local workers are not available to perform the job to be done by 457 visa workers (IMMI 2013a; Bahn, Barratt-Pugh, and Yap 2013). 457 visa holders have consistently comprised just 2.5% to 3.5% of the Australian resource sector workforce over the past five years (AMMA 2013c; Mining Skills Australia 2013).

Interesting is the correlation between the unemployment rate and 457 visa application lodgements as illustrated in Figure 9:

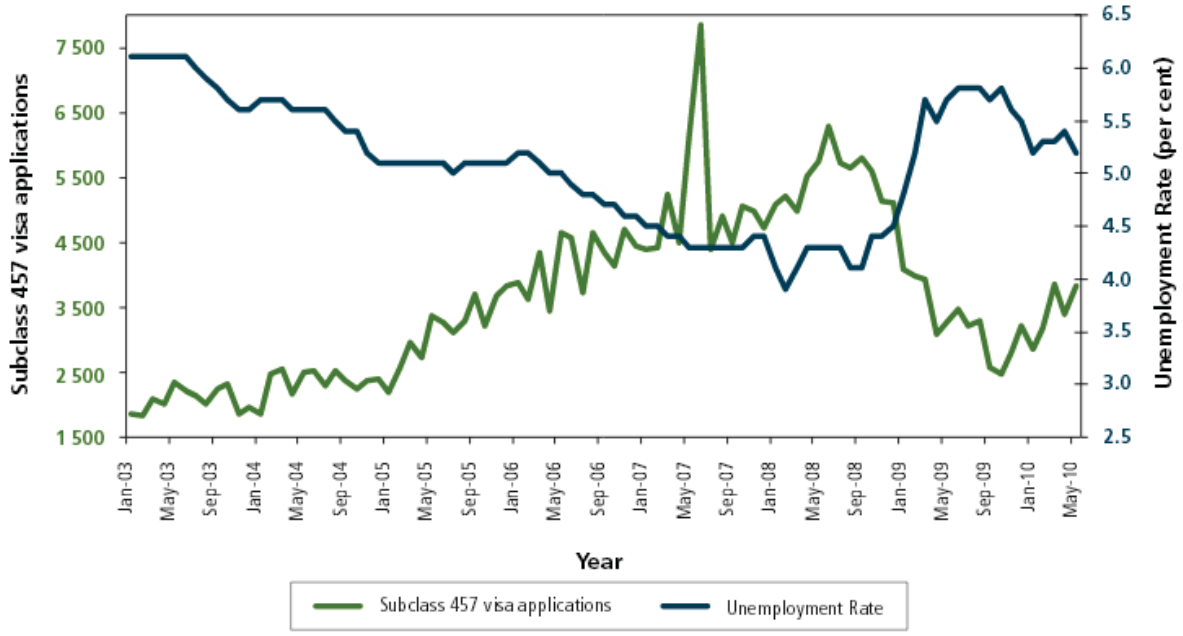


Figure 9: Correlation between unemployment rate and 457 visa primary applications lodgements in Australia[3]

In addition to international labour migration through temporary and permanent skilled migration visas, the *Australian student visa* allows international students to take on maximum of 20 hours of paid work per week during semester (Gamble, Patrick, and Peach 2010) and the *Working Holiday visa (subclass 417)*[4] allows people aged 18 to 30, to travel and work in Australia for up to 12 months (Jarvis and Peel 2012).

Emerging issues

- Restrictions to 457 visa will further exacerbate the shortage of skilled professionals required to sustain and grow the industry in the future.
- Diminish social license when foreign workers get employed although unemployment in Australia

3.1.7 Political and legal environment

Whereas in continental Europe, productivity and economic performance been central in national government agendas for a long time, this discussion has started in Australia only about 20 years ago (Macneil, Haworth, and Rasmussen 2011). Australian government has since tried to implement industrial regulations policy to encourage organisations and their unions to improving workplace productivity and cooperation (Macneil, Haworth, and Rasmussen 2011).

[3] Note: The spike in June 2007 was a result of the announcement in the last week of June of the introduction of the English language requirement for trade occupations from 1 July 2007.

[4] Not applicable for Switzerland

9'760 employees in the WA mining industry are trade union members (11.2%) (DOCEP 2011).

Other than in Switzerland there is no article in the Australian constitution and there is no truly national labour law where national standards are based on. Only with the previous Labour government[5] ten so called National Employment Standards (NES) were introduced – but this in turn is not necessary relevant for Western Australia employees because WA in addition has its own "Western Australia state system"[6]. For further information on NES see Appendix 3.

On top of the NES there may be industry related *modern awards*[7] (as from 2010) or *pre-modern awards* (before 2010) or *enterprise agreements*[8] respectively.

The mining sector was a major adopter of the pre-enterprise agreements, the so-called Australian Workplace Agreements (AWAs). As Dickie and Dwyer (2010) argue, these AWAs helped to change the mining industry from a culture of confrontation and divisiveness to a collaboration where choice and flexibility are paramount.

So, for the Western Australian mining industry that means if the staff belongs to a company which is a *constitutional corporation*, he/she is covered by NES or not. Additionally he/she may benefit from the *Mining Industry Award 2010* or an enterprise agreement.

Almost two-thirds (64.3%) of WA mining industry employees had their pay set by registered or unregistered individual arrangements. A further 34.3% were paid via collective agreements (DOCEP 2011)

BHP Billiton WA Iron Ore employees for example are covered by the *Western Australia state system* and the *Mining Industry Award 2010*. BHP Billiton Coal employees are covered by the *National Employment Standards* and an enterprise agreement that was negotiated with the Queensland coal mining unions.

Emerging issues

- Complexity of legal environment

[5] 2007-2013 Julia Gillard and Kevin Rudd

[6] The WA state system covers employers who are not 'constitutional corporations' and their employees. In general terms, this includes employers who are sole traders, and some partnership and trust arrangements. The NES in turns broadly covers employers who are constitutional corporations and their employees.

[7] For the 'Mining Industry Award 2010' see https://extranet.deewr.gov.au/ccmsv8/CiLiteKnowledgeDetailsFrameset.htm?KNOWLEDGE_REF=216305&TYPE=X&ID=250136848956321148888991289 4&DOCUMENT_REF=382681&DOCUMENT_TITLE=Mining%20Industry%20Award%202010&DOCUMENT_CODE=MA000011

[8] Negotiated with unions

3.2 Statistics regarding the current labour market and workforce

Unlike other industries, the WA mining workforce has grown quickly and is predominantly male with lower levels of completed education, longer working hours and above average earnings. In this section, I analyse this general statement along the following subsections:

- Employment
- Unemployment
- Replacement and turnover
- Labour conditions
- Demographics

3.2.1 Employment

Prior to the current mining boom, all the Australian states experienced roughly the same employment growth (Debelle and Vickery 1999). However, since 2003 natural resources strong Western Australia experienced a significant stronger employment growth than other states and territories. Figure 10 shows the employment growth in WA mining industry including the average annual growth of 12.4% over the last five years (SkillsInfo 2013).

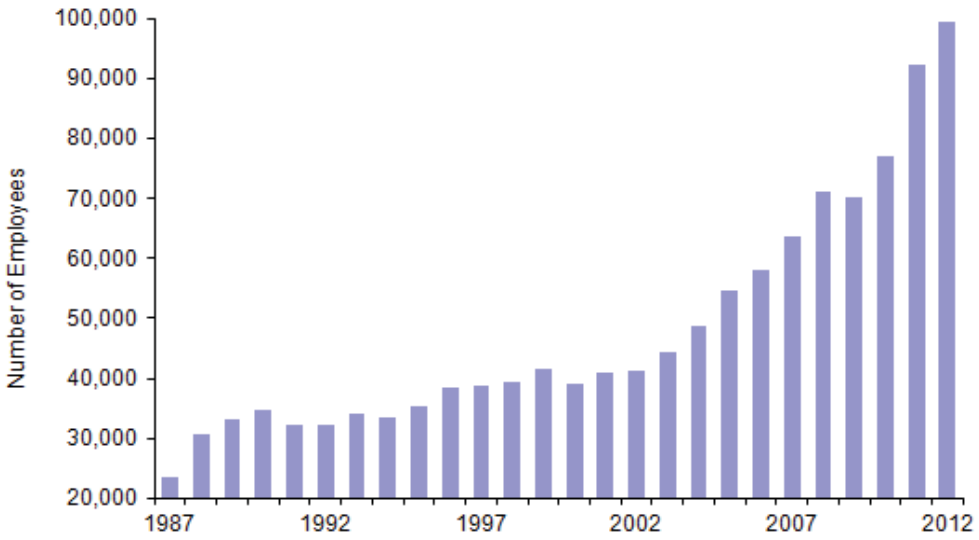


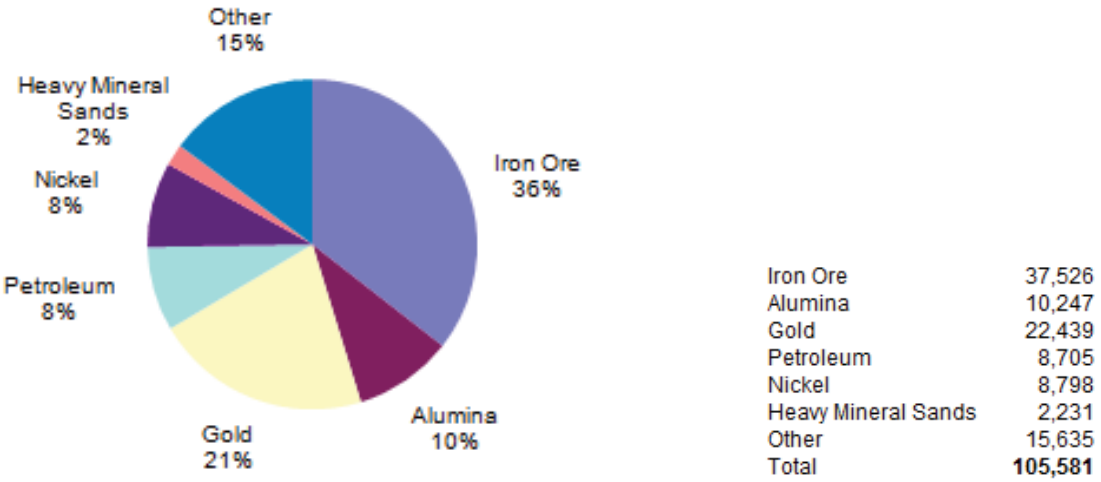
Figure 10: Development employment in WA mining industry

Interestingly, only a small portion of jobs generated in the overall economy are directly located in the mining industry, while more than 80% of the total number of additional jobs were generated in other industries (Ye 2007). Service industries and industries that are closely related to investment are inevitably linked to the mining industry. This includes for example government services such as education, health and community services, wholesale and retail trade (Ye 2007; NRSET 2010).

Australia wide the mining industry employed only about 1.6% of the total workforce in 2011 and 2.3% in 2012 respectively (SkillsInfo 2013; Bryant and Jaworski 2011). In Western Australia these figure is considerably higher with 7.5% in 2013 and the mining industry is now the fourth biggest industry[9] in WA (DEEWR 2013d).

[9] after 1) Construction, 2) Health Care and Social Assistance and 3) Retail Trade

As mentioned in section 2.3, the Australian wide mining industry currently directly employs approximately 264'000 people (SkillsInfo 2013). In Western Australia, this figure for 2012 varies down to info source at 99'551 (DMP 2013a), 105'585 (DMP 2012) or 104'200 (DEEWR 2013d) respectively. According to DMP (2012) 37'526 people or 36% are directly employed in the iron ore market (see Figure 11). This includes 8'300 in BHP Billiton, 10'129 in Rio Tinto[10] and 8'812 in Fortescue Metals Group but no contractors who are employed in site preparation and removing overburden at a mine site on a contract or fee basis.



Iron Ore	37,526
Alumina	10,247
Gold	22,439
Petroleum	8,705
Nickel	8,798
Heavy Mineral Sands	2,231
Other	15,635
Total	**105,581**

Figure 11: WA minerals and petroleum employment per commodity

In 2011–12 the WA mining and petroleum industry directly employed 105'581 people. The iron ore sector the largest employer with 36%. In 2003 Western Australia's economy began to expand strongly and mining employment has grown on average by around 10% each year. Generally it is calculated that every job created in the mining and petroleum industry will create three more in other sectors. These extra jobs are created in retail (clothing, supermarkets), hospitality (hotels, restaurants), support services (IT, administration) and manufacturing (machinery, parts). As a result, in 2011–12 the industry was indirectly responsible for employing an estimated total of 422'300 people in Western Australia (DMP 2013c).

Emerging issues

- Statistical data is not standardised and congruent hence not reliable
- Almost no statistical data available on contractors
- Not sure if mining companies are aware of social responsibility for indirect employment growth in other industries

3.2.2 Unemployment

As a result of the increased employment, the national unemployment rate in Australia fell from 8.5% in June 1997 to 5.4% in December 2012. The unemployment rate in Western Australia was similar to the national rate through much of the 1980s, but fell considerably faster than the national average during the current mining boom with 7.0% in June 1997 to 4.4% in December 2012 (Debelle and Vickery 1999; DEEWR 2012). Remarkable is the WA youth unemployment rate of 10.7% which includes people 15-24 years of age (DEEWR 2012).

A chart including the Australian unemployment rate see Figure 9 in section 3.1.6.

The Australasian Institute of Mining and Metallurgy Employment Survey (AusIMM 2013) recently revealed a different view with the perspective of the institute's 13'500 members: Unem-

[10] Incl. Hamersley Iron

ployment among Australian mining professionals increased from 1.7% in July 2012 to 10.9% in July 2013. AusImm spokesman said: "Many highly skilled minerals professionals are now unemployed or under-employed and we risk losing their skills. This will reduce the ability of the minerals industry to innovate and improve productivity and to respond to increases in demand for our resources as economic conditions improve in our major markets." (AusIMM 2013).

Tonts et al (2011) point out the evidence that when downturns in the mining industry apply, the resultant contraction of local labour markets can lead to high rates of unemployment, poverty and outmigration due to untransferable skills. However, in the current mining boom, WA resource towns such as Kalgoorlie and Karratha experience highly competitive labour markets and contribute to the low unemployment rate in WA.

Emerging issues

- Statistical data is not standardised and congruent hence not reliable
- Concerning rate of youth unemployment
- Loss of skills of under-employed skilled minerals professionals
- Non-transferable skills

3.2.3 Replacement and turnover

Figure 12 shows the development of the turnover rate in mining industry (AMMA 2011; Ernst & Young 2013) which is the highest among all Australian industries.

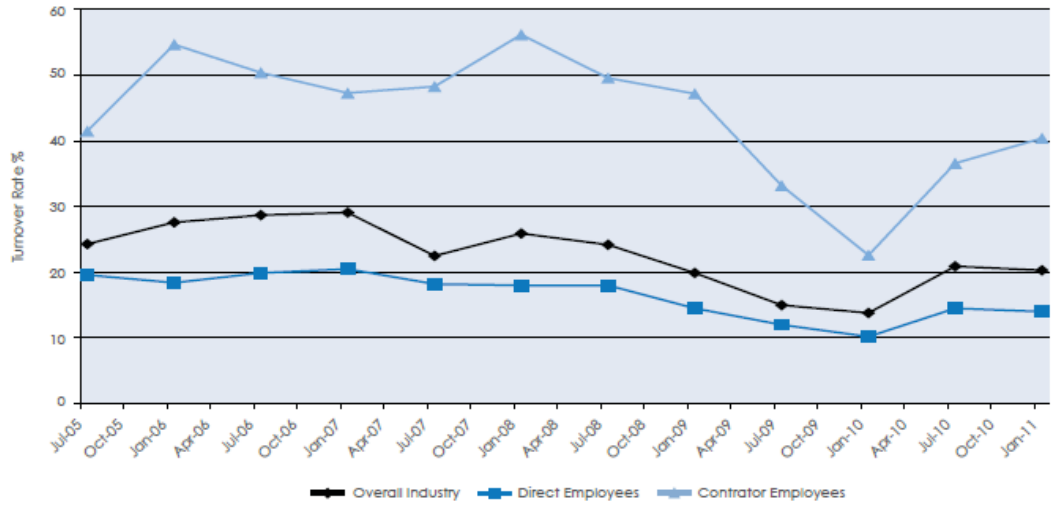


Figure 12: Turnover rate in the Australian mining industry

Note that this is one of the rare charts that distinguish between contractors and permanent employees.

AMMA however does not specify if the chart only includes people who leave their current jobs for another in the same sector (turnover) or if it includes people who leave the sector or retire (replacement demand). NRSET (2010) state that turnover rates vary substantially between occupations and are apparently double as high as for FIFO workers compared to other employees.

The comparatively low turnover rate after the GFC in 2009 lets me assume that employees tried to secure their positions and were less willing to change job.

Emerging issues

- Unclear definition of "turnover"

3.2.4 Occupations and labour conditions

The top 10 occupations for people employed in the Australian mining industry according to SkillsInfo (2013):

Occupation	Percentage (%)	Average weekly earnings (in AUS$)
Drillers, Miners and Shot Firers	45.4	1'996
Metal Fitters and Machinists	23.3	1'500
Truck Drivers	10.6	1'200
Electricians	8.6	1'300
Other Building and Engineering Technicians	8.0	1'775
Production Managers	6.1	1'469
Earthmoving Plant Operators	5.9	1'500
Mining Engineers	5.3	2'844
Geologists and Geophysicists	5.0	1'826
Other Construction and Mining Labourers	4.9	1'618

Table 4: Top 10 occupations in Australian mining industry

Compared to all other industries in Australia, the mining industry workforce earn high above average weekly wages and especially FIFO workers benefit from many different allowances on top of their base salary (AMMA 2011; Tonts, Plummer, and Lawrie 2011).

The WA Department of Commerce's (2011) overview on the job distribution in the WA mining industry follows a less detailed structure but includes not mining specific jobs such as managers and clerical:

Job profile	Percentage (%)
Managers	10.5
Professionals	20.7
Technicians and Trade Workers	23.8
Community and Personal Service Workers	1.7
Clerical and Administrative Workers	13.3
Sales Workers	0.3
Machinery Operators and Drivers	24.4
Labourers	5.3
Total	**100.0**

Table 5: Job distribution in WA mining industry

Figures on median weekly earnings for full-time employees in the Australian mining industry in 2012 vary between AUS$1900 according to SkillsInfo (2013) and AUS$2'388 according to the Australian Bureau of Statistics (ABS 2012a). Yet another figure demonstrates the WA Department of Commerce with AUS$2'313 for employees in the WA mining industry compared to AUS$1'451 in all WA industries (DOCEP 2011).

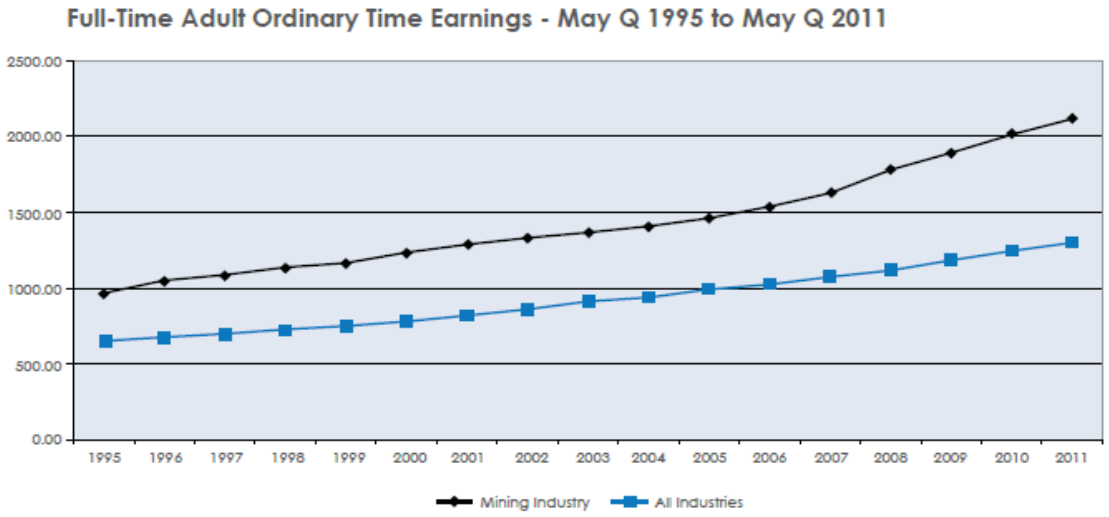


Figure 13: Average weekly earnings in the Australian mining industry

The overwhelming majority of WA mining industry employees worked full-time (96.6% or 85'030 employees), part-time employment was highest in the exploration and other mining support services (DOCEP 2011).

Mining has the longest working hours of any industry in the form of regular rosters[11], day shifts and/or long working weeks (Bryant and Jaworski 2011). The average full-time hours for employees in the Australian mining industry is at 45.3h per week (SkillsInfo 2013).

In July 2012, only 2.9% of employed Australian minerals professionals reported that they wanted to work more hours, say that they are "under-employed". By July 2013, many of those professionals found themselves unemployed. Among those still working, there was a three-fold increase in reported under-employment, with a 9.1% rate of under-employment. (AusIMM 2013).

Emerging issues

- Labour conditions may be unattractive for people who seek work-life-balance among family and culture and/or collaborative management style
- Two-speed economy with ever growing discrepancy of wages for mining industry compared to other industries
- Escalating labour costs interfere with international competitiveness
- Some occupations include skills set that is not transferable to any other industry

[11] Example from a RT contractor working as a FIFO Drill Fitter on a *mining* construction project: Roster includes 2 weeks ON, 1 week OFF. The time from home to the airport is unpaid and in the responsibility of the contractor, the time between the airport and the work site (around 2 hours) is paid labour time. The two weeks consist of 7 day shifts (6am to 6pm), then 1 day off at the camp, then 7 night shifts (6pm to 6am) and flight back home in the morning of day after the last night shift. The time between the mining camp and the actual work site is in addition to the 12 work hours. The OFF time is also referred as rest & recreation time (R&R). *Mining* projects are higher regulated than *civil* projects which include eg new railways or ports. In *civil* projects rosters of 3 weeks ON and 1 week OFF are the rule for a FIFO Drill Fitter.

Example from a BHP employee in the role as a Superintendent Execution: Roster consists of 5 days ON, 2 days OFF, 4 days ON, 3 days OFF. Travel from home to airport is non-paid, from airport to mine site is paid and during work hours. Work days likewise from 6am to 6pm (this is also for administrational personnel at the mine site).

Example form a BHP employee in the role as a Planner NPI: Roster consists of 8 days ON, 6 days OFF. Travel from home to airport is non-paid, from airport to mine site is paid and during work hours. Work days likewise from 6am to 6pm.

3.2.5 Demographics

The Australian Mining Institute survey presents a general composition of the Australian mining industry workforce which includes employees and contractors (see Figure 14). It shows that overall, the mining industry is predominantly made up of full-time employed workers, male dominated with a smaller number of independent and other business operators when compared with other industrial sectors in Australia (Van Krieken 2013).

	Employed full-time		Employed part-time		Employed total	
	% Male	% Female	% Male	% Female	% Male	% Female
Managers	7	9	33	0	7	8
Professionals	16	24	33	40	16	26
Technicians	33	9	-	-	32	8
Community and personal services	1	-	-	-	1	-
Clerical and administration	3	32	-	60	3	36
Machinery operators and drivers	37	24	33	-	37	21
Labourers	3	3	-	-	3	3

Figure 14: Australian mining industry workforce composition as of May 2013

3.2.5.1 Age

Figure 15 shows the age distribution amongst the WA mining industry employees. The median age for workers in the WA mining industry currently is 39 years (SkillsInfo 2013). In 2011, the Department of Commerce stated it at 38 years (39 years for males and 35 years for females) with more than half of workers in the 24 to 54 age range (DOCEP 2011).

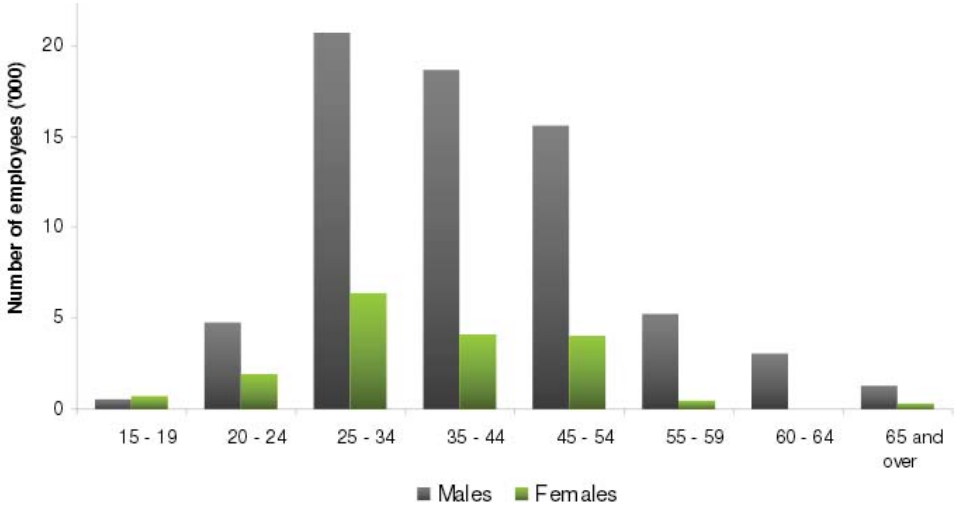


Figure 15: Age distribution in WA mining industry employees

However, Dickie and Dwyer (2010) state that "a large proportion of the current mining workforce is in the 50-years old bracket and will be reaching retirement age over the next decade. Associated with this exodus of employees will be the loss of specialist knowledge associated with working in the industry".

Emerging issues

- Increased replacement because of retirement of large numbers of workers
- Loss of experienced skills because of retirement of large numbers of workers

3.2.5.2 Gender

The mining industry has the lowest level of female workforce participation of all Australian industries, comprising fewer than 9% (Bryant and Jaworski 2011; PWC 2013).

In February 2013, the female share of employment in the Australian mining industry was 14.3% (SkillsInfo 2013). In the WA mining industry however, 20.5% were female (DOCEP 2011).

Females are more likely to be employed in clerical and administrative jobs rather than managerial and professional positions (Bryant and Jaworski 2011; Van Krieken 2013).

At the same time, the highest discrepancy in Australia between the earnings of full-time male and female employees occurs in the mining industry. The gender pay gap in the WA mining industry accounts for 25.3%. Males therefore earned on average AUS$610 more per week than females (AUS$2'412 compared to AUS$1'802) (DOCEP 2011).

It is argued that the long and inflexible working hours in the mining industry exclude family relations from work relations on a structural level and that female with their reproducing bodies, and the caring labour they perform as mothers, embodies their work choices (Bryant and Jaworski 2011; PWC 2013).

The absence of female workers already shows in the interest of young women for apprenticeships in mining (PWC 2013). Bryant and Jaworski (2011) describe in their study, that young women "are not interested in mining" because "it occurs in remote communities and women would not feel comfortable working within such a male dominated culture". Young females would rather go to university and look for the moral worth to specific occupations.

And like a vicious circle, the absence of women among apprentices reinforces the view that particular jobs belong to people according to their gender (Bryant and Jaworski 2011).

Bryant and Jaworski (2011) point out that in their research HR personnel rarely acknowledged the need for any structural or cultural changes required in shift work in order to foster increases in the numbers of women in the mining workforce.

Emerging issues

- Compared to other industries, female participation in the mining industry is still very low. Females low represented in decision making.
- Working conditions and working environment not attractive for females.
- Mining industry does not seem to be interesting for young females to enter.

3.2.5.3 Cultural origin

Literature and statistics do not show the amount of Indigenous people actually employed in the mining industry but Tonts et al (2011) describe the "poverty in the midst of plenty" and show that many Indigenous communities remain disengaged from nearby resource projects and therefore cannot benefit from the current mining boom.

Sawyer and Gomez (2012) investigate the historical conflicts between mining companies and Indigenous people. They describe cases when Aboriginal communities were forcibly closed and its residents removed to make way for mining. In all these cases, the federal and state governments took side with the respective mining corporations.

About 20 years ago some mining corporations started to strategically re-position themselves concerning the relationship with the Indigenous communities. Rio Tinto for example took a different public position in 1995 as its CEO publicly challenged the industry to work within the existing native title framework rather than continuing to oppose it (Sawyer and Gomez 2012).

The environmental damage inevitably caused by mining activity as core business places companies in direct conflict with those recognized Indigenous landowners who continue to accord high value to the cultural landscape imbued with religious significance.

The mining industry defines economic development in a similar manner to the state that privileges global capital above Indigenous rights to cultural and aspirational differences: the settler-colonial and industry project to exploit the land for commercial gain is similar. Under the guise of corporate social responsibility, mining companies are instrumentally looking to link their concerns about Indigenous poverty with industry concerns about labour shortage. In short, getting positive employment outcomes at mines, as at Century, is beneficial both for reputation and for business.

Emerging issues

- Indigenous people seen as latent talent but historical environment not ready to utilise the particular.

3.2.5.4 Education

More than one-third of employees in the WA mining industry do not have a post school qualification (35.8%). A further 28.4% had a Certificate III or IV and 17.2% had a bachelor degree (DOCEP 2011).

Highest level of qualification	Percentage (%)
Postgraduate	4.1
Graduate diploma or certificate	1.2
Bachelor degree	17.2
Diploma or advanced diploma	6.6
Certificate III and IV	28.4
Certificate I and II	1.0
Certificate not further defined	1.6
Not stated or inadequately described	4.0
No qualifications	35.8
Total	**100.0**

Table 6: Qualification distribution in WA mining industry employees

Emerging issues

- Skills gap due to big percentage of unskilled or underskilled workers occupy positions with high skills need

3.3 Key labour market stakeholders

In this section, I analyse the key labour market stakeholders in the WA mining Industry and their role and expectations.

3.3.1 Labour demand from industry employers

Major and minor mining companies, joint ventures and contractor companies[12] define the demand-side of the labour market in the WA mining industry.

Employers directly and indirectly interact with current and potential workforce, governments and education institutes.

There are a number of employer representative bodies such as the Australian Mines & Metals Association (AMMA) on a national level or the Chamber of Minerals and Energy of Western Australia (CME) which not only provides a platform to discuss common topics and issues[13], experts to influence policy development, host initiatives to address common challenges[14], engage in training and development and acknowledge high performance through awards[15] (AMMA 2011). They assist employers with workforce consultancy services throughout the mining business cycle as shown in Figure 16 (AMMA 2013a):

Figure 16: AMMA workforce consultancy services throughout the mining business cycle

Section 0 of this paper will provide a discussion on how three mining companies are embedded in the WA labour and on how they react to current and future challenges.

Employers however not only demand labour, some of them also offer traineeships[16] or apprenticeships[17]. Currently, the Australian mining industry employs more than 11'000 apprentices and trainees, representing about 5% of the direct workforce (AMMA 2013c). The growth trend for the number of mining industry apprentices and trainees has almost quadrupled from 2003 to 2011 and the National Centre for Vocational Education Research (NCVER) shows that the mining sector spends around AUS$1.15b or 5.5% of direct labour cost on training, well above government benchmarks (Diamond 2013).

[12] Amongst others Leighton Contractors, NRW, Action Drill & Blast, Chandler Macleod

[13] For example at the annual Mining Skills Summit

[14] For example the Woman in Resources Sector Alliance (WRSA)

[15] For example the Women in Mining Award or the Health and Safety Award

[16] Trainee enters into a contract with an employer to gain hands-on skills and work experience while earning a wage. Usually in non-trade related areas.

[17] Apprentices enter into a contract with an employer who teaches all aspects of a trade

- Expectations towards current and future workforce and their representative bodies
  - Unions stop pursuing opportunistic and self-serving terms in enterprise agreements (Kates 2013)
- Expectations towards government
  - Robust workplace relations system (AMMA 2009)
  - Measures to address capacity constraints caused by infrastructure bottlenecks and skills shortages (AMMA 2009)
  - Support initiatives that enable increased labour mobility, specifically interstate migration and FIFO work practices (CME 2013)
  - Productivity growth encouraging environment that is fair for both business and employees (Kates 2013).
  - Efficient and effective policy making process for new project sites (so-called "greenfields") and agreement renewal, causing major scheduling problems in a significant number of cases (Kates 2013)
  - Opportunity to recruit skilled labour from overseas to address lack of available skilled labour in Australia - despite it being the high-cost, high-risk option (Kates 2013)
- Expectations towards education providers
  - Mitigate skills shortages with increased supply of employable graduates
  - Education and training initiatives to prepare for the growth in the operations workforce (CME 2013)
  - Tailor courses according to specific industry needs (Billett 2000)

Emerging issues
- Escalating labour cost interfere with international competitiveness
- Major scheduling problems in a significant number of cases because of slow policy making and agreement renewal
- Do not feel responsible for skills shortage issue and push solution solving to supply-side

3.3.2 Labour supply from current and potential workforce

Current and potential workforce[18] offer the supply-side of the labour market.

Employee representing bodies include the mining and energy division of the Construction Forestry Mining and Energy Union (CFMEU) and the Australasian Institute of Mining and Metallurgy (AusIMM).

Expectations towards employers include attention to health and safety, adequate rewards, training perspective and good working conditions.

Emerging issues
- Not enough interest in industry from potential workforce
- Not enough candidates in domestic labour market

3.3.3 Education providers

Education institutes which include universities, Tertiary and Further Education (TAFE) and private training centres are open for Australian and international students.

[18] Employees and contractors

- Universities[19] offer undergraduate degrees, honours degrees, postgraduate course degree, postgraduate research degree mining topics such as Applied Geology, Exploration Geophysics, Metallurgical and Minerals Engineering, Spatial Science and Mineral Economics.
- Government owned and operated Tertiary and Further Education (TAFE)[20] courses provide practical skills and industry training with flexible entry requirements and opportunities for further study at university. I-IV certificate courses and diploma include Building Design/Construction, Civil/Structural Engineering, Electronics/Communications Engineering, Manufacturing, Mining, Oil and Gas/Mechanical Engineering/Drafting and Surveying
- Other private owned training centres[21] offer trainings with and without recognised titles.

The National Centre for Vocational Education Research (NCVER) is Australia's principal provider of vocational education training research and statistics.

The Business and Higher Education Round Table (B-HERT) is a not-for-profit organisation founded in 1990 to strengthen the relationship between business and higher education.

Leighton Contractor currently not only employs but also trains large numbers of workers in India with the view to encourage them to apply for a temporary 457 visa so as to work on Australian mining sites (Hodge 2011).

- Expectations towards industry employers
  - WIL program coordinators find it increasingly difficult to identify placement opportunities for international students in the mining industry (Gamble, Patrick, and Peach 2010).
- Expectations towards government
  - Lower restrictions with international student visas (Gamble, Patrick, and Peach 2010)

Emerging issues
- Not enough employable graduates
- Reaction to new requirements too slow
- Low willingness of mining companies for apprentices or WIL projects

3.3.4 Government

Lawson and Dwyer (2002) state that the government can directly influence regional labour market and employment growth with explicit policy of regional development such as state sponsored visas and a Skilled Occupation List.

Currently, several national and WA government departments are involved in policy making and have a direct influence on the labour market in the Western Australian mining industry:

- Australian Bureau of Statistics (ABS) provides official statistics on demographics and work conditions (ABS 2012b, 2012a).
- Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) is a research bureau and provides analysis amongst others on minerals.
- Productivity Commission (PC) is a research and advisory body on a range of economic, social and environmental issues.

[19] incl. Curtin University's Western *Australian School of Mines* (WASM) and University of WA's *School of Civil and Resource Engineering*

[20] Incl. *Central Institute of Technology* and *Education & Training International* (ETI)

[21] Incl. CME initiated *People for the Future*

- Australian Government, Department of Immigration and Border Protection (IMMI) provides access to Australian visa regulations (IMMI 2013b, 2013a).
- Australian Government, Department of Education, Employment and Workplace Relations (DEEWR) provides national leadership in education and workplace training including research to identify skill shortages in the Australian labour market (DEEWR 2012, 2013d, 2013b; SkillsInfo 2013).
- Australian Workforce Productivity Agency (AWPA, previously known as Skills Australia) consult with industry and education providers and offers advice on current, emerging and future skills and workforce development needs (Skills Australia 2010).
- Australian Trade Commission (Austrade) assists Australian businesses in export/import, investment and education.
- Natural Resource Sector Employment Taskforce was established to help secure additional skilled workers needed for major resources projects (NRSET 2010).
- Government of Western Australia, Department of Mines and Petroleum (DMP) promotes private investment in the mining industry, regulates Health and Safety and provides statistical data (DMP 2010, 2013d, 2013a, 2012)
- Government of Western Australia, Department of State Development (DSD) overlooks major development projects (DSD 2013b, 2013a)
- Government of Western Australia, Department of Commerce (DOCEP) provides a labour market overview for the WA mining industry (DOCEP 2011)

- Expectations towards industry employers
  - Communicate future trends so law making process and education can be regulated accordingly and in a timely manner.

Emerging issues
- Changing and patchy skills shortages rather than general labour shortage
- Ending construction projects release workers and decrease tight labour markets

3.4 Deep dive into specific stakeholders and potential workforce

This section analyses specific stakeholder groups in the WA mining industry:

- Contractors
- Graduates
- Apprentices
- Willingly or unwillingly unemployed
- Migrants

3.4.1 Contractors

Statements related to the amount of contractors engaged in WE mining industry could not drift any further apart. The AusIMM members' employment survey on the one hand identifies 3.5% independent contractors and other business operators in Australian mining industry (Van Krieken 2013). Dickie and Dwyer (2010) on the other hand argue that "with the start of the recent mining boom, the amount of contractors overtook employees engaged in the Western Australian mining workforce".

Figure 17 shows the development of WA mining employment divided by employees and contractors according to the WA Department of Mineral and Petroleum (2010). Unfortunately this chart is no longer provided by any more recent DMP statistics release.

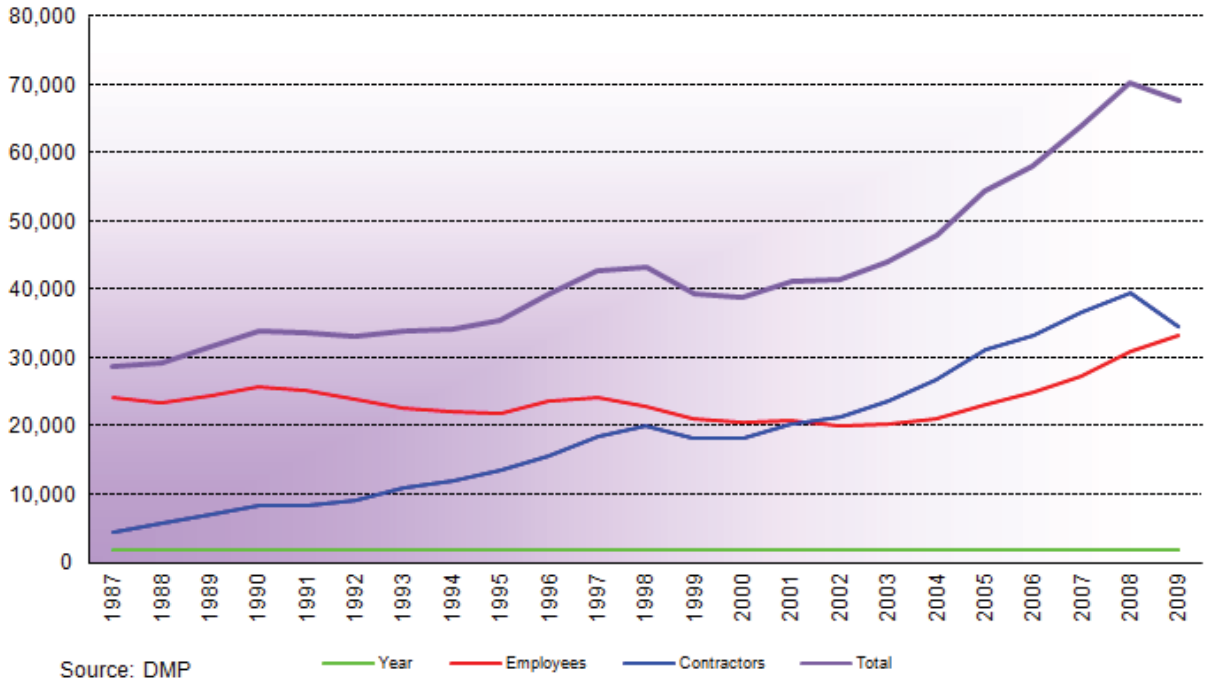


Figure 17: Development of WA mining employment

Emerging issues

- Missing data on contractors engaged in WA mining industry
- Contractor engagement managed by business managers without HR involvement
- Workforce planning does not include contractors

3.4.2 Graduates

Whilst Australian employers are generally satisfied with the quality of graduates' technical skills and capabilities, they have urged higher education institutions to improve employability through non-technical skills such as communication, teamwork and problem solving (Gamble, Patrick, and Peach 2010; Jackson 2013). Non-technical skills according to Jackson (2013) encompass those cognitive, social, self-management and administrative skills.

Mining companies in rural areas explain that "there is a close relationship between the organisation and the community... Local kids have parents working on site and they have a strong link to the company. That is how we get involved in talking to local high school students... we recruit from the local area as local kids are more likely to stay..." (Bryant and Jaworski 2011).

Emerging issues

- Many graduates receive little or no exposure to the mining industry during their study.
- University courses are highly technical and do not include non-technical skills development such as cognitive, social, self-management and administrative skills.
- Graduates do not meet the expectations of employers when entering the labour market, some of them may be unemployable and need further training before being effective in their profession.

3.4.3 Apprentices

Apprenticeships in Australia are not the same as in Switzerland. To learn a trade in Australia, people either study at university or attend a course at TAFE. There is little to no exposure to real business life during that time.

Bryant and Jaworski (2011) describe how Australian government policy has focused on increasing resources to attract and train apprentices in areas identified as being short supply of labour. However, of 19 mining sites Bryant and Jaworski (2011) questioned, only nine reported employing apprentices, five had no female apprenticeships, while other four had very few[22]. Even when employers "identified an impending shortage of trades persons due to a decline in apprenticeship numbers, none of the enterprises indicated they intended to increase their commitment to apprenticeships" (Billett 2000).

The reluctance of mining companies to provide mining specific training is of concern, as the vocational training sector cannot be expected to anticipate ongoing and changing institutional needs, particularly when the firms involved do not strategically predict their own skills needs (Lindorff 2011).

According to the Australian Mines and Metals Association (2013c) 13% of Australian mining apprentices were Indigenous and 20% were mature-aged Australians.

In addition to Australian based apprenticeships, Austrade is championing the idea of Australian financed and run vocational training courses in Indian companies, and maybe even an India-based Australian mining and engineering college, with the capacity to train as many as 100'000 Indian workers annually (Hodge 2011).

Emerging issues

- Mining companies do not want to invest in young professionals, they want to hire fully trained and experienced people.
- Mining companies do not strategically predict their skills need hence VET lack information on ongoing and changing institutional skills needs.

[22] For example one company with 2 female apprentices, compared with 30 male apprentices. The largest number of female apprentices was 5 in a company that employed 80 apprentices in total.

3.4.4 Willingly or unwillingly unemployed

The Australian Minerals Institute investigate in their members' employment survey the reasons for willingly unemployed mining professionals (Van Krieken 2013). Figure 18 shows that more than 30% of fully trained and experienced employees decide to exit the mining workforce to either take a career break, return to study or for family reasons. The reasons for exit the workforce not only differ in gender but also amongst professions.

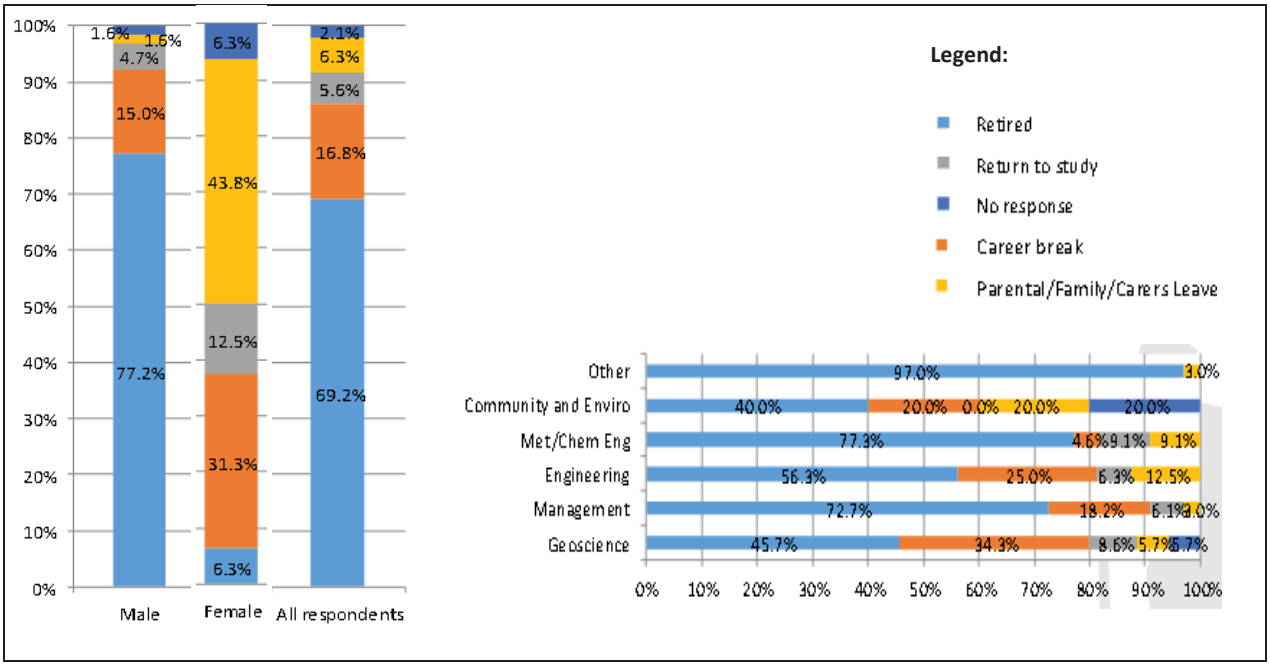


Figure 18: Reasons for Australia wide willingly not being in the labour force

What the survey does not show is how many mining professionals moved into another industry such as petroleum.

Emerging issues

- Current employment contracts and work environment seem not to allow professionals to combine their study and family needs while being employed.
- Current employment contracts also seem not to handle career brakes very well. Mining companies seem to lose these people after they have resigned instead of keeping them engaged and offer unpaid leave or sabbaticals.

3.4.5 Migrants

The last census data from 2008 show that since start of the current mining boom in 2003 overseas migration have increased and that interstate migration even turned from an out- to an immigration (ABS 2008). Figure 19 illustrates the components of the population growth in WA:

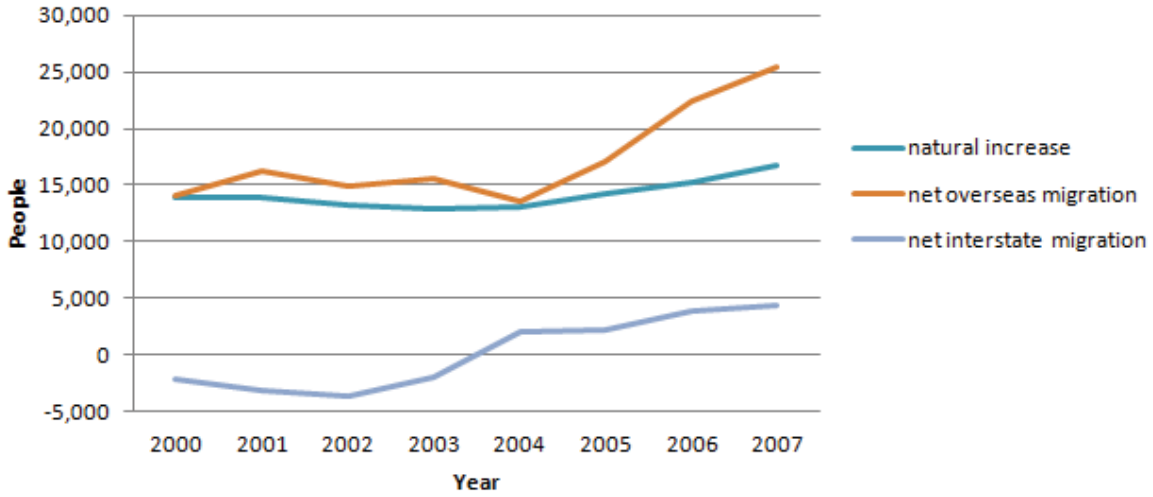


Figure 19: Components of the population growth in WA between 2000 and 2007

Interstate migrants are most likely people from either the Northern Territory, the Australian Capital Territory or from South Australia. The biggest single sources off overseas migrants come from New Zealand, followed by those from the United Kingdom, the Philippines and South Africa.

Emerging issues

- Cultural and language barrier

3.5 Reflection of vacancies in the job market

The WA labour market remained strong in 2012, with above average employment growth and low unemployment. Advertised vacancy levels however fell in 2012, compared with the previous year (DEEWR 2012). Figure 20 shows the 26.5% decrease in the DEEWR Internet Vacancy Index.

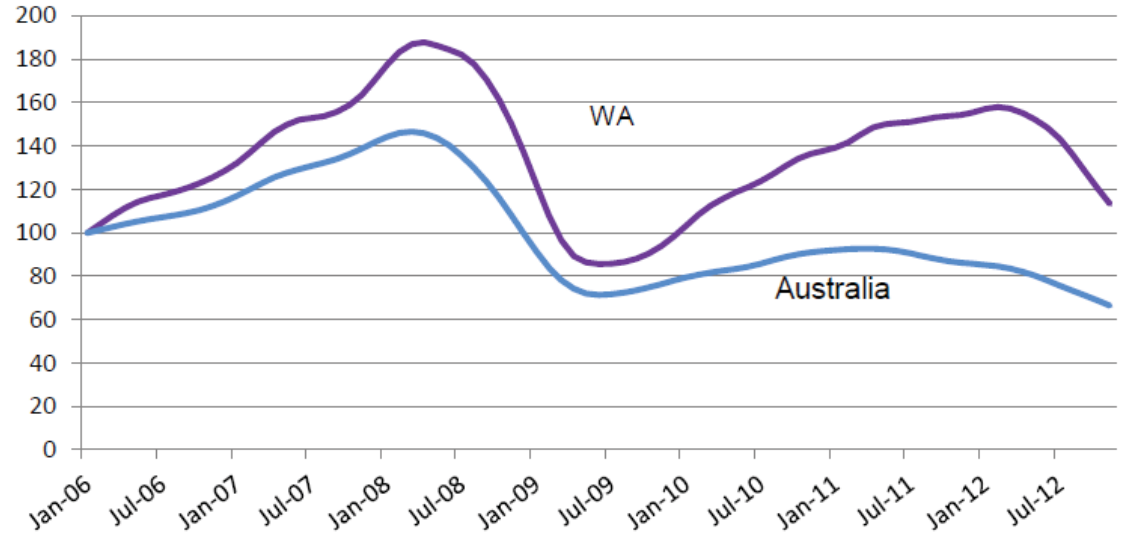


Figure 20: DEEWR Internet Vacancy Index (Jan 2006 = 100)

Top 10 job offers by category found on the *Mining Oil and Gas Job Search Page* on 9 September 2013:

Category	Job Offers per category
Engineering	17
Management (on-site) / Mine Managers	10
Maintenance	53
Plant / Machinery Operators	20
Technicians	15
Trades and Skilled	44
Administration / Clerical	12
Planning and Scheduling	11
Processing and Production	9

Table 7: Job Offers in miningoilandgasjobs.com

Thereof more than two-thirds are based in regional WA, compared to less than one third in metropolitan WA. Over 80% are full time on permanent basis compared to casuals and contractors. Also mostly FIFO or DIDO compared to residential. Only one indigenous opportunity but more than 90% with gender diversity opportunity (AMMA 2013b).

Miningoilandgasjobs.com is one of AMMA's initiatives specifically designed to address this growing demand, as increased media attention on the skills shortage affecting resource employers generates widespread interest in employment in the industry (AMMA 2011).

The *Resources Sector Jobs Board* shows similar top 10's on 9 September 2013 however only specific mining jobs and no management processes (Australian Government 2013):

Category	Job Offers per category
Engineering & Maintenance	402
Operations	328
Processing	91
Drill & Blast	51
Exploration & Geoscience	20

Table 8: WA Job Offers in seek.com.au

My Career belongs to the Fairfax Media group and shows the following advertisements on 9 September 2013 (again only specific mining jobs and no management processes) (Fairfax Media Group 2013):

Category	Job Offers per category
Maintenance	53
Engineering	36
Management	24
Other	36

Table 9: WA Job Offers in my.career.com.au

The international *Resources Job Board InfoMine* drill down to Australia[23] shows (InfoMine 2013):

Category	Job Offers per category
Trade & Skilled	1156
Management & Administration	1050
Maintenance / Mechanical	894
Mining Production	875
Engineering	815
Construction	496
Supervisory	400
Machinery Operators	341
Technicians	230
Academic, Research	198

Table 10: Australian job offers in http://www.infomine.com/careers/

Emerging issues

- Job vacancies do not reflect skills shortages

[23] Unfortunately not Western Australia

3.6 Summary of issues emerging from the current labour market

The table below summarises the identified issues emerging from the situation of the current labour market. I catalogued them along eleven key findings which will be further discussed in section 5:

Section	Emerging Issues	Key findings										
		Volatility and uncertainty	Industry image, culture and work environment	Demographic challenge	Talent pool and labour force diversification	Changing skills requirement	Productivity challenge	Legal environment	Data and Terminology	Social license to operate	Collaboration and management	Skills shortage
Volatile and complex workforce need	◗ Reliability of future workforce need predictions due to uncertainty in stage of the business cycle ◗ Productivity challenge in tightening market conditions ◗ Changing skills set need in transition from construction to production phase ◗ Contracting employees because of cultural and process alignment with business strategy and otherwise because of social license and communication ◗ Perceived skills shortage due to mismatch of labour demand and supply	x				x	x	x			x	x
Remoteness and labour mobility	◗ Dilemma with FIFO/DIDO loss of time while commuting versus life-style while on R&R ◗ Younger generations may not be willing to have long rosters and be apart from life-style and families			x	x		x					x
Image and culture	◗ Culture perception appears adverse to latent new joiners to the industry and to anyone who does not conform to perceived culture and norms		x							x		x
Health and safety	◗ Dilemma HSEC and productivity ◗ Need for processes and inspections						x	x		x	x	x
Interstate labour migration	◗ Mining companies bear increased recruitment efforts due to interstate marketing and relocation costs						x					x
International labour migration	◗ Restrictions to 457 visa will further exacerbate the shortage of skilled professionals required to sustain and grow the industry in the future. ◗ Diminish social license when foreign workers get employed although unemployment in Australia						x	x				x
Political and legal environment	◗ Complexity of legal environment							x				x
Employment	◗ Statistical data is not standardised and congruent hence not reliable ◗ Almost no statistical data available on contractors ◗ Not sure if mining companies are aware of social responsibility for indirect employment growth in other industries								x	x	x	x
Unemployment	◗ Statistical data is not standardised and congruent hence not reliable		x						x	x	x	x

Section	Emerging Issues	Key findings										
		Volatility and uncertainty	Industry image, culture and work environment	Demographic challenge	Talent pool and labour force diversification	Changing skills requirement	Productivity challenge	Legal environment	Data and Terminology	Social license to operate	Collaboration and management	Skills shortage
	◗ Concerning rate of youth unemployment ◗ Loss of skills of under-employed skilled minerals professionals ◗ Untransferable skills											
Replacement and turnover	◗ Unclear definition of "turnover"								x			x
Labour conditions	◗ Labour conditions may be unattractive for people who seek work-life-balance among family and culture and/or collaborative management style ◗ Two-speed economy with ever growing discrepancy of wages for mining industry compared to other industries ◗ Escalating labour costs interfere with international competitiveness		x				x			x		x
Demographics	◗ Increased replacement because of retirement of large numbers of workers ◗ Loss of experienced skills because of retirement of large numbers of workers ◗ Work expectations of new generation workers may differ from existing generation workers ◗ Compared to other industries, female participation in the mining industry is still very low. ◗ Females low represented in decision making. ◗ Working conditions and working environment not attractive for females. ◗ Mining industry does not seem to be interesting for young females to enter. ◗ Indigenous people seen as latent talent but historical environment not ready to utilise the particular. ◗ Some occupations include skills set that is not transferable to any other industry ◗ Skills gap due to big percentage of unskilled or underskilled workers occupy positions with high skills need		x	x	x			x				x
Labour demand from industry employers	◗ Escalating labour cost interfere with international competitiveness ◗ Major scheduling problems in a significant number of cases because of slow policy making and agreement renewal ◗ Do not feel responsible for skills shortage issue and push solution solving to supply-side						x	x			x	x
Labour supply from current and potential workforce	◗ Not enough interest in industry from potential workforce ◗ Not enough candidates in domestic labour market				x						x	x
Education providers	◗ Not enough employable graduates				x						x	x

Section	Emerging Issues	Key findings										
		Volatility and uncertainty	Industry image, culture and work environment	Demographic challenge	Talent pool and labour force diversification	Changing skills requirement	Productivity challenge	Legal environment	Data and Terminology	Social license to operate	Collaboration and management	Skills shortage
	◗ Reaction to new requirements too slow ◗ Low willingness of mining companies for apprentices or WIL projects											
Government	◗ Changing and patchy skills shortages rather than general labour shortage ◗ Ending construction projects release workers and decrease tight labour markets							x	x		x	x
Contractors	◗ Missing data on contractors engaged in WA mining industry ◗ Contractor engagement managed by business managers without HR involvement ◗ Workforce planning does not include contractors								x		x	x
Graduates	◗ Many graduates receive little or no exposure to the mining industry during their study. ◗ University courses are highly technical and do not include non-technical skills development such as cognitive, social, self-management and administrative skills. ◗ Graduates do not meet the expectations of employers when entering the labour market, some of them may be unemployable and need further training before being effective in their profession.				x						x	x
Apprentices	◗ Mining companies do not want to invest in young professionals, they want to hire fully trained and experienced people. ◗ Mining companies do not strategically predict their skills need hence VET lack information on ongoing and changing institutional skills needs.				x						x	x
Willingly or unwillingly unemployed	◗ Current employment contracts and work environment seem not to allow professionals to combine their study and family needs while being employed. ◗ Current employment contracts also seem not to handle career brakes very well. Mining companies seem to lose these people after they have resigned instead of keeping them engaged and offer unpaid leave or sabbaticals.		x		x							x
Migrants	◗ Cultural and language barrier				x			x		x		x
Reflection of vacancies in the job market	◗ Job vacancies do not reflect skills shortages								x		x	x

Table 11: Summary of issues emerging from the current labour market

Altogether, the labour market in the WA mining industry is quite complex. Not only macro-economical and business parameters unique to the industry influence each other but also parameters in broader socio-politics, geography, ecological environment, legal environment and

the historical heritage. The recent development has led to different perspectives on the situation amongst the labour market stakeholders: Everybody tries to get "a piece of the cake" and everybody constantly seems to be in "catch up mode". In these terms, the industry seems to be quite immature and a common understanding of the situation has to emerge with the time.

4. Outlook and preview of future labour market challenges

For the first time in years, labour market issues are not ranked as one of the top business risk for mining companies anymore. Ernst & Young's yearly report (2013) even starts with exclaiming "The focus of risk has swung!" and shows capital dilemmas as the new top risk. Figure 21 shows that skills shortage dropped down to ranking no 5, this after skills shortage in the last six years always scored top 1 or 2 ranking:

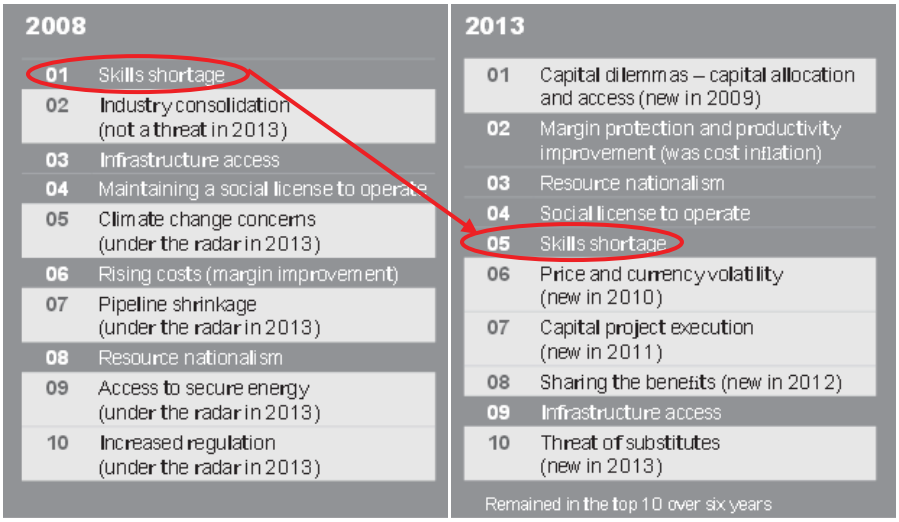


Figure 21: Top 10 business risks for mining and metals by Ernst & Young

Why this is the case and which trends can be identified in the labour market in the WA mining industry is presented in this section of the paper along the subsections:

- Previous forecast scenarios
- Economic outlook and impact on labour market demand
- Demographic outlook and impact on labour market supply
- Job outlook

4.1 Previous forecast scenarios

In 2007, Ye examined the impact of the current mining boom (with focus on iron ore) on the Western Australian economy using a general equilibrium approach on a time period until between 2003 and 2025. He investigated two scenarios and in both he calculated with a constant iron ore price of $100 per dry ton.

Scenario 1 (see Figure 22) assumes that rising demand for iron ore is sustainable and the Western Australian economy is expected to benefit significantly from the commodity boom. Regarding outcomes for the labour market, the scenario estimates a yearly average of 10'400 growth in WA employment.

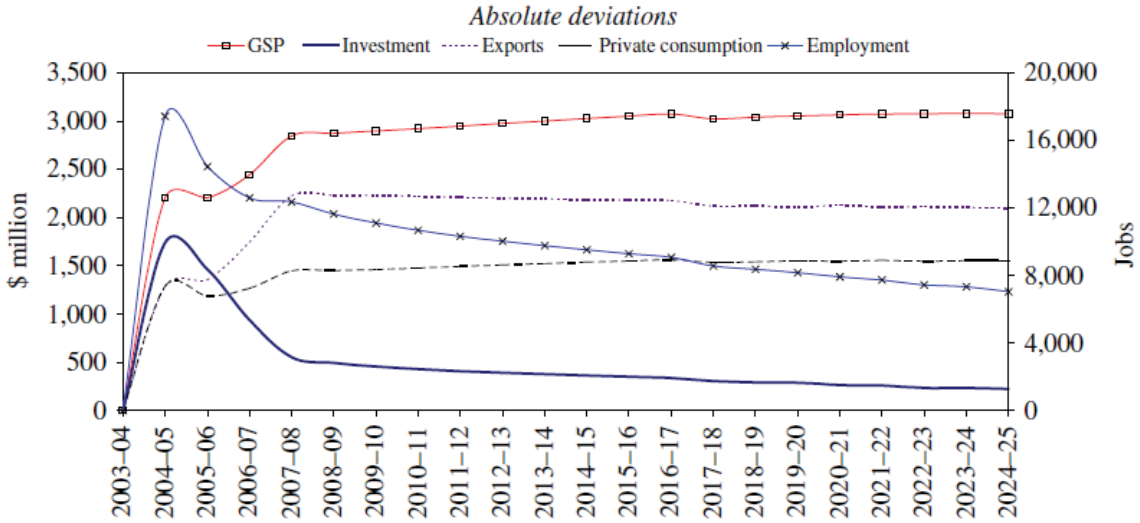


Figure 22: Scenario 1 and Western Australian macroeconomic impact on GSP, investment, consumption, exports and employment

The pessimistic scenario 2 (see Figure 23) assumes that in 2008-09 iron ore exports fall back to the base case level. The economy-wide impact in the subsequent years is significantly smaller than in scenario 1. Nevertheless, due to the substantial gains in the earlier years of the simulation period, on average, the iron ore boom is still projected to have a positive impact over the whole period. WA employment would increase by about 1'970 persons on average per annum.

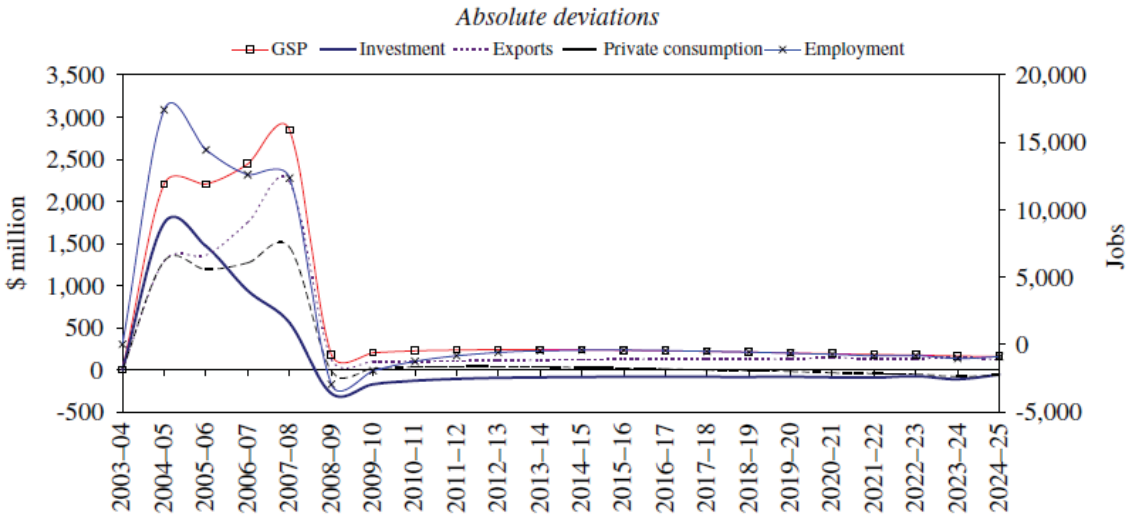


Figure 23: Scenario 2 and Western Australian macroeconomic impact on GSP, investment, consumption, exports and employment

Ye (2007) concludes that the magnitude of the impact on investment, employment, consumption, exports and GSP will depend on whether the boom is sustainable.

These scenarios are outdated and - with an average employment growth of 12.4% over the last 5 years as shown in section 3.2.1 - reality even outperformed Ye's scenario 1. However, the scenarios highlight that employment is directly linked with commodity demand and that if exports decline, employment in the industry will clearly decline too.

Emerging issues

- If the boom is over, mining companies have to be flexible but social responsible in adjusting their workforce.

4.2 Economy outlook and impact on labour market demand

Mid 2013, the WA mining industry is widely expected to be at a turning point – and this for several reasons.

4.2.1 Iron ore demand will decline short-term but will remain stable in the long run

Recent newspaper articles draw a controversial picture of the short-term economical outlook for the WA resources sector.

Reuters correspondent (Serapio) wrote on 29 July 2013: "China's hunger for iron ore ... has started to wane as its maturing economy seeks to slim down its industrial capacity" and "with no other country coming close to being able to absorb the slack left by China, iron ore prices risk years of decline as a major oversupply swamps demand, with some forecasting prices to be cut in half by 2015."

On the contrary, Reuters correspondents (Lian and Stanway) wrote on 9 August 2013 that "China's iron ore imports surged to a record high in July as domestic buyers replenished their inventories to meet surprisingly resilient steel demand during the summer."

Over the long run there seem to be no concern for Asian decreasing demand in Australian commodities because of anticipated economic growth and increasing urbanisation (Klinger 2013; Accenture 2012a; BHP Billiton 2013a; Rio Tinto 2013a). Executive Director Louise Rolland (Ernst & Young 2013) explains: "There has been a short-term easing in the skills shortage crisis because of project deferrals and cancellations, but it remains a medium to long-term challenge especially in geology and engineering".

However, as Chinese companies are expanding iron ore operations throughout the world themselves there will be more pressure on iron ore prices going forward (Accenture 2012a). Such operating cost pressures, reduced productivity and labour shortages could negatively impact operating margins and expansion plans (BHP Billiton 2012a).

Emerging issues

- Uncertain economy outlook needs mining companies to be able to flexible adjust their workforce need.
- Margins on iron ore will drop.
- Mining companies will need to better utilise the infrastructure, financial and human capital assets they have.
- Mining companies will reduce staff numbers in order to reduce operating costs.

4.2.2 Construction will transfer to production

The WA Department of Education, Employment and Workplace Relations report (2013a) expects that the mining workforce peaks in 2013-14 as "mines transition from a construction phase to a less labour intensive operational phase" and will be expected at 108'400 in 2017 (DEEWR 2013d; Debelle and Vickery 1999). However, further construction workers are required for already approved resource projects (Bahn, Barratt-Pugh, and Yap 2013).

CME (2013) estimates that the workforce required for growth plans in the WA mining industry is to peak at 125'000 people in 2014 and employment will then slowly reduce (see Figure 24).

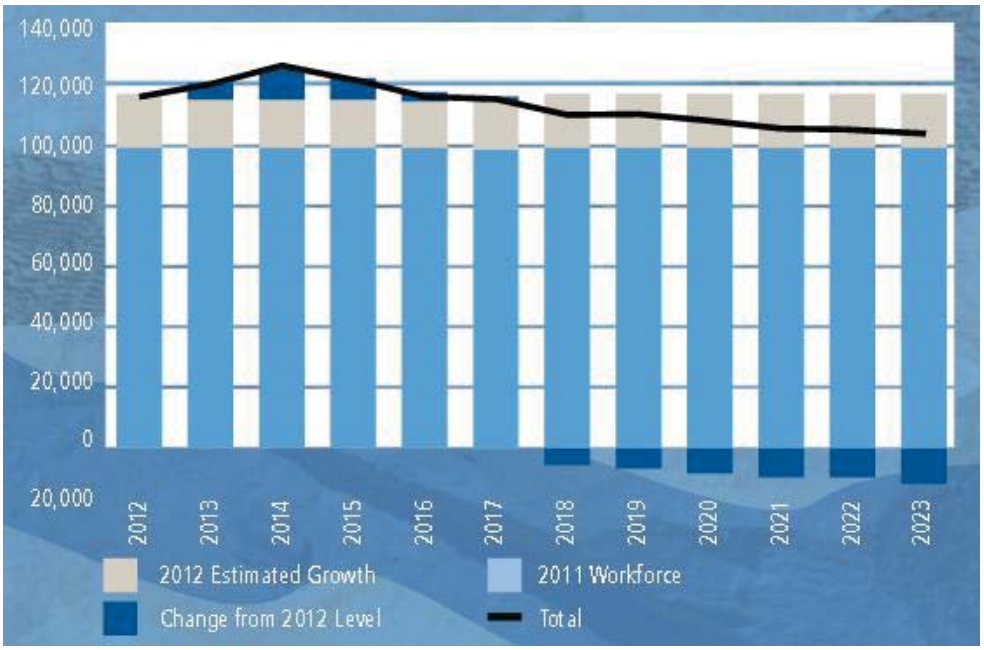


Figure 24: Minerals and Energy Workforce Outlook (Headcount)

CME (2013) explains that by 2018, the WA mining workforce will drop to below 2012 levels although an additional 19'000 operational staff are required as major projects[24] commence operation (see Figure 25).

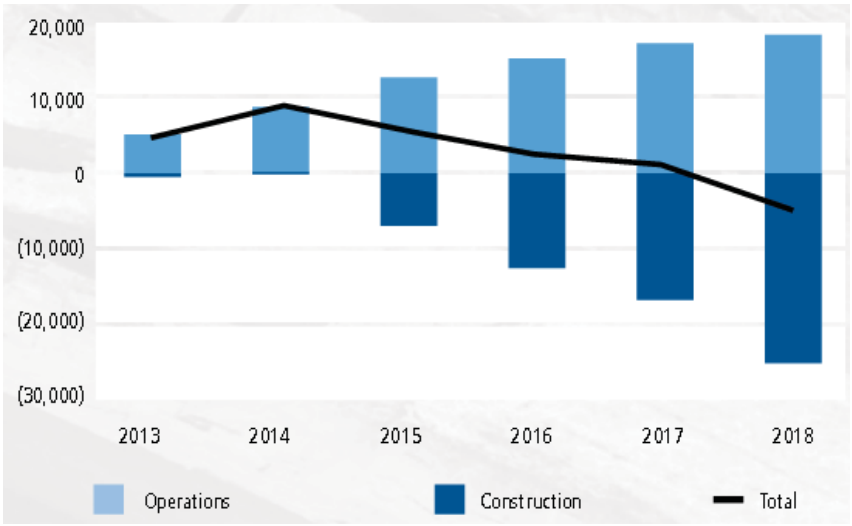


Figure 25: New workforce breakdown (Headcount)

However, there is a wide spread of further estimates proclaimed in academic and economic literature. Bahn et al (2013) assume that the Australian construction projects will require an additional 70'000 workers by 2020. Hodge (2011) even suggest "as many as 2.5 million people in the next four years". Natural Resource Sector Employment Taskforce (2010) expects an increasing demand for operational skills and predicts a shortfall of 1'700 mining engineers and 35'800 tradespeople by 2015. AMMA director Tara Diamond challenged this forecast at the Mining Skills Australia Summit (2013) and predicted the shortage of mining engineers as high as 5'000 and of tradespeople as high as 100'000 by 2015.

[24] Eg BHP Billiton's Jimblebar extension

But not only the amount of people in the mining workforce, also the skills set of these people will have to change. The Chamber of Minerals and Energy of WA explains: "The changing composition of workforce requirements from construction to operations will shift the skills required for mineral and energy projects" (CME 2013).

Emerging issues

- Wide spread of workforce need estimates.
- Mining companies will need to better utilise the infrastructure, financial and human capital assets they have.
- Change in skills set need.

4.2.3 Competition will increase productivity, technological development and safety

With additional minors going global and new industry entrants, the mining industry will see increasing competition for both mineral and human resources. Increasing productivity through advanced processes and techniques will be important and will have to deliver much more at the same or reduced cost (Accenture 2012a). That means that industry leaders will have to be more holistic thinking, integrated and disciplined in allocating financial and human capital.

Dr. Susanne Bahn (2013) from Edith Cowan University clarifies expectations: First, the extreme jump to new technologies to run these projects has seen Australia playing catch-up with other nations in the world. Resources firms have had to draw on skilled workers from the UK and Europe to manage and transfer their skills and knowledge to Australian workers. Second, with the slowing of the resources sector there remains a difference in expectations of workers who have left resources projects in the North West to work in the metropolitan area. Some skilled workers are expecting the city jobs will offer the same generous salaries and conditions they received while working remotely in the north. Some adjustment needs to occur in terms of expectations because as a study that is currently underway shows, workers on 457 visas are being sourced because local workers are unwilling to take a drop in their salaries when moving to work in the city.

Dickie and Dwyer (2010) describe that technological advancements in the mining industry continue as organisations strive to improve metal recoveries and make lower grade deposits economical. Therefore, today's mining industry requires skilled workers who can integrate sophisticated equipment and leading edge technology in every aspect of mining operations if they are to remain competitive and sustainable in any economic circumstance.

Implementation of new technologies, for example the introduction of remote mining techniques will reduce the safety risk, however, the level of training required for truck drivers will considerably increase (Dickie and Dwyer 2010).

Automation may allow people to move out of risky operations and instead manage their jobs from a remote location (Ernst & Young 2013). See the Youtube video called "The mining industry – The future is Automation" uploaded by ABB on this topic[25].

Emerging issues

- Mining companies will need to be more efficient and effective to be competitive.
- Employees will need to reflect their salary expectations when taking on a job in a less remote area.

4.2.4 Consolidation will happen within the industry

In 2007, Ye described that iron ore production was long seen as an exclusive club of the big mining houses but that at the time of his studies was being promoted by a whole spectrum of

[25] http://www.youtube.com/watch?v=POqw0rIJe78

industry players and even those without previous mining interests and certainly with no iron ore experience. In 2007 there were more than 60 companies exploring for iron ore in WA.

Majors have recognised the need for productivity increase and are shifting track, Rio Tinto and BHP Billiton are highlighting cost cutting agendas and trying to put underperforming assets up for sale. Both have cut exploration and capital expenditure budgets, putting major projects on hold. Contractor companies are also feeling the outcome of the transition, with mass layoffs due to mining construction projects drying up or being delayed (Heber 2013b).

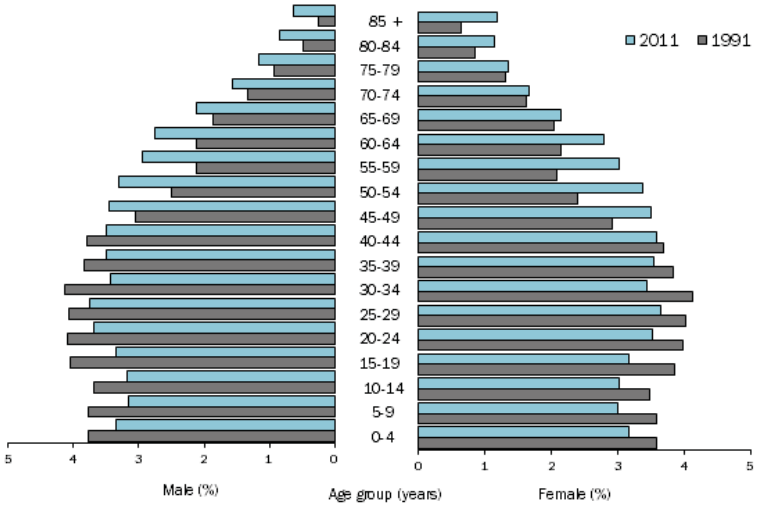
However, with tighter markets it is harder to find buyers for underperforming assets (Latimer 2013b). Ernst & Young are cited in same news article and anticipate "greater consolidation at the junior and mid-tier level as critical mass becomes increasingly important for accessing project funding. We also expect the continued injection of capital from private capital, off-takers and specialist finance providers".

Emerging issues

- Cost cuttings and lower salaries.
- Less vacancies for job seekers to choose from.

4.3 Demographical outlook and impact on labour market supply

Australia is experiencing a decline in birth rates and an increasingly ageing workforce (Bryant and Jaworski 2011). Figure 26 shows the shift in the age pyramid towards an older population (ABS 2012b).



Source(s): Australian Historical Population Statistics, 2008 (cat. no. 3105.0.65.001) and Australian Demographic Statistics, June 2012 (cat. no. 3101.0).

Figure 26: Australian population structure, age and sex, 1991 and 2011

It is predicted that in the decade between 2010 and 2020 more people will retire than will join the workforce (Bahn, Barratt-Pugh, and Yap 2013). Compare with the mining industry age curve in section 3.2.5.1.

In addition, Generation X and Y employees and even younger workforce entrance will replace existing Baby Boomers who have different values and ideals. Therefore, employment contracts and working environments for these people will need to be different to those of Baby Boomers if mining companies want to be successful in replacing retiring employees (Dickie and Dwyer 2010).

In terms of education, a growing disparity between high income earners engaged in specialised, highly skilled occupations and the low-income earners employed in unskilled, peripheral occupations is expected (Tonts, Plummer, and Lawrie 2011).

Emerging issues
- More people will retire than will join the workforce
- Work expectations of new generation workers may differ from existing generation workers
- Growing disparity between high-skilled and unskilled occupations

4.4 Job outlook

The Australian Government combined all these factors and initiated a *Job Outlook* that forecasts a 5-year trend for future employment growth for specific mining occupations as shown in the table below (DEEWR 2013c):

Growth forecast	Occupation	Level of job openings	More than 40% aged above 45
very strong growth	Electrical Engineering Draftspersons, Technicians	low	No
	Other Natural and Physical Science Professionals	low	No
moderate growth	Cartographers and Surveyors	below average	No
	Occupational & Environmental Health Professionals	average	No
	Other Building and Engineering Technicians	average	No
	Truck Drivers	high	Yes
slight growth	Electricians	above average	No
	Geologists and Geophysicists	low	No
	Industrial, Mechanical and Production Engineers	average	Yes
	Production Managers	above average	Yes
	Structural Steel and Welding Trades Workers	high	No
	Chemical and Materials Engineers	low	No
	Earthmoving Plant Operators	above average	Yes
	Safety Inspectors	low	Yes
relatively steady	Mining Engineers	below average	No
decline	Chemical, Gas, Petroleum & Power Plant Operators	low	Yes
	Crane, Hoist and Lift Operators	low	Yes
	Drillers, Miners and Shot Firers	high	No
	Engineering Production Systems Workers	below average	No
	Metal Fitters and Machinists	above average	No
	Other Construction and Mining Labourers	below average	No
	Other Stationary Plant Operators	below average	Yes
	Science Technicians	average	No

Table 12: 5-year trend for future employment growth in Australian mining occupations

Emerging issues
- According to above table it is predominantly Truck Drivers who will be retired in the near future and who will be still in above average need in the next five years.

4.5 Summary of issues emerging from the labour market outlook

The table below summarises the identified issues emerging from the labour market outlook. Same as in the previous section, I catalogued and will further discuss them in section 5:

Section	Emerging Issues	Key findings										
		Volatility and uncertainty	Industry image, culture and work environment	Demographic challenge	Talent pool and labour force diversification	Changing skills requirement	Productivity challenge	Legal environment	Data and Terminology	Social license to operate	Collaboration and management	Skills shortage
Previous forecast scenarios	◗ If the boom is over, mining companies have to be flexible but social responsible in adjusting their workforce.	x								x	x	x
Demand decline	◗ Uncertain economy outlook needs mining companies to be able to flexible adjust their workforce need. ◗ Margins on iron ore will drop. ◗ Mining companies will need to better utilise the infrastructure, financial and human capital assets they have. ◗ Mining companies will reduce staff numbers in order to reduce operating costs.	x					x					x
Construction to production	◗ Wide spread of workforce need estimates. ◗ Mining companies will need to better utilise the infrastructure, financial and human capital assets they have. ◗ Change in skills set need.	x				x					x	x
Competition increase productivity, technological development and safety	◗ Mining companies will need to be more efficient and effective to be competitive. ◗ Employees will need to reflect their salary expectations when taking on a job in a less remote area.					x	x					x
Consolidation	◗ Cost cuttings and lower salaries. ◗ Less vacancies for job seekers to choose from.		x				x				x	x
Demographics	◗ More people will retire than will join the workforce ◗ Work expectations of new generation workers may differ from existing generation workers ◗ Growing disparity between high-skilled and unskilled occupations			x		x						x
Job outlook	◗ According to above table it is predominantly Truck Drivers who will be retired in the near future and who will be still in above average need in the next five years.			x					x			x

Table 13: Summary of issues emerging from the labour market outlook

Altogether, the WA mining industry seems to be on a turning point and this not only when it comes to having almost fully explored the region and assigned the ore deposits, but also in terms of the in the life cycle of the mines and by being on the edge from traditional to modern mining techniques.

5. Discussion of key findings

In this section, I discuss the previously identified issues which I catalogued along eleven key findings. All these findings influence each other but overall, they all impact the perception and severity of the skills shortage in the WA mining industry (see Figure 27).

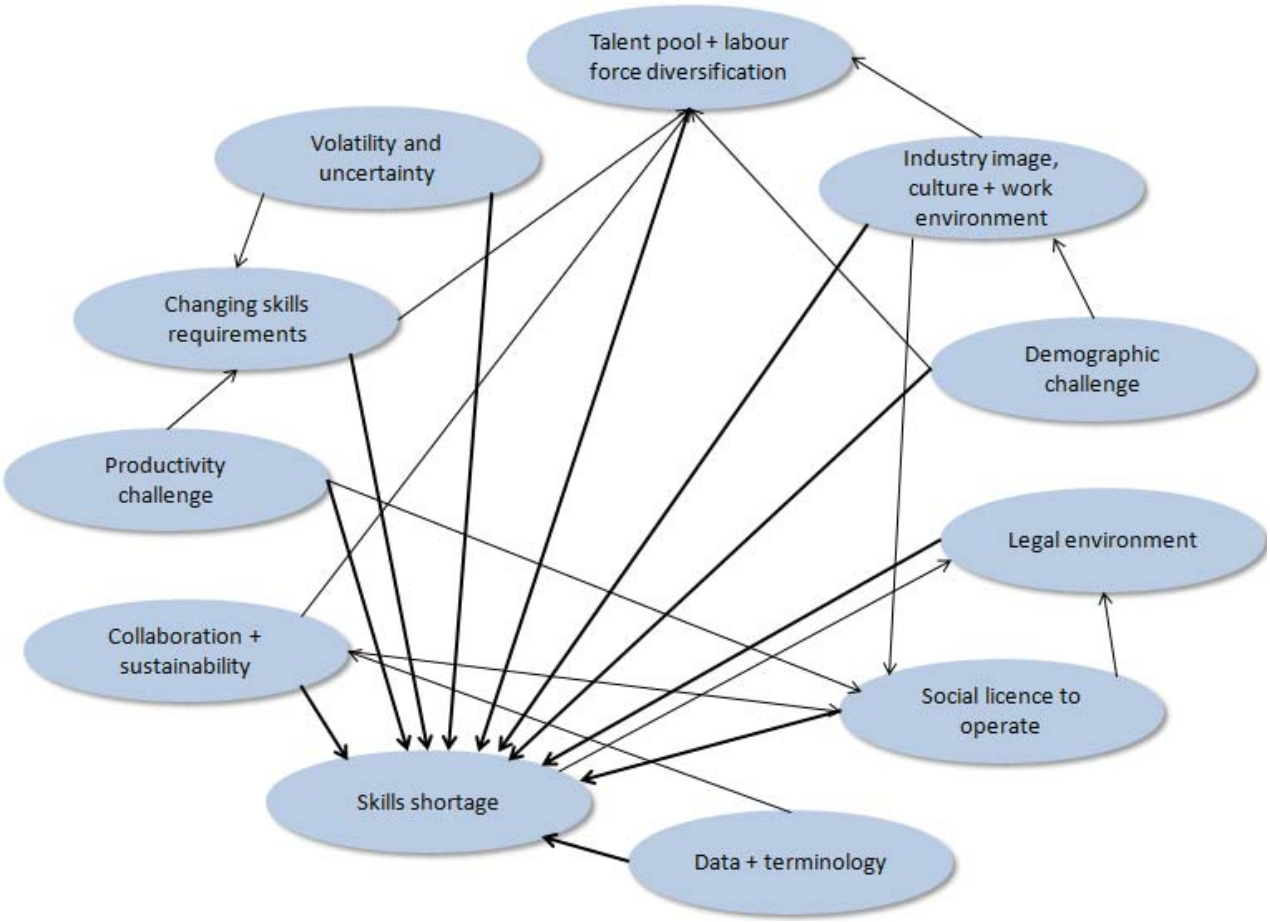


Figure 27: Key findings

5.1 Volatility and uncertainty

Commodity price and ore demand are volatile and not directly controllable by mining companies. However, the impact on the labour market is immense and has to be managed by the mining companies' HR departments.

5.1.1 Effect

The traditional mining company approach in dealing with volatility has been to boost their workforce in boom periods and to lay off staff in decline periods to reduce costs (Dickie and Dwyer 2010). This hire-and-fire approach applies not only to employees but also to contractors. It is supported by Australian regulations which do foresee notice periods only up to four weeks (see Appendix 3) and it is anchored by Australian culture which has a higher *uncertainty acceptance* rate and a lower *long-term orientation* rate than Switzerland (see cultural limitations in section 7.1).

Sudden additional skilled labour demand creates a problem for the Australian mining industry as the domestic skilled labour base is not big enough to instantly meet new requirements and there are strict regulations on recruiting from the international labour market (Huang and Austin 2011). The lack of long-term or strategic prediction of enterprise workforce skills need in business cycle hence leads to skills shortages (Billett 2000; Lindorff 2011; Richardson 2007).

Sudden workforce diminishments on the other side leave lots of workers without job and, as some of the mining occupations include specific and non-transferrable skills, higher unemployment or out-migration occur (Tonts 2010). Above that, the impact of layoffs during downturns damages the employer brand and increase turnover hence leaving the state with further skills shortages come the next boom (Ernst & Young 2013).

Besides the macro-economic perspective, miners have typically used historical performance, strategic plans and external market projections for their annual planning and budgeting process (Accenture 2013). In this process, internal business information such as financial planning or sales forecasting is separate from operation information, and the two must be reconciled through manual processes. In essence, different parts of the organisation are using different data to create human capital plans and budgets, with varying levels of information volatility and delay (Accenture 2013). As a result, mining executives lack access to an integrated "state of the business" view, various departments work in silos, operations depend on backward-looking lagging indicators and there is a disconnect between corporate decision makers and local operations.

5.1.2 Strategies to address the finding

Mining companies need to predict quantitative and qualitative future workforce requirements and they have to be able to flexibly adjust their workforce.

AMMA director Tara Diamond's (2013) advises for mining employers at this year's Mining Skills Summit in regards to workforce planning:

- Work toward long-term outcomes, planning ahead for three-to-five years;
- Involve the executive, business and finance team in workforce planning;
- Make the planning focussed on strong data, rather than assumptions on employee behaviour;
- Segment the workforce into meaningful groups to focus on the core operations of the company; and
- Develop a strategy that takes into account employee retention, not just recruiting.

"Workforce planning is no longer a luxury, but a necessary part of doing business", Diamond says.

Dickie and Dwyer (2010) also suggest a more strategic planning approach and "to do everything that supports the strategy but nothing that does not support the strategy". Accenture (2012a).promotes proactive behaviour as well as strategic and fully integrated processes. Ernst & Young (2013) argue that mining companies can often do little to avoid layoffs in cyclical downturns but they should proactively manage mid- to long-term staffing requirements plus even shorter time horizons to allow clear communication, timely course correction and risk management.

5.2 Industry image, culture and work environment

General perceptions of the industry image are low and company internal cultures and work environments appear intolerant of diversity and scare potential workforce for a number of reasons,

including lifestyle choices[26] as well as personal values[27] (Accenture 2012a; Bryant and Jaworski 2011).

5.2.1 Effect

There is limited awareness of the diverse employment opportunities available and the highly specialist skills required to work within the mining industry (Dickie and Dwyer 2010) which on one hand seem attractive but on the other hand bare the risk of being impermeable with other industries. Mining companies find it difficult to attract staff even in boom times, although high salaries are on offer (Dickie and Dwyer 2010).

Bryant and Jaworski (2011) describe that the mining industry is generally perceived as intolerant to anyone who does not conform to existing culture and norms. Apparently even HR personnel still have strong associations with the pit, working underground, driving massive trucks and work which is "dirty[28], dangerous and not made for smaller people like women". The effect is that the mining industry does not seem to be interesting for young females to enter hence there are less women in the pipeline to progress into management and decision making hence there is less chance for decision and policy making in direction to a diversity friendlier workplace hence there the mining industry will remain male-dominated.

However, Pattenden (1998) argues that "the reality of modern mining is very poorly represented in the general community and many misconceptions based on out-dated practice prevail". In terms of an adequate work environment, Pattenden suggests employer-sponsored childcare, voluntary shift work, flexible rostering, paid maternity leave and the general reduction of work hours.

Consequently, mining companies register small numbers of valid candidates to choose from or lose workers to other industries and other parts of the world. Hence other industries have a larger pool of prospective employees from which to recruit and mining companies claim skills shortages. On the other side workers who are employed in mining companies "get stuck" in remote locations or specialised occupations or have to take a loss in wages when returning to urbanised locations or other industries.

5.2.2 Strategies to address the finding

Dickie and Dwyer (2010) promote a consequent and effective practice with any HR initiatives. If diversity is named in the charter of a mining company, they foster a culture which is truly open for diversity and develop a work environment with policies that allow for example more flexible work patterns. They suggest developing career paths, which allow transfer from and to other industries and a proactive and understandable communication of HR initiatives so that the business recognises the impact of all HR initiatives on their business.

Dickie and Dwyer (2010), Ernst & Young (2012) and Accenture (2011, 2012a) recommend a differentiated employee value proposition (EVP) — to earn a reputation as an employer of choice, to persuade workers to join the industry and to retain employees. Companies should offer not only attractive compensation but also individually tailoring non-financial benefits. Miners need to look at whether their vision is distinctive and attractive enough to the next generation and accordingly adjust the work environment (Accenture 2011). Preferences of younger generations include flexibility, reduced rosters (more time at home), training to broaden skills and mining camps[29] with more of the comforts of home (Dickie and Dwyer 2010), and opportuni-

[26] such as difficulties in balancing career demands with personal relationships and balancing work with parenting commitments

[27] such as sustainability in health, safety, environment and community

[28] 'dirty work' therewith refers to soil, dampness and darkness

[29] Mining camps that I have visited or heard of normally consist of so called 'dongas' (transportable buildings with 9-12m^2 single rooms), a 'dry mess' (canteen), a 'wet mess' (sheltered place with bar and alcohol allowance), kiosk, administrational offices and

ties to travel and gain wider experience. Particularly at remote sites, improved conditions such as cultural and recreational facilities, subsidised housing and educational opportunities can help to retain talent. Accenture (2011) also highlights the imperative for technological development and names improved safety through automation as one strategy to become an employer of choice.

Open and transparent internal communication as well as to the wider audience and collaboration with other labour market stakeholders will improve the image of the mining industry (Pattenden 1998). Therefore explain the link between mining profits and the wealth of the WA society and talk about long-term community engagement and environmental impact.

More than the *attraction* of skilled personnel is to protect the existing labour forces. Strategies to *retain* key staff include reviews of remuneration and benefits package, job design[30] and career management/planning, honest communication in performance management and flexible working arrangements (Dickie and Dwyer 2010; Accenture 2011).

5.3 Demographic challenge

The mining industry demographics show that mass retirements will happen over the next decades and that at the same time a large number of skilled staff will be required to design and operate mining operations (Dickie and Dwyer 2010). In total it is predicted more people will retire than will join the workforce (Bahn, Barratt-Pugh, and Yap 2013).

5.3.1 Effect

Diamond (2013) and Bahn et al (2013) state that the aging workforce is contributing to mismatches in labour demand and supply. However, this finding is not only in numbers of people required in the workforce, it also includes the loss of experienced skills when long-service workers leave the labour force and that new generation workers will have different expectations regarding work conditions and environment.

The gender and cultural origin related challenge will be discussed in section 5.4. And the educational challenges will be discussed in section 0.

5.3.2 Strategies to address the finding

Literature mostly draws attention to the age challenge but makes no specific recommendations. Only Dickie and Dwyer (2010) suggest launching more professional HR processes such as workforce planning, succession planning, talent pools and professional development programs. In terms of workforce planning, a demographical inventory would help. There should also be better strategies for knowledge transfer from elderly to younger workforce.

5.4 Talent pool and labour force diversification

This finding includes the lack of an active and integrated management of 1) the talent pool and 2) the labour force in terms of diversification through age, gender cultural origin and education. All previously analysed issues reduce the "minority talent pipeline" from students, to graduates, to candidates for employment, to promotions of employees into management, C-suite and board.

reception (includes library and video rental), NPI workshops and warehouse, BBQ area, pool, gym, maybe other sports facilities like tennis court or minigolf, a fence around the whole camp and a gate.

Some mining camps have serious space shortage and there it may be that two people – one on day shift, the other on night shift – have to share a room. Also, during R&R rooms normally have to be emptied completely.

[30] With more meaningful work and challenging assessments

5.4.1 Effect of a lacking talent pool diversification

Bahn et al (2013) states that the Australian economy generally lacks the capability to train sufficient domestic workers within the timeframe industry requires.

However, at *student level* it is to say that generally many more males than females choose a mining related university or TAFE course. Generally, there are high restrictions towards international student visas and once international students seek WIL projects, there is a high resistance from the side of mining companies to offer as such (Gamble, Patrick, and Peach 2010).

At the *graduates level* it is argued that some of these group of people are not employable and mining companies are not willing to invest in young professionals, they want to hire fully trained and experienced people (Gamble, Patrick, and Peach 2010). Jackson (2013) argues that the development of non-technical skills forms the first stage in achieving graduate employability. The second stage is the successful transfer of these skills to the workplace. Whereas the first stage is focused on educational institutes such as universities and TAFE, the second stage is not necessarily overlooked by industry stakeholders but simply, and maybe incorrectly, assumed as occurring automatically. There seems to be a mismatch of how to transfer the developed technical and non-technical skills of graduates to the workplace. Universities and TAFE recognise their goal to develop these skills in students and that a transfer can only be made in cooperation with motivated students and real employer sponsored projects. Employers predominantly believe that acquiring these skills remains the responsibility of educators (Jackson 2013).

It appears that Australian universities produce theoretically well-trained graduates but most of them have never been exposed to a real mining work environment. They lack basic work skills like self-management and communication skills hence they cannot be effective straight after university and need special assistance when entering the workforce (Pattenden 1998).

Bryant and Jaworski (2011) conclude that employment opportunities are often influenced not only by the availability of work, but also by the recruitment practices and characteristics of employers rather than workers.

All in all, there is a perception that there are too few valid candidates to choose from in the domestic labour market which implies two factors: Number of people is not enough and qualifications are insufficient (Lindorff 2011; Richardson 2007). However, effectively there is not necessarily a shortage; there is simply a perception of a lack of available talent (PWC 2013).

5.4.1.1 Strategies to address the finding

Literature names the following strategies for mining employers:

- increase the sector's recruitment of graduates (NRSET 2010),
- attract professionals from other industries[31] and a broader demographic (NRSET 2010; Ernst & Young 2012),
- access non-traditional and underrepresented labour pools[32] (Ernst & Young 2012),
- recruit from the unemployed (NRSET 2010),
- mobilise more labour from other Australian states, particularly the southern ones (Diamond 2013), and
- utilise temporary or permanent migration where immediate gaps occur (NRSET 2010; Diamond 2013).

[31] such as petroleum and manufacturing as these industries seek similar and/or complementary skills

[32] such as women and indigenous communities

And for the WA government and education institutes:

- increase the number of students completing relevant degrees at university (NRSET 2010), and
- lower restrictions with international student visas (Gamble, Patrick, and Peach 2010).
- VET should target leadership and management areas, "not just as discrete areas of study, but as units integrated into other courses" (Lindorff 2011).

Educational institutes should offer a) exposure to real world mining during courses and b) include not only technical but also non-technical skills into their courses (Gamble, Patrick, and Peach 2010; Pattenden 1998).

Mining employers are encouraged to identify more WIL project placements in their companies, to provide more trainee and apprentice placements to TAFE students and to actively participate in transfer the developed technical and non-technical skills of graduates to the workplace (Gamble, Patrick, and Peach 2010; Jackson 2013).

Mining employers should give up the expectation of "full skills coverage" in candidates and invest in further development and training of semi-skilled candidates (Lindorff 2011; Richardson 2007; Diamond 2013).

Gamble, Patrick and Peach (2010) conclude that the message to Australian universities is to capitalise on opportunities to partner with multinational organisations to produce graduates from other countries with the capabilities which are in demand. For multinational organisations in Australia it is the attraction and retention of appropriately skilled graduates from Australia and from other countries.

Jackson (2013) suggest to undertake WIL or internships towards the end of their degree program.

Jackson (2013) concludes that internal efforts at achieving work-readiness have focused on clarifying industry-relevant non-technical skills in business graduates, incorporating their development in curricula and assessing graduate workplace performance. There has been considerably less attention paid to *measuring non-technical skill outcomes* at university and even less on the subsequent *transfer* of acquired skills to the workplace.

Currently, several Australian universities successfully run work-integrated learning programs. The most popular ones are Griffith University, with its flagship Industrial Affiliates Program (IAP), and Queensland University of Technology, which has funded an in-depth learning and teaching project designed to facilitate the embedding of authentic real-world learning experiences across the entire curriculum (Gamble, Patrick, and Peach 2010).

Gamble, Patrick and Peach (2010) describe the case of an Electronic Engineering student who through IAP worked on a mining project parallel to his bachelor studies. This student stated that the real advantage comes in interviews when he can talk about his personal involvement with a "real life project with real outcomes" not just theoretical cases. Or in other words: he was able to meet employers' requirement through "concrete demonstration of real work".

Some Australian domestic students are actively choosing to undertake work-integrated learning programs in their universities or in other countries. It seems this is voluntary not compulsory.

5.4.2 Effect of a lacking labour force diversification

Skilled professionals who - for whatever reasons - do not agree with the mining work culture and environment withdraw their human capital from the mining industry and seek employment in

other industries. All these people automatically lack on the supply side of the WA mining labour market.

For example female professionals: Mayes and Pini (2010) describe that "change is everywhere" in mining as more women are now entering professions and that these women will slowly progress into senior management positions so any change that is currently taking place will be accelerated in the future. The way has been "cleared" for younger women we are told and no barriers or obstacles to women's career progression in mining remain intact. While the masculine hegemony in the mining industry is asserted in the literature it is presented as belonging to a distant past. However, mining still is the worst sector for gender diversity – worse than the oil and gas industry – with just 5% of board seats held by women in the top 500 mining companies. The fact is, that female decision making has a positive impact on a company's performance and that profit margins are lower for mining companies without women on the board than for those with (PWC 2013).

Another example are professionals with a migrant or Indigenous background: The lack of diversity comes along with limited innovation, limited customer orientation[33] and – in the case of the Indigenous people - also with a reduced social license to operate (Bahn, Barratt-Pugh, and Yap 2013; Sawyer and Gomez 2012).

In summary, the lack of diversity is maintained by particular practices, traditional norms and assumptions, as well as workplace culture and skills shortage therefore is a term not neutral (Bryant and Jaworski 2011). Only within the last decade and driven by the amplifying skills shortages, mining companies have started to engage with migrants, females and Indigenous as potential workforce.

5.4.2.1 Strategies to address the finding

Ernst & Young (2012) advises business leaders to "account for demographic and diversity factors when making investment decisions".

PWC (2013) extensively examines how to attract women to the mining industry and suggest to

- introduce legislation which requires or encourages gender diversity,
- introduce company diversity policies and education on diversity benefits[34],
- measure board effectiveness and performance in relation to diversity,
- broaden the perspective on educational background for possible candidates, and
- analyse the impact of diversity on future social, industry, technological and other trends in mining.

Similar, Dickie and Dwyer (2010) suggest HR professionals to consequently execution and measure respective diversity policies and openly communicate with the business about its impacts on the business. HR professionals need to work on their attitude and encourage minority groups to join the workforce and succeed within the company (Bryant and Jaworski 2011).

In 2011, the Australian Mines and Metals Association took the lead and established the Australian Women in Resources Alliance (AMMA 2011). AWRA's objective is to increase the participation of women in the resource industry workforce up to 25% by 2020 with a number of initiatives such as online mentoring programs and scholarships for talented women (Diamond 2013).

[33] Such as culture and language

[34] Australia's performance results indicate that some form of gender equality regulation may lead to improved gender diversity. However, it is too early to prove whether changes to Australian Stock Exchange guidelines will have long-term effect on company diversity policies as these guidelines only came into effect for the financial year 2011.

Mentoring programs are also suggested by Pattenden (1998) and she suggests special networking opportunities. Harassment should not be tolerated at all and mining companies should have processes and measurements to address discrimination. For example they should ensure that individuals appointed as contact officers should be of recognisable influence and status within the organisation (Pattenden 1998).

In summary, there is little literature on how to increase diversity not only in gender but also in cultural origin, age and education.

5.5 Changing skills requirements

The changing skills requirements are mainly based on the transfer from construction to production which will require a higher average level of skills (Diamond 2013). But within the production phase in modern mining, Dickie and Dwyer (2010) name 1) changes in technologies and 2) changes in customer expectations as two additional reasons for massively changing skill requirements.

5.5.1 Effect

Firstly, technological developments include automation[35], three dimensional modelling, 3D printing, submarine mining and remote control centres. The move is an attempt to drive for growth by simultaneously reducing costs and increasing safety - and skills shortages surely accelerated this trend (Heber 2013a). Future workforce will need to be familiar with these technological trends and require more holistic and abstract thinking[36].

Accenture mining program and project manager Nigel Court, explains the business transformation: "[Majors] understand that doing mining the same way they've done it for the last 20 years is not the way to create a high performing business" and regarding the implementation of remote control centres: "Centralising all of [their] key decision makers around supply chains and maintenance bases takes some thinking about how you do that and execute, how you pick the right people, where you should centralise, as well as challenges around finding a facility that can be set up appropriately" (Heber 2013a).

In consequence, elderly workers, lower skilled workers and unions have all expressed concern over job security. "Jobs change on site but they don't necessarily go away," Court said (Heber 2013a).

Accenture (2011) names advantages of automation which all have an impact on the labour market, for example that there will be less need for scare talent[37] which reduces total compensation, that personnel need to spend less time in remote and high-risk locations and hence that operational safety will increase[38].

Secondly, customer expectations include the understanding of culture and language of Australia's mainly Asian customers. It is likely that individuals with experience in dealing with these customers will become highly sought.

[35] Last year Vale announced that they are working on removing trucks from their largest iron ore mine and they even have a project with mine-waste-eating bacteria.

[36] Imagine dump truck drivers who nowadays work under FIFO rosters and high allowances in remote areas. In the near future these dump trucks will be piloted via automated cockpits from Perth-based control centres.

[37] such as heavy equipment operators

[38] minimises common errors and hazards due to operator fatigue or incorrect judgments

5.5.2 Strategies to address the finding

Dickie and Dwyer (2010) suggest to professionalise leadership skills but do not necessarily elaborate on how to do that.

The skills shift can wider and faster be facilitated by new ways of employee training such as online learning, real time collaborative approaches and simulated learning (Heber 2013a; Accenture 2011). Accenture (2011) suggests to focus on both function and business process, to create learning curricula with continuous review of qualifications and proficiency, and to use competency frameworks for hard and for soft skills.

Other than that, there are no strategies mentioned in literature on how to strategically manage these massive anticipated skills shifts.

5.6 Productivity challenge

Global Mining and Metals Leader Mike Elliott (Ernst & Young 2012): "The bottom line is that if returns start to wane, then there is a greater imperative for organisations to tightly and more effectively manage their risks to maintain an adequate risk/reward balance".

5.6.1 Effect

Significant risks associated with skills shortage include impact to production, project delays, and increasing labour costs.

Dickie and Dwyer (2010) argue that it is critical that mining companies structure their business "to get more out of what they already have" and Reuters (Serapio 2013) explains: „With production costs at between $30-$50 a tonne, big miners like Australian producers Rio and BHP, will still remain profitable even with far lower margins and it makes sense for them to produce more for less. On the other hand, small miners and new entrants with costs nearer $100 could go to the wall".

Hence, mining companies must do better with their existing human resources capital – besides the financial and technological capital. Or in other words, mining companies and HR departments must maximise full human capital potential through increased efficiency and effectiveness, minimise direct labour costs (compensation), and minimise indirect labour cost[39] (training & development, recruitment, management, FIFO/DIDO commuting).

5.6.2 Strategies to address the finding

Mining companies should harness corporate intelligence through retention strategies and rightsize instead of downsizing in bust times (Dickie and Dwyer 2010; Ernst & Young 2013). They should to do better with the existing workforce and identify and retain talent within the firm while training and developing that talent (Dickie and Dwyer 2010). And it is suggested that they standardise processes, IT systems and data (Accenture 2012a).

Ernst & Young (2012) highlights that identifying, attracting and retaining critical operational and construction skills remains a top priority and that "companies need to understand what is important to their targeted workforce and be creative in providing not only an attractive compensation but also a range of additional employee benefits".

[39] Conservative estimates assess indirect costs at nearly double direct costs (Ernst & Young 2013)

5.7 Legal environment

As described in section 3.1.7, the industrial relations in WA are rather confusing and change with every new government.

Dickie and Dwyer (2010) highlight the importance of having a robust workplace relations system in place to identify and address capacity constraints caused by infrastructure bottlenecks and skills shortages.

5.7.1 Effect

Changing legislation and processes (eg agreement renewal, SOL) and information sources (for example SkillsInfo) lead mining companies with repeating efforts to adjust their policies and practices. Different government departments seem to discuss the same labour issues although based on different statistical data.

Consequently, mining companies lack the legal basis to timely employ workers in greenfield projects or engage with workers from overseas (Kates 2013; Mining Skills Australia 2013). Educational institutes cannot rely on forecasts hence lagging in new industry courses and providing skilled labour supply.

5.7.2 Strategies to address the finding

The government is encouraged to

- provide a robust workplace relations system which is fair for both business and employees (AMMA 2009; Kates 2013),
- have measurements to address capacity constraints caused by skills shortages (AMMA 2009), and
- have an efficient and effective policy making process for new project sites and agreement renewal (Kates 2013).

Unions should stop pursuing opportunistic and self-serving terms in enterprise agreements (Kates 2013).

Changes to WA migration plans allow nominated migrants' applications (those workers on the SOL) to be processed ahead of applicants for independent skilled migration. New applicants who fit these criteria will be processed in 12 months, instead of the traditional three year wait (Bahn, Barratt-Pugh, and Yap 2013).

5.8 Data and terminology

An old management adage says that you cannot manage what you cannot measure. But to be able to measure (and pull valid interpretations out of it), terminology has to be clear and data has to be complete and conform.

5.8.1 Effect

Unreliable data in statistics and misleading terminology leads to a misconception of expectations within a company but also between stakeholders in the wider labour market.

5.8.2 Strategies to address the finding

Accenture (2013, 2011) suggests to standardise business processes, common data and integrated ERP systems. Increased business processes and more transparency within the mining companies not only bring internal benefit[40] but also allow to better discussing future workforce needs with governments, unions and educational institutes.

5.9 Social license to operate

Social license to operate is a relatively new term created by the mining industry. It includes the continually acceptance or approval to an organisation's operations or project by the local community and other stakeholders. Competition in the mining industry will increase pressure for improved safety and sustainability (Accenture 2012a).

5.9.1 Effect

Ernst & Young (2013) names the consequences of the social license to operate on the WA mining labour market:

- Local skilled professionals are not interested in working for mining companies.
- Lack of government and community's endorsement for mining projects and initiatives in general.
- Damage in relations hence ability to negotiate further contracts with government.
- Opposition instead of collaboration.

However, the social license to operate for the mining industry has also an impact on the wider WA labour market, including other industries which are directly or indirectly linked to mining companies.

5.9.2 Strategies to address the finding

The AMMA (2009) highlights an inevitable shift towards national health and safety regulations.

Mining companies have to improve their health, safety, environment and community (HSEC) initiatives and measurements (PWC 2013).

5.10 Collaboration and management

Mining companies grew quickly over the last few decades through new market entrants who wanted to "have a bit of the cake" and through national and international merger and acquisition. They were mainly focused on securing resources and investment for their major projects and there has been little ongoing collaboration with external stakeholders and room for internal improvement.

5.10.1 Effect

Consequences of a lack of collaboration between internal company departments leads unreliable workforce forecast scenarios and managers not having the right workforce in place to succeed in their departments. In particular, constraints in HR workforces (and the total absence of HR professionals in smaller firms) with widespread lack of according HR processes[41] and incon-

[40] Including less FIFO costs due to better collaboration across locations

[41] such as succession planning and skills inventories

sistent data lead to duplication of HR and business efforts, misinterpretations and inefficiency and intensify the issues of this finding (Lindorff 2011).

The consequences of a lack of external collaboration with governmental and educational institutes leads to job vacancies which cannot be filled due to the lack of available and employable candidates. Without collaboration, the complexity and rapid pace of change in the economy and in many firms with rather reactive than proactive business management leaves governments and education institutes to work reactively as well (Lindorff 2011).

5.10.2 Strategies to address the finding

There are several approaches described for the collaboration of mining companies with *internal* and *external* stakeholders.

Dickie and Dwyer (2010) suggest to address the collaboration issue through proactive and understandable communication from HR to all business levels. Also, the delivery of HR practices including workforce planning should be joint decision making between corporate and operations, and between highly professional HR practitioners and line managers. However, corporate HR departments must own and be accountable for the organisation's HR policy, plans and procedures (Dickie and Dwyer 2010).

Accenture (2011, 2012a) highlights the importance to develop fully integrated processes and data which means ongoing effective collaboration between all internal departments instead of silo thinking and acting. They promote integrated planning, diversification and development of talent. Latter with *next generation portals* designed around a worker's role which support collaboration, knowledge management and learning and create a work environment that is dynamic and rich in experience.

Additionally, Accenture (2011) suggests to design external focused strategies to target specific demographic groups, such as women and students and names Oz Minerals (Prominent Hill) as a good example in their collaboration with New South Wales Technical and Further Education Commission to recruit from local and indigenous communities.

Pattenden (1998) and Dickie and Dwyer (2010) propose to develop closer links between mining companies with the education institutes to encourage greater awareness of the practical applications of courses to the business and Accenture (2011) doubles up and specifically promotes to

- liaise with high schools and encourage school kids to embark on trade apprenticeships,
- launch accelerated apprenticeships for adult unskilled workers or for employees from other industries with transferrable skills,
- announce "bonded scholarships" to attract apprentices and university students with financial incentives during study or training in return for working in the industry for some time after graduating, and
- partner with universities to create education, professional development and research opportunities.

5.11 Skills shortage

More than the previously discussed, this finding is at the same time an outcome of all above described ones. I therefore discuss it in more details and along the following subsections.

- Definitions
- Effect
- Roles and responsibilities
- Recent development of skills shortages in the WA mining industry
- Skills which are in need
- Strategies to address the finding

5.11.1 Definitions

Bryant and Jaworski (2011) argue that the term skills shortage is slippery and that this is an issue for all labour market stakeholders: First because Australia does not have an objective means of identifying skills shortages, despite having a list of occupations designated as being in short supply. Second because skills shortages are generally understood as a universal lack of workers. This is despite shortages varying across occupations, employers and regions. Third because skills shortages are confused with "skills gaps"[42]. In their study, they generally summarise skills shortage as the "mismatch of supply [worker] and demand [employer] in the labour market".

Sutherland (2009) narrows skills shortage as "the absence of potential employees with the requisite *technical* abilities to perform tasks required by the firm" and the National Centre for Vocational Education Research defines skills shortage as the "insufficient supply of appropriately qualified workers available or *willing* to work under existing market conditions" (Healy, Mavromaras, and Sloane 2012). The Department of Education, Employment and Workplace Relations (2012) distinguishes *skills shortages* from *recruitment difficulties*[43] and elaborates that *"s*kill shortage exist when employers are *unable to fill* or have considerable difficulty filling vacancies for an occupation, or significant specialised skill set, within that occupation, at current level of remuneration and conditions of employment, and at a reasonably accessible location".

Apart from the academic view on reasons for skills shortages, the Australian Department of Education, Employment and Workplace Relations (2012) argues that skill shortages can coexist with unemployment. Skills shortages may be restricted to experienced workers or those who have specialist skills. Shortages can result from a number of factors including low levels of training, high levels of wastage, changes in technology, and increasing demand for new skills within an occupation. Local mismatch may also result where workers who have the skills are not regionally close to the employers seeking those skills.

[42] According to Jackson (2013) *skills gaps* refer to the "disparity between industry needs and higher education provision" meaning not the amount of people in the labour market but the quality of skills. Sutherland (2009) however describes *Skills gaps* as "skills deficiencies on the part of a firm's existing workforce" meaning the internal perspective of a company.

[43] They distinguish skills shortages from recruitment difficulties which "occur when some employers have difficulty filling vacancies for an occupation. There may be an adequate overall supply of skilled workers, but some employers are unable to attract and recruit sufficient, suitable workers for reasons which include: specific experience or specific skill requirements of the vacancy, differences in hours of work required by the employer and those sought by applicants, or particular location or transport issues" (DEEWR 2012).

5.11.2 Effect

On a company's level, academic studies report the following consequences of skills shortages:

- Skills shortages in the labour market leave teams understaffed and team members with increased performance pressure and higher stress level (Lindorff 2011).
- Lindorff (2011) further reports decrease in staff morale, loss of high-performing employees and reduction of customer service.
- Negative impact on profits and performance goals causing firms to lost market share to competitors (Lindorff 2011).

Interestingly, only 13% of the respondents in Lindorff's survey reported that skills shortages did have an impact on the company's strategic planning.

Consequences on the macro-economic level include:

- Inadequate capacity of infrastructure and the delays in major project construction (Huang and Austin 2011).
- Skills shortages and high remuneration in Western Australia's labour market attract inter-state migration with two outcomes: Leaving other regions and/or industries with less skilled workers and easing eliminating differentials in wage levels and industrial relations policies between Australia's states and territories (Debelle and Vickery 1999; Ye 2007).
- Cause large inflow of international migrants which short-term eases the problem but which long-term impact on demographics and social structure may be underestimated (Ye 2007).

Jackson (2013) states that the lack of certain skills such as leadership, critical thinking, problem solving and change in human capital impedes innovation – which is widely considered the driving force of global competitiveness. Companies without necessary innovation hence will not compete successfully in the global market.

Besides academic studies, management company Accenture mentions that high rates of turnover erode consistency and quality, and undermine execution of long-term programs to improve performance. Lack of manpower is affecting miners' ability to execute their capital projects. For example, one of Accenture's clients, a gold mining company, explained that the cost of one single project jumped from 3.6 Billion US$ to 5 Billion US$ due to skills shortages and increased labour costs (Accenture 2012a).

5.11.3 Roles and responsibilities

Confusing *skills shortages* with *skills gaps* leaves issues with shortages as something for governments to solve. Public discussion about skills shortages in Australia has focused on the supply side of skills development and how the tertiary education sector may equip workers with relevant qualifications. Ultimately, this means that a given employer does not feel responsible in the discussion around skills shortages (Bryant and Jaworski 2011).

Sheldon and Thornthwaite (2005) however describe that most companies prefer to meet skill needs through recruitment rather than training. Yet current Australian Vocational Education and Training (VET) policy is that individual firms are in the client base, and that funding should reflect the wishes of these companies.

Thus VET faces the expectation it "will respond rapidly and effectively to industry emergency calls about... skills shortages" (Butler and Ferrier 2006).

5.11.4 Recent development of skills shortages in the WA mining industry

A six monthly publication on the topic of skills shortages in WA (DEEWR 2012) shows

- Some occupational labour markets are cyclical, responding relatively quickly to changes in economic conditions. For some skilled occupations[44], however, shortages have been relatively persistent, even in times of economic downturn.
- Recruitment of skilled workers was easier in 2012 than it has been at any time over the past six years (except for 2009). Employers attracted an average of 1.6 suitable applicants per vacancy[45], which is similar to 2010 but significantly fewer than in 2009 when economic conditions were soft.
- Interestingly, employment fell in just one occupational group, Machinery Operators and Drivers (down by 4.2%) and this decrease was driven largely by lower employment of Drillers, Miners and Shot Firers.
- Shortages are evident for a number of professional, technical and trade occupations, although shortages are less widespread than they were in 2011. Employers are still experiencing some difficulty attracting workers with specialist skills and extensive experience.
- Skill shortages are patchy, with significant variation in recruitment success across occupations, but are evident particularly in resources sector-specific occupations (such as mining engineers and geologists) and Engineering professions and trades. Construction trades vacancies were filled without significant difficulties for most trades.

Adequate candidates cannot be *found* or accessed in the labour market which leads to a *perception* of rather than an actual skills shortage. That does not mean that they do not *exist* (Lindorff 2011) but maybe they do not agree with the offered work conditions (for example the number of hours they want to work) (Richardson 2007). Skills shortages seem to be a random claim instead of a specific and differentiated call. Bryant and Jaworski (2011) assume that "skills shortages are shaped by assumptions about gender, embodiment and place, bound to specific sites of mining". Hence there is probably no skills shortage but employers are biased regarding gender, age or origin.

Ernst & Young (2013) sees the advantage in recent development and declares that the "current economic downturn eases the skills shortage pressure and provides the industry with the opportunity to recalibrate its salary levels as compensation levels are well above the market average. However, the sector must not lose focus and under-invest in its efforts to tackle long-term challenges posed by the issue".

5.11.5 Skills which are in need

NRSET (2010) highlights a *skills shortage* of welders, earthmoving plant operators, motor mechanics, carpenters and joiners and concreters. Looking ahead, WA is likely to face increasing shortages of these skills, as well as shortages of structural steel and welding trades workers, fitters and electricians, structural steel concrete workers and crane lift and hoist operators (NRSET 2010). CME (2011) however names skilled trades people, engineers and metallurgists as the majority of skills which be in shortage in WA by 2016. DEEWR (2013c) highlights a moderate growth in truck driver demand with a high level of job openings and more than 40% of current workers aged above 45 years.

Lindorff (2011) examined more than 2000 managers in all different kinds of Australian firms regarding their perception of *skills gaps*. It finds that 84% of the examined mining companies re-

[44] DEEWR does not elaborate on which ones.

[45] Compared to 2.0 suitable applicants per vacancy on national level

port skills gaps and that skills gaps are more common in large[46] than in small or medium businesses. The *skills gaps* most frequently mentioned by all respondents were in leadership, professional and industry-specific skills and basic skills such as communication and interpersonal skills (Lindorff 2011). This is in contrast to reports by Gamble, Patrick and Peach (2010) which claim that high proportions of school leavers have poor basic skills, and place emphasis upon trade skills.

Mining firms report the highest shortage of external candidates. The continued growth of the sector suggests it may be in constant "catch up" mode (Lindorff 2011).

5.11.6 Strategies to address the finding

Not surprisingly, there are more suggestions to *solve* the problem of skills shortages than to actually *identify* skills shortages.

From an operational perspective Dickie and Dwyer (2010) suggest:

- Replace retirees and implement processes to make sure that valuable knowledge is preserved and passed on to younger workers.
- Retention of key talent (identification and development of key talents, generating a culture of loyalty even through downtimes when mining companies traditionally shed staff).
- Growing the talent pool (strategic recruitment with attractive packages).
- Training and development (new technologies, understanding culture and language of customer).
- Keep staff motivated (good communication especially in downtimes).

Lindorff (2011) suggests that strategic efforts should be made to increase the general level of economic skills of managers and business leaders so they better understand the link between business strategies and human capital strategies.

She also suggests that Human Resources skills should be taught and provided to managers to enable a more professional approach to workforce planning, recruitment and selection. This may reduce their *perceptions* of skills shortages in the potential workforce and provide them with appropriate discipline knowledge to identify and address the issue.

In 1991, the federal Labour government established a program to foster a partnership approach between firms, unions and employees to improving enterprise-level performance (Macneil, Haworth, and Rasmussen 2011). This so called *Australian Best Practice Demonstration Program* included a list of 13 best practice characteristics and amongst others emphasised on the need for a shared vision, clear business strategy, CEO commitment to change and an effective Human Resources Management. The initiatives of this program seem to be similar to Lindorff's suggested improvement goals. A few years after the program had been implemented, good progress was evaluated in some areas[47] but rarely a true cultural change and a proven way of changed working pattern. Macneil, Haworth and Rasmussen (2011) explain this as followed: "The new emphasis on productivity took time to develop, and its effects would take time to work through to firm level." Also, "HR managers in particular were usually inexperienced in and unused to sophisticated participative arrangements. Union leaders and the rank-and-file were sometimes equally inexperienced."

The federal government could allow more workers on temporary 457 visas to enter the country and/or they could increase the number of apprenticeship training places. The government has recognised these options and increased traineeship and apprenticeship places in the budgets.

[46] More than 1001 employees

[47] such as higher skills levels

However, as there will still be a considerable shortfall of skilled workers in the short term as apprenticeships have a long lead-time, many companies insist to expand the recruitment of workers on temporary 457 visas (Bahn, Barratt-Pugh, and Yap 2013). Minister Chris Evans responds to this issue: "There are plenty of occupations where there is adequate supply of young Australians coming through our schools, TAFE colleges and universities to take up new job opportunities. They must be given the opportunity to fill these vacancies first". And Senator Chris Boven is cited in Bahn et al's (2013) study on the approach with 457 visa holder who have already been in the country for nearly four years: "The Government will establish a fast-tracked pathway from the temporary skilled subclass 457 visa to permanent residence under the employer-sponsored visa program... We know these workers can do the job and are ready to make a commitment to Australia..."

Targeting expatriate Australians to return home is another approach suggested by Dickie and Dywer (2010).

CME (2011) concludes that "there is no single solution to the skills shortage" but that a more *holistic, flexible and innovative framework* is needed. Such one is presented by Ernst & Young (2012) as shown in Figure 28 and described in the table below:

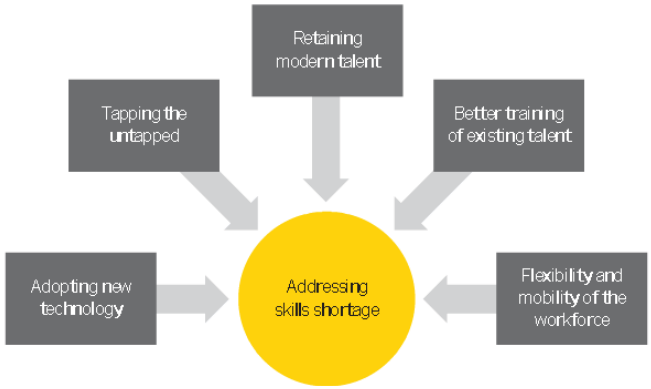


Figure 28: Ernst & Young's approach to address skills shortage in the mining industry

Topic	Strategies
Adopting new technology	◗ Substitute capital for labour through innovation and reassess longer-term demand for specific skills in light of expected automation ◗ attract new talent to the industry and change the sector's image by opening up highly technical roles
Tapping the untapped	◗ innovative ways to develop new career paths (despite the traditional model wherein a worker joins the sector after completing an undergraduate program and stays in the job and/or organisation for years) ◗ balance career development and remuneration ◗ develop strategic alliances with institutions and communities
Retaining modern talent	◗ acknowledge woman and local workers as latent talent pool ◗ acknowledge corporate social responsibility ◗ source talent from aligned sectors and a broader demographic ◗ encourage retired workers to re-enter the workforce
Better training of existing talent	◗ encourage semi-skilled workers to up-skill ◗ retain critical skills held by older workers ◗ sustainable skills development programs
Flexibility and mobility of the workforce	◗ FIFO as functional solution to combine flexible remote working with big-city lifestyle incl. social and cultural life ◗ early labour scheduling and sourcing within mine planning

Table 14: Ernst & Young's approach to address skills shortages in the mining industry

Many of these strategies have already been named by other sources but Ernst & Young is the only one who tries to provide a "full picture" when addressing skills shortages from the perspective of a mining company.

The Natural Resources Sector Employment Taskforce (NRSET 2010) also developed such a "full picture" in the form of 31 specific recommendations - although from the perspective of the government of WA rather than from a mining company:

No	Recommendation
1	New partnership approach
1.1	Mining companies to provide workforce impact statement and workforce planning details when applying for state project approval
1.2	Regional development organisations to manage collaboration between mining companies, education and employment service organisations regarding workforce planning
1.3	SkillsAustralia to report annually on the status of skills shortages in the natural resource sector
1.4	Mining companies to weighting training culture as high as safety culture
1.5	State governments to implement single point of contact for mining company
2	Increase number of trade professionals
2.1	Mining companies to increase number of apprenticeships
2.2	Government to trial alternative apprenticeship models(for example mobile training centres at mine sites)
2.3	Gladstone region to develop program to boost apprenticeships
2.4	Industry skills councils to assist people in the recognition of their current trade certificates and definition of training gaps
2.5	Mining companies to place priority on up-skilling existing workers before recruiting overseas
2.6	Employment service providers to promote work in the natural resource sector amongst unemployed trades-people
2.7	Construction workers who lose their job to seek re-education in adult apprenticeships
2.8	Government to broker higher education
3	Graduate more engineers and geoscientists
3.1	Universities to formalise and strengthen their ties with each other and with mining companies
3.2	Industry associations to provide internships and mentoring for all first- and second-year engineering students
4	Meet temporary skills shortages with temporary migration
4.1	Government improves information and support to mining companies seeking for 457 visa workers
4.2	Government to introduce Enterprise Migration Agreements for major projects
5	Strengthen workforce participation
5.1	Government to develop strategy to enhance language, literacy and numeracy skills of job seekers
5.2	Government to encourage industry players to create jobs for local people not currently in the workforce
5.3	Government to fund a pilot program for brokers
5.4	Government to fund FIFO development coordinators who include unemployed
5.5	DEEWR to develop strategy for attracting and retaining women in the mining industry
5.6	Government to foster programs which seek to match Indigenous people with sustainable jobs
5.7	Government to explore possibility of expanding broker capacity to existing small-to-medium sized Indigenous contracting businesses
6	Forge stronger ties between industry and education
6.1	All labour market stakeholders together develop a marketing kit to promote agreed career pathways

No	Recommendation
6.2	Government and industry associations to further develop connections between schools and educational institutes
6.3	Government to ensure funding for education institutes with strong link to natural resource industry
6.4	Schools and VET officials to ensure that their (pre-)VET courses are fully recognised for quality and relevance by mining companies
6.5	Government to increase senior school students' participation in mathematics and science as these subjects build the basis for future required skills set in the mining industry
7	Address the need for affordable housing and community infrastructure
7.1	Government to urgently address housing shortages
7.2	Government to consider funding infrastructure in regions affected by resource operations

Table 15: NRSET recommendations to address the skills shortage in WA mining industry

5.12 Summary of key findings

Summarised the correlation and effects of the key findings on the labour market in the WA mining industry:

Key finding	Correlation and effect
Volatility and uncertainty	Sudden additional labour demand creates skills shortages hence accelerates innovations in automation, sudden workforce diminishments leads to mass lay-offs and higher unemployment rate and out-migration due to un-transferrable skills. Miners have typically used historical performance for their annual planning and budgeting process hence workforce predictions are unreliable due to lagging indicators.
Industry image, culture and work environment	Limited awareness of the diverse employment opportunities and low industry image directly lead to smaller numbers of candidates in the talent pipeline. Mining companies find it difficult to attract staff even in boom times, although high salaries are on offer.
Demographic challenge	The aging workforce is contributing to mismatches in the labour demand and supply. But not only the numbers of people retiring but with it the loss of experienced skills is a challenge and maybe accelerates innovations in automation.
Talent pool and labour force diversification	The WA economy lacks the capability to train sufficient domestic workers. Education institutes fail to 1) attract diverse group of students and then to 2) produce enough employable graduates. Outcome is that too few valid candidates even apply for mining jobs. Also skilled professionals who do not agree with the mining work culture and environment withdraw their human capital from the mining industry and seek employment in other industries. All these people automatically lack on the supply side of the WA mining labour market. Mining companies have started to engage with migrants, females and Indigenous as potential workforce. But this key finding is a viscous circle: Less diversification leads to reduced social license to operate and smaller talent pool. Smaller talent pools lead to skills shortages. Reduced social license to operate leads to higher productivity challenge.
Changing skills requirements	Technological development in mining is an attempt to drive for growth by simultaneously reducing costs and increasing safety - and skills shortages surely accelerated this trend. Elderly workers, lower skilled workers and unions have all expressed concern over job security but mining experts assure that jobs will change on site but they do not necessarily go away. The questions remain: Where do all these high skilled technology people come from and where do the low skilled "hands-on" workers go?
Productivity challenge	Significant risks associated with skills shortage include impact to production, project delays, and increasing labour costs. To remain competitive, mining companies must do better with their existing (human resources) capital.

Legal environment	High restrictions towards international students and temporary skilled migration leave mining companies with skills shortages. And frequently changing legal policies leave mining companies without legal basis to timely employ workers in greenfield projects or engage with workers from overseas.
Data and terminology	Unreliable data in statistics and misleading terminology leads to misconception of expectations within a company but also between stakeholders in the wider labour market.
Social license to operate	Local skilled professionals are not interested in working for mining companies. Lack of government and community's endorsement for mining projects and initiatives in general. Damage in relations hence ability to negotiate further contracts with government. Opposition instead of collaboration. That all leads to smaller talent pipelines and higher productivity challenge for the mining companies.
Collaboration and management	Consequences of a lack of collaboration between internal company departments leads unreliable workforce forecast scenarios and managers not having the right workforce in place to succeed in their departments. The consequences of a lack of external collaboration with governmental and educational institutes leads to job vacancies which cannot be filled due to the lack of available and employable candidates.
Skills shortage	All these above discussed findings influence each other but overall, they all impact the perception and severity of the skills shortage in the WA mining industry. On a company's level, skills shortages lead to decreasing staff morale, reduced customer service and finally to lost market share to competitors. High turnover erodes consistency and quality, and undermine execution of long-term programs to improve performance. On a macro-economic level, the effect includes inadequate capacity of infrastructure and delays in major project construction, inflow of national and international migrants which impact demographics, social structure and inflation. However, the lack of certain skills such as leadership, critical thinking, problem solving and change in human capital impedes innovation – which is widely considered the driving force of global competitiveness. Companies without necessary innovation hence will not compete successfully in the global market.

Table 16: Summary of the correlation and effect of the key findings

A summary of all strategies (listed along process areas instead of key findings) can be found in Appendix 5.

6. Approach of three mining companies in WA to address key findings

This section presents approaches and processes that are used by three mining companies in Western Australia to respond to above identified key findings.

Unfortunately not only I but the National Resources Sector Employment Taskforce has also found mining companies reluctant to offer information about their future workforce needs (NRSET 2010). They might be concerned that sharing such information may reveal investment intentions. The extensive use of contractors makes information gathering difficult as these workforce participants normally are not included in internal studies. Hence below information is based on public accessible data and information.

6.1 BHP Billiton

Since 2001, when Australian Broken Hill Proprietary (BHP) and UK Billiton merged, BHP Billiton is a leading global resources company with the purpose to create long-term shareholder value through the discovery, acquisition, development and marketing of natural resources. Their strategy is to own and operate large, long-life, low-cost, expandable, upstream assets diversified by commodity, geography and market (BHP Billiton 2012a).

BHP Billion is a diversified multinational company, operates in eight commodity divided businesses[48], so called Customer Sector Groups (CSGs), and employs world wide 125'000 employees and contractors[49]. They have a strong presence in Western Australia with their principal iron ore operations in the Pilbara region. Western Australia Iron Ore (WAIO) has more than 12'000 employees and contractors and comprises a complex integrated system of seven inland mining operations, more than 1'000km of rail, stock yards and two separate port facilities located in Port Hedland (BHP Billiton 2012a).

For the financial year 2011/12, they report a total revenue of US$M 72'226, an underlying EBITDA of US$M 33'746 and capital expenditure of US$M 20'223 (BHP Billiton 2012a). They declare a group-wide turnover rate of 11.3% (BHP Billiton 2012c).

6.1.1 Response to volatility and uncertainty

In 2012, BHP Billiton announced that they will continue to invest in and grow their business over the next two years - although they closely monitor their financial business risks due to high fluctuation in commodity prices and exchange rates as well as reducing demand from China. Operating cost pressures, reduced productivity and workforce mismatches might negatively impact their operating margins and expansion plans (BHP Billiton 2012a).

BHP Billiton has acknowledged the link between their business risks and the effect on their workforce. Therefore, one of their actions was to strengthen their Workforce Planning team. Western Australia Iron Ore alone has published three job advertisements in the last few months (BHP Billiton 2011, 2012b, 2013c) and these advertisements highlight the worldwide mandatory Strategic Workforce Planning processes and tools including:

- 20Y Workforce Master Plan to ensure a robust view of workforce requirements,
- "Life of Asset" and 5Y Workforce Plan to ensure feasible workforce fulfilment strategies,
- Internal workforce demographic and demand studies to identify future workforce requirements, and

[48] Petroleum, Aluminium and Stainless Steel Materials, Base Metals (including Uranium), Diamonds and Specialty Products, Iron Ore, Manganese, Metallurgical Coal, Energy Coal
[49] Average of 37% employees and 63% contractors

- Reports on external workforce related activity to proactively inform the business on external market developments relating to workforce.

BHP Billiton names the diversification of their portfolio of commodities, geographies and currencies as a key strategy for reducing volatility (BHP Billiton 2012a). This can be an advantage in terms of talent retention as employees might be transferred between CSG's in case a mine has to be closed or a CSG experiences cost pressure. Indeed, for employees this might include similar work conditions like policies, processes and systems but also changing work locations, rosters and commuting times.

6.1.2 Response to industry image, culture and work environment

BHP Billiton is committed to a high level of governance and strives to foster a culture that values and rewards ethical standards, personal and corporate integrity and respect. Their charter and their Code of Conduct highlight and clarify these values (BHP Billiton 2012a, 2013b):

- *Sustainability*, which means putting health and safety first, being environmentally responsible and supporting communities,
- *Integrity*, which means doing what is right and "walking the talk",
- *Respect*, which means embracing openness, trust, teamwork, diversity and relationships that are mutually beneficial,
- *Performance*, which means achieving superior business results by stretching capabilities,
- *Simplicity*, which means focusing on efforts on things that matter most, and
- *Accountability*, which means defining and accepting responsibility and delivering on commitments.

BHP Billiton recognised that they are "strengthened by diversity" and enforces a work environment "in which everyone is treated fairly and with respect and has the opportunity to maximise their potential" (BHP Billiton 2012c). Therefore BHP Billiton established human resource processes covering recruitment planning, diversity, remuneration, development and mobility of the workforce to ensure a strong diversified global talent pool (BHP Billiton 2012a). However, in terms of work conditions there seems to be not much flexibility. Their Sustainability Report declares 96.3% full-time employment (BHP Billiton 2012c).

6.1.3 Response to demographic challenge

As highlighted in section 3.2.5.1, BHP Billiton also experiences less young people entering the company than elderly who will leave the company in foreseeable time due to their age[50] (BHP Billiton 2012c). Figure 29 shows BHP Billiton's overall age curve in 2012:

[50] 18% under 30 versus 22% over 50

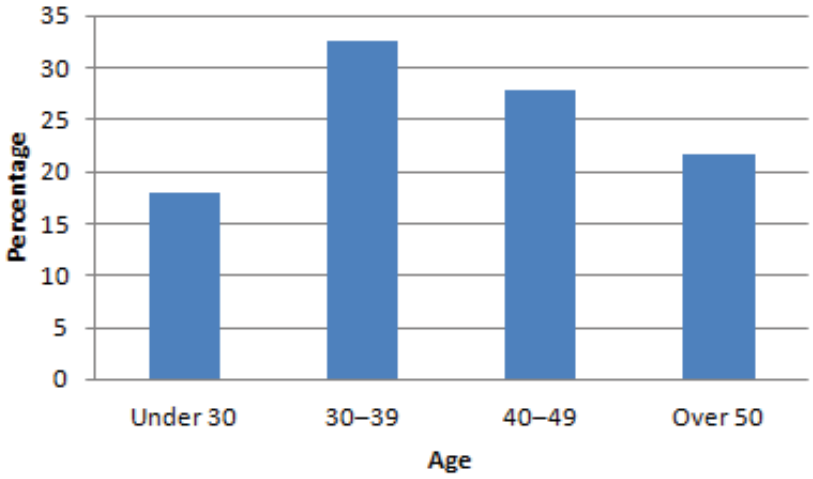


Figure 29: BHP Billiton's age curve based on Sustainability Report 2012

In none of the published documents does BHP Billiton explain how to secure the knowledge and experience of the more than 20% of the workforce who will retire in the next 15 years.

6.1.4 Response to talent pool and labour force diversification

With their 1SAP project (further explanation see section 6.1.8), BHP Billiton has established group-wide human resource processes covering recruitment planning, diversity, remuneration, development and mobility of staff to ensure a strong diversified global talent pool (BHP Billiton 2012a). Their approach to diversity is underpinned by key principles, including:

- a diverse workforce is necessary to the delivery of their strategy that is predicated on diversification by commodity, geography and market;
- the aspiration is to have a workforce that best represents the communities in which their assets are located and their staff live;
- actions that support their diversity aspirations should be consistent with the established approach to talent, performance and reward;
- achieving an appropriate level of diversity will require structured programs at an early career stage that ensure the development of necessary skills and experience for leadership roles;
- measurable objectives in support of diversity will be transparent, achievable over a period of time and fit for purpose; and
- a set of measurable objectives will focus on 1) enabling a diverse workforce by way of removing barriers and 2) establishing appropriate representation targets.

6.1.4.1 Talent pool

BHP Billiton seeks to ensure strong internal candidate representation for roles, only supplemented by external and if necessary international recruitment (BHP Billiton 2012c). A recent news article (Swanepoel 2013) describes BHP Billiton and its joint venture partner Mitsubishi who have set new benchmarks at their coal mine in Queensland: "Almost half the 900 people working at Daunia were recruited from the Cairns and Brisbane regions with an emphasis on attracting women and indigenous people to the coal industry," a BHP Billiton spokesman is cited in the article.

BHP Billiton's "Foundations for Graduates" Program is 2-year program designed for graduates to transition from study to work and to provide the youngsters with development opportunities in

their early working years with the mining giant. The program provides each year positions for around 500 new graduates from a variety of disciplines (BHP Billiton 2012c).

6.1.4.2 Labour force diversification through age, gender cultural origin and education

In financial year 2011, BHP Billiton committed to three key measurable objectives to enhance their diversity performance (BHP Billiton 2012c):

1) Develop and implement a diversity plan dedicated to achieving diversity of gender, skills, experience and ethnicity, while taking into account legislative requirements.

2) Increase female participation in their Accelerated Leadership Development Program (ALDP) up to 40%. In FY2012, female participation in the program successfully reached 43%.

3) Review graduate recruitment process and identify and implement the necessary actions to address low female representation. Initiatives to increase female graduate intake shall be implemented at group-level and shall include targeted advertising, sponsorships and partnering with university and industry bodies.

In 2012, females comprise 17% of BHP Billiton's total workforce. Approximately 10% of their 406 senior leaders are female. Pay equity across the senior leaders is based on skills, experience and size of role; the male-to-female salary ratio is 1.034:1.000. The Board sets an additional goal of increasing the number of women on the Board from 2 to at least 3 out of 13 over the next two years (BHP Billiton 2012a). Nowadays, BHP Billiton adds in every of their job advertisement the following strategic intention: "BHP Billiton Iron Ore is an Equal Opportunity Employer and encourages indigenous Australian and female candidates to apply."

BHP Billiton acknowledges historical imbalances and past discrimination and takes steps to address these issues through programs and funding such as the "Indigenous employment and training and Black Economic Empowerment" or the "Australian Indigenous Education Fund" (BHP Billiton 2012c; Latimer 2013a).

6.1.5 Response to changing skills requirements

BHP Billiton reports 20 major projects in execution with a total budget of US$22.8 billion whereof three projects in WAIO (BHP Billiton 2012a).

Project Name	Target date for initial production
Inner Harbour Expansion	H2 2012
Port Blending and Rail Yard Facilities	H2 2014
Jimblebar Iron Ore Mine Expansion	Q1 2014

Table 17: WAIO major projects

All of these projects will come to an end in the near future which means shifting from construction into operational mode. No major project approvals are expected during FY2013. However, BHP Billiton seeks to lay the foundation for further development projects such as the Outer Harbour Extension in Port Hedland and further development of WAIO Port, Rail and the Jimblebar mine.

Under the keyword "Next Generation Mining", BHP Billiton has fast tracked the modernisation of its existing operations and works towards integrated remote operating centres, autonomous haulage, autonomous drilling and new ways of evaluating and modelling ore bodies. The first such remote operation centre has been launched in Perth earlier this year and it has added to the trend of mining and logistics work being controlled in Perth CBD instead of in the Pilbara (Ernst & Young 2013; Heber 2013a).

6.1.6 Response to productivity challenge

In response to the harsh market conditions, BHP Billiton has implemented "prudent measures that will safely and substantially reduce operational costs and non-essential expenditure across our entire business" (BHP Billiton 2012a).

6.1.7 Response to legal environment

BHP Billiton declares that their "operations may continue to be affected by the Australian Fair Work Act 2009 as labour agreements expire and businesses are required to negotiate labour agreements with unions. In some instances labour unions are pursuing claims in the bargaining process about union access and involvement in some areas of operational decision-making. These claims may adversely affect workplace flexibility, productivity and costs" (BHP Billiton 2012a).

6.1.8 Response to data and terminology

Since 2001 BHP Billiton has grown quickly through M&A activities as well as through organic growth. At one point the leadership team realised that to steer and further develop their organisation they needed reliable internal data and people across the organisation using the same terminology and processes. Thereupon BHP Billiton decided upon a global business transformation project called 1SAP. This project has been running since 2005 and includes strategy-alignment and standardisation of defined business processes[51], the implementation of a new ERP with reliable data and clear responsibilities across the organisation and change management for all employees. The dedicated aim of 1SAP is to create value, safety and scalability and to constantly improve operating discipline and to ensure to "do the basics well" (BHP Billiton 2012a).

6.1.9 Response to social license to operate

BHP Billiton defines the social licence to operate as win-win relationships and partnerships with the communities in which the company operates. "Earning the trust of our employees, contractors, customers, suppliers, communities and shareholders and establishing mutually beneficial relationships is vital to our success" (BHP Billiton 2012c).

BHP Billiton regularly engages with their key stakeholders to understand areas of interest and address potential concerns about their operations. In their Sustainability Report they discuss their approach and performance in regards to health and safety for their workforce, governance and risk management processes, social responsibility, contribution to improved standards of living and self-sustaining communities, their impact on the environment and approach to resource conservation and biodiversity; and ensuring a broader economic contributions of their operations (BHP Billiton 2012c). Figure 30 shows the dedicated targets and performance:

[51] Including workforce planning and management of the talent pool

Target [1]	Performance	
Zero Harm	**Result**	**Commentary**
Zero fatalities	■	Three fatalities at our controlled operations
Zero significant environmental incidents and zero significant community incidents	■	No significant environmental or community incidents
Health		
All operating sites to finalise baseline health exposure assessments on occupational exposure hazards for physical exposures	■	Target achieved in FY2010
15% reduction in potential employee exposures (but for the use of personal protective equipment) over the occupational exposure limit (OEL)	■	An 8% reduction in potential employee exposures [2] (but for the use of personal protective equipment) compared with the FY2007 base year
30% reduction in the incidence of occupational disease	■	A 22% reduction in the incidence of employee occupational disease compared with the FY2007 base year. The greatest number of cases related to musculoskeletal illness and noise induced hearing loss
Safety		
50% reduction in total recordable injury frequency [3] (TRIF) at sites	■	TRIF for FY2012 was 4.7, a 36% reduction compared with the FY2007 base year
Environment		
Aggregate Group target of 6% reduction in greenhouse gas (GHG) emissions per unit of production	■	A 16% reduction in GHG energy intensity compared with the FY2006 base year
Aggregate Group target of a 13% reduction in carbon-based energy per unit of production	■	A 15% reduction in energy intensity compared with the FY2006 base year
Aggregate Group target of a 10% improvement in the ratio of water recycled/reused to high-quality water consumed	■	A 29% improvement in the ratio of water recycled/reused to high-quality water consumed compared with the FY2007 base year
Aggregate Group target of a 10% improvement in the land rehabilitation index	■	A 1% decline on the land rehabilitation index compared with the FY2007 base year
Community		
1% of pre-tax profits to be invested in community programs, including cash, in-kind support and administration, calculated on the average of the previous three years' pre-tax profit	■	US$214 million invested in community programs, including US$65 million contributed to BHP Billiton Sustainable Communities, our UK-based charitable company

Figure 30: HSEC performance by BHP Billiton 2012

"Due to the nature of our operations HSEC incidents or accidents and related regulations may adversely affect our reputation or licence to operate" (BHP Billiton 2012a).

Safety is a core value for BHP Billiton: "We believe that all accidents, occupational illnesses and injuries are preventable; and that we will only be truly successful when every employee and contractor goes home safely at the end of every day" (BHP Billiton 2013a).

6.1.10 Response to collaboration and management

With more than 100 locations throughout the world and thereof more than 10 iron ore mine sites and operations in Western Australia, BHP Billiton faces a special internal challenge with collaboration and management. Standardised processes, 1SAP as the "single source of truth" and video conference equipment in every location help to overcome this challenge. Since 2008 ChangeTracking[52] has provided a detailed view of both leaders' and employees' engagement in collaboration and their vision of transformation (Change Track Research 2012).

Externally, group representatives attend selected events, such as political party conventions, mining conferences[53] or bodies such as the Minerals Council of Australia. BHP Billiton will express its views in a manner that "adheres to high standards of ethics and complies with the letter and spirit of the law". They engage in direct communication with unions as required (BHP Billiton 2012c).

[52] Change Tracking is a change management research tool owned by Accenture

[53] For example 'Indigenous Business, Enterprise and Corporations Conference', 'Workforce Planning in Mining Conference' or 'Skills Development Summit'

Prospective employees are made aware of employment arrangements prior to joining the company and they may participate in political processes as individuals but not representing BHP Billiton (BHP Billiton 2012c).

6.1.11 Response to skills shortage

In their Annual Report 2012, BHP Billiton points out that "the inability of the Group to attract and retain highly skilled staff with relevant industry and technical experience may adversely impact our ability to complete projects under development on time and budget or successfully respond to new development opportunities" and they highlight possible shortages in engineering, technical service, construction and maintenance.

Interestingly, up to now these concerns have always been formulated as a future condition but have not been outlined as actually occurred. Same with the following concerns: "The lack of suitable accommodation in remote regions adjacent to development projects and community reactions to development and potential workforce FIFO arrangements may impact costs and the ability to optimise construction and operating workforces" (BHP Billiton 2012a).

BHP Billiton does not name specific approaches on how to tackle the identified skills shortages.

6.2 Rio Tinto

Rio Tinto's company history reaches back to 1873 when a British-European syndicate bought and reopened an ancient copper mine near Spain's red river. In 1995 UK Rio Tinto Zink Corporation and Australian Conzinc Rio Tinto Limited merged to a dual listed company and since then developed to a diversified multinational mining giant operating in more than 40 countries and employing more than 71'000 employees (Rio Tinto 2013a).

For the financial year 2012, Rio Tinto reports a consolidated sales revenue of US$M 50'967, an underlying EBITDA of US$M 19'411 and capital expenditure of US$M 17'418 (Rio Tinto 2013a).

Nowadays, Rio Tinto maintains an integrated network of 14 iron ore mines (as shown in table below), 3 port facilities and a 1'500km rail network in the WA Pilbara and Hamersley Range and employs more than 13'000 people. From currently 237 million tons per annum produced in the Pilbara, Rio Tinto plans to increase production to 360 million tons per annum by 2015 (Rio Tinto 2013a).

Mine	Production commenced	Workforce
Brockman 2/Nammuldi	1992	FIFO
Brockman 4	2010	FIFO
Robe Valley Operations	Robe Valley: 1972, Mesa A: 2010, Mesa J: 1992	49% Residential, 51% FIFO
West Angelas	2002	FIFO
Mount Tom Price[54]	1966	Residential
Greater Paraburdoo	Paraburdoo: 1972, Channar: 1990, Eastern Range: 2004	78% Residential, 22% FIFO
Marandoo	1994	FIFO
Yandicoogina	1998	FIFO
Hope Downs	2007	FIFO

Table 18: Rio Tinto mines and workforce

6.2.1 Response to volatility and uncertainty

In their Annual Report 2012, Rio Tinto names the following actions to tackle ongoing volatility and uncertainty:

1) Strengthen capital allocation and discipline.

2) Reduce costs and improve performance at our existing operations.

3) Deliver our approved growth projects.

Rio Tinto does not specify in any of their published documents, how these actions will impact their staff. However, Rio Tinto names "labour disputes" and "difficulties to recruit and retain key staff" as business risks which are intensified in tightened market situations (Rio Tinto 2013a).

6.2.2 Response to industry image, culture and work environment

Rio Tinto promotes themself as a favourable employer because they provide "adventure, genuinely interesting work, and fantastic career opportunities" and because of their four core values (Rio Tinto 2013g):

[54] The first Rio Tinto iron ore mine in Western Australia had about 4'500 employees and contractors and produced 220 million tons of iron ore per year.

- *Accountability* - Depend on innovation, so they seek to do everything they can to empower their people to act decisively and to reward them for their initiative.
- *Teamwork* – Believe that working together, in an atmosphere of mutual trust and respect, is the engine that drives their business forward.
- *Integrity* - Foster a culture of honesty and fairness to their colleagues, customers, suppliers and the communities in which they operate.
- *Respect* - Look out for the health, safety and wellbeing of their team-mates, and aim to recognise each other's contribution to the success of the enterprise.

In addition, Rio Tinto promotes "work arrangements that accommodate the diverse needs of individuals at different career and life stages" (Rio Tinto 2013a).

6.2.3 Response to demographic challenge

In none of the documents open to public does Rio Tinto provide detailed information on their workforce profile. They do not mention any challenges related to demographics. But in their Annual Report 2012 they announce to design a "diversity and inclusion scorecard" with metrics in three areas: 1) demographics, 2) performance and development, and 3) values to be applied across Rio Tinto. This scorecard helps to baseline, trend and track progress as well as to address areas where Rio Tinto may be underperforming.

6.2.4 Response to talent pool and labour force diversification

6.2.4.1 Talent pool

In 2012, Rio Tinto designed a newly integrated graduate talent strategy to improve the way they attract, develop and retain graduates in the company. This initiative also provides the framework for how graduates will be developed during the two-year graduate program (Rio Tinto 2013f).

In 2013, Rio Tinto hired 241 new graduates of which 28% are women and 17% from emerging regions. In addition they engaged 87 apprentices, 9% women and 16% Indigenous (Rio Tinto 2013d).

6.2.4.2 Labour force diversification

Rio Tinto fosters "change through diversity and innovation" and understands workforce diversity not only as age and gender but also as race, national or ethnic origin, religion, language, political beliefs, sexual orientation and physical ability. Rio Tinto is committed to "providing employment and career development opportunities to local communities. This mutually beneficial arrangement not only contributes to local economic growth, it also provides a stable talent-pool for our operations" (Rio Tinto 2013a).

In 2012, the proportion of women on the board is 14%, in senior management 15% and in the overall workforce 18%. As the largest Indigenous employer in Australia in 2012, Rio Tinto's WA iron ore businesses employ 7% Aboriginal Australians (Ernst & Young 2013; Rio Tinto 2013a).

Rio Tinto names the following diversity goals and performances (Rio Tinto 2013a):

- Females to represent 20% of the senior management by 2015. 15% representation achieved in 2012.
- Females to represent 40% of the 2015 graduate intake. 30% representation achieved in 2012.
- 15% of the 2015 graduate intake to be nationals from regions where they are developing new businesses. 24% representation achieved in 2012.

The Annual Report 2012 names the following current and planned activities and initiatives related to diversity:

- Executive Committee and "Group Diversity Council" sponsored *diversity and inclusion plans*.
- Active involvement with *Women in Mining* groups, professional women's associations and other targeted recruiting efforts.
- *Why gender matters* guide to further integrate gender, diversity and human rights considerations into all levels of management.
- *Diversity champions network* for increasing leadership engagement, cross-company collaboration and the sharing and replication of best practices.
- 3-year commitment by the chairman to mentoring high-potential female board candidates through the *FTSE100 Cross-company Mentoring Programme*.

6.2.5 Response to changing skills requirements

Similar to BHP Billiton, Rio Tinto's major capital iron ore projects all come to an end in the near future (see Figure 31). Only Simandou (which is not in WA but in Guinea) has approved funding for longer than 2015 (Rio Tinto 2013b):

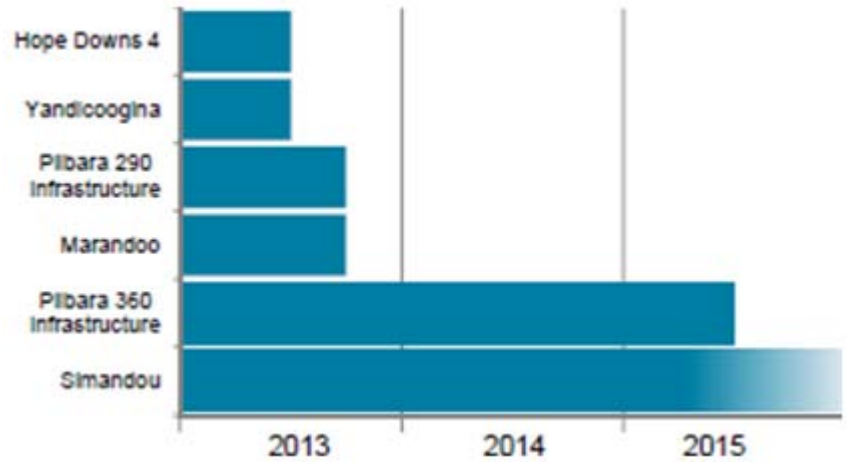


Figure 31: Rio Tinto Iron Ore project pipeline

Launched in 2008, Rio Tinto's "Mine of the Future" program is about finding advanced ways to extract minerals deep within the earth while reducing environmental impacts and further improving safety (Rio Tinto 2013c; Heber 2013a; Ernst & Young 2013):

- The *Operations Centre* in Perth is a key component to enable all Rio Tinto iron ore mines, ports and rail systems to be operated from a single location. It incorporates visualisation and collaboration tools to provide real-time information across the demand chain, and allows optimising mining, maintenance and logistic activities across the Pilbara.
- Rio Tinto aspires to become the world's largest owner and operator of *autonomous haulage system* trucks. They currently have 15 autonomous trucks in operation at their Pilbara sites, steered from their Operations Centre in Perth more than 1'500km away[55]. Early 2014, there should be more than 40 trucks across three mine sites.

[55] For a sneak preview see http://www.youtube.com/watch?v=d96N3dVqg4s

- *Autonomous drill systems* have been successfully trialled at the West Angelas mine in preparation for deployment into other WA operations. In addition to autonomous operation, the drills have innovative rock-recognition capabilities.
- Rio Tinto pioneers in the area of automation with the world's first automated long-distance heavy-haul rail network to be launched in 2014 and completed a year later[56]. This innovation will facilitate the additional capacity required during rapid expansions - without substantial investment in additional trains. Greater flexibility in train scheduling and the removal of driver changeover times will create additional capacity in the rail network.

Although not explicitly said, this program includes massive changes in professional skills requirements – away from manually operated to remotely controlled machinery, from Pilbara based to Perth based jobs.

In 2011, Rio Tinto launched the "Rio Tinto College" which includes the development of functional skills such as Marketing, Health, Safety, Environment and Communities, Stakeholder Engagement, Leadership and Human Resources and comprise a mix of formal classroom, social and e-learning (Rio Tinto 2013f).

Going forward, Rio Tinto plans the following activities and initiatives related to changing soft skills requirements (Rio Tinto 2013a):

- Online language learning tools for 23 different languages to encourage employees to improve existing foreign language skills as well as to learn new languages.
- Training programmes for senior leaders, hiring managers and recruiters to help minimise the impact of unconscious bias in recruitment and training as well as to improve cross-cultural understanding needed for further globalisation.

6.2.6 Response to productivity challenge

Rio Tinto attempts to improve productivity and reduce costs. They are targeting cumulative cash cost savings of US$5 billion over the next two years and have achieved US$1.5 billion in H1 2013 already - through reduction of operating cost and lower exploration and evaluation spend (Rio Tinto 2013a, 2013b).

"We are having to take some tough decisions and actions. We've still got some way to go but we're heading in the right direction", said Rio Tinto CEO Sam Walsh in a recent news article (Heber 2013b).

For the iron ore business in the Pilbara, these actions include:

- Supply chain initiatives (US$62m in 2013),
- Enhancements to mine maintenance schedules (US$39m in 2013),
- Optimisation of workforce including headcount reductions, relocations, challenge of flight cost and challenge of contractor and consultant cost (US$40m in 2013), and
- Lower operational readiness costs (US$12m in 2013).

6.2.7 Response to legal environment

No published comments to legal environment.

[56] Investments so far US$518 million

6.2.8 Response to data and terminology

No published response to data and terminology.

6.2.9 Response to social license to operate

Rio Tinto names the following health and safety goals and performances (Rio Tinto 2013a):

- 30% reduction in the rate of new cases of occupational illness per 10'000 employees between 2008 and 2013. 76% reduction achieved by end of 2012.
- 10% reduction in the rate of employees per 10'000 exposed to an 8h noise dose of more than 85 decibels between 2008 and 2013. 3.2% decrease achieved by end of 2012.

Rio Tinto measures their injury frequency rate which dropped over the last years as shown in Figure 32 (Rio Tinto 2013b):

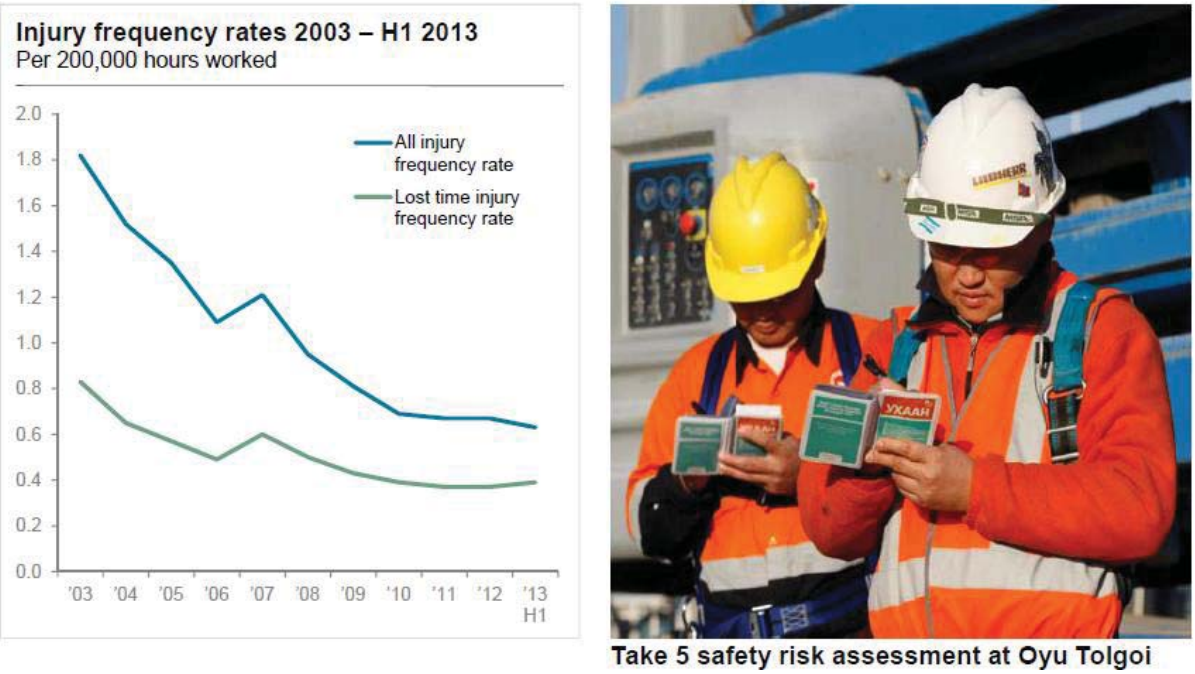


Figure 32: Rio Tinto injury frequency rate and "Take 5" safety risk assessment

One way to prevent injuries is Rio Tinto's so called "Take 5" risk assessment which is a small form that has to be filled in by every employee in prior to executing a task and/or after having been exposed to a hazard/near miss hazard. It includes analysing the task, identifying and assessing the risks and naming which controls will be/have been put in place.

6.2.10 Response to collaboration and management

Like BHP Billiton, Rio Tinto representatives participate in many conferences and events and Rio Tinto is one of the main supporters of Australian Women in Resources Alliance (AWRA).

In order to seeking support for their current and future mining operations, Rio Tinto has negotiated and implemented participation agreements with several Aboriginal groups in the Pilbara. The agreements provide Rio Tinto with business certainty and for Aboriginal people they ensure participation opportunities including health and education, jobs and wealth creation (Rio Tinto 2013e).

6.2.11 Response to skills shortage

The ongoing challenge to recruit the workforce of the future is addressed with a number of activities including the introduction of a national FIFO program with regional FIFO hubs, recruitment of record numbers of apprentices and graduates, the utilisation of 5 dedicated regional training facilities and the funding of more than 40 mining-related scholarships to the University of Western Australia (Rio Tinto 2013a).

6.3 Fortescue Metals Group

Fortescue Metals Group (FMG) is an Australian mining company founded in 2003 by Perth born and raised Andrew Forrest. Since then, FMG has had a race for the best ore deposits with BHP Billiton and Rio Tinto, the two mining giants already producing ore in the Pilbara. In less than a decade, FMG has gone through exceptional growth with construction of the first mine started in early 2006, the first ore shipped in May 2008 and since 2011 being the world's fourth largest iron ore producer (FMG 2013b).

Fortescue Metal Group's operations today include (FMG 2013c):

	Chichester Hub	**Solomon Hub**
Mines	Cloudbreak (2008) Christmas Creek (2009 – 2012)	Firetail (2012) Kings (expected 2013)
Further infrastructure	1 mining camp with 1'600 rooms Airstrip Power station	3 mining camps with 3'000 rooms Airstrip Power station
Rail	620km network, 45 locomotives, 3'244 ore wagons, 30 fuel tanker wagons, 37 ballast wagons, 10 side dump cars, 19 rail carrying cars and eight compressor car	
Port	Herb Elliott Port in Port Hedland including four ship loading berths (5th is expected to be completed in 2014), three inload and two outload circuits	

Table 19: Fortescue Metals Group operations

For the financial year 2012, FMG reports a revenue of US$M 6'681, an EBITDA of US$ 3'000 and 3'968 employees plus more than 11'000 contractors. Relatively low turnover rate of 14.2% (compared to the industry average of 22%) (FMG 2013a).

6.3.1 Response to volatility and uncertainty

FMG endured hardships during the first few months of FY2013, but the company remains confident that iron ore prices will stabilise (FMG 2013a). No published response on how the company wants to tackle volatility and uncertainty in regards to their workforce needs.

6.3.2 Response to industry image, culture and work environment

FMG is the only big mining company in WA which extensively uses social media to promote their business amongst job seekers. To not only address job seekers but also to provide information and a better insight to their families, FMG organises "family days" at mine sites and publishes "Life on site" videos on Youtube[57].

6.3.3 Response to demographic challenge

No published response to demographic challenges.

6.3.4 Response to talent pool and labour force diversification

6.3.4.1 Talent Pool

A two year graduate program allows graduates to rotate across FMG sites and departments based on their interests and business capacity. The program offers real work experience and a

[57] http://www.youtube.com/watch?v=Ni8yVMxJDi0

chance to make a tangible difference with guidance from an experienced technical team (FMG 2013a).

In 2012, FMG had 33 apprentices and approximately 50 traineeships. Traineeships cover areas such as Business Administration, Competitive Manufacturing, Instrumentation, Telecommunication and Warehousing. FMG offers all employees' the opportunity for further education and training such as graduate programs, leadership development programs and assistance for future education[58] (FMG 2013a).

FMG is especially proud of its Vocational Training and Employment Centre (VTEC) which was established in 2006. VTEC trains Aboriginal people to be job-ready and guarantees them a job with FMG or one of its contractors or service providers after having successfully completed their relevant VTEC training (FMG 2013a).

In addition, FMG runs a Five Star Program with the target to build future opportunities for Aboriginal students and employees:

- Fortescue Aboriginal Scholarship Scheme for high school students.
- Fortescue Aboriginal Vocation Scheme which is an Aboriginal School Based Traineeship, during which recipients will be encouraged to complete years 11 and 12 while completing a Certificate II.
- Fortescue Aboriginal Cadetship Scheme linking Aboriginal students enrolled at university with FMG work placements and ongoing employment once they finish their studies.
- Fortescue Aboriginal Leadership Scheme including a Frontline Manager Program and a Leadership Recognition Award.
- Fortescue Fresh Start Scheme which aims to provide meaningful pre-employment training to Aboriginal prisoners that are within three months of release from prison.

6.3.4.2 Labour force diversification

Labour force diversification is a relatively new key term for FMG. Only in FY2012, the company established diversity objectives which are aligned with their corporate values[59] and with legal requirements (FMG 2013a). Figure 33 shows an extract from their Annual Report 2012 including diversity goals and results in 2012:

Objective Area	Objective	Measure	Current Status
Governance	Implement an Equity and Diversity Policy that complies with Legislative requirements.	Policy developed and communicated to the business.	Policy loaded on Intranet and communicated in Induction program.
	Implement a Complaints Procedure that is compliant with Fortescue's Values and meets Legislative requirements.	Complaints procedure in place.	Fair Call reporting procedure in place. Investigation process for EEO, Harassment and Bullying in place
	Prepare and submit annual EOWA Report for Fortescue.	Quality report submitted on time annually.	Inaugural EOWA Report submitted.

[58] including certificate IV, diplomas, advanced diplomas, undergraduate degrees and postgraduate qualifications including masters' degrees

[59] Transparency, integrity, corporate accountability and stewardship

Leadership	Establish Executive Mentoring Programs for groups with minorities in leadership roles.	Mentoring program in place.	Women @ Fortescue lunch series with the CEO established. Aboriginal Leadership Program implemented, first program conducted. Mentoring is a key part of the program. Aboriginal Employees lunch with the CEO series scheduled.
Training	Integrate Equity and Diversity Training into Induction Programs for employees and contractors. Create an online Equity and Diversity Training package for leaders and employees. Communicate and reinforce the Equity and Diversity Policy to the whole workforce.	Training incorporated into induction programs. Online training package for leaders and employees operational. Workforce and contractors have attended a training session.	Respect session integrated into Induction program, to reinforce expected standards. EEO Contact Officer Training Complete for Operational Site. Online training package scoped, a broader online Code of Conduct refresher training program will be considered. Training sessions being completed by site training teams. Agenda item and discussion at Contractor Forum, with request to reinforce expected standards of behaviour with their own workforces.
Policy and Procedure	Develop and implement flexible working arrangement guidelines. Develop and implement a paid parental leave policy.	Policy developed and approved. Policy developed and approved.	Flexible Work Arrangement Guidelines developed. Parental Leave Policy Scoped.

Figure 33: FMG diversity goals and status in FY2012

In regards to their current workforce, FMG reports a total female participation rate of 23%[60] and an indigenous participation rate of 10.1% (FMG 2013a). Note that these figures only include employees but not contractors:

Figure 34: FMG employee number development 2007 - 2012

[60] management level 13%, executive level 16.7% and at board level 0%

6.3.5 Response to changing skills requirements

Automation gains ground at FMG. The company is in the process of introducing an Integrated Train Control System where trains are tracked by GPS and operating instructions are delivered direct to the train via digital communications providing greater utilisation efficiency and improved safety controls (FMG 2013a).

To ensure that employees and contractors are equipped with the right skills, FMG provides inductions and role specific training. Key areas of ongoing focus include safety, environmental and cultural awareness training. These are delivered both during the induction process and on the job (FMG 2013a).

6.3.6 Response to productivity challenge

No published response to productivity challenges.

6.3.7 Response to legal environment

No published response to legal challenges.

6.3.8 Response to data and terminology

No published response to data and terminology challenges. This may not be such an issue for this relatively small and young company.

6.3.9 Response to social license to operate

As the major mining companies, FMG encompasses Health, Safety, Environment and Communities (HSEC) to maintain their social license to operate.

Under Health and Safety, they target zero fatalities, year on year reduction on lost time injury frequency rate, and year on year reduction on total recordable injury frequency rate.

Except for one tragic fatality in FY2011, they achieved all these targets in the financial years 2010, 2011 and 2012 (FMG 2013a).

6.3.10 Response to collaboration and management

Fortescue Metals proudly states that they have achieved their HSEC goals mainly through the collaboration with and support from key stakeholders including their workforce, local communities including traditional land owners, governments, suppliers, customers, non-government organisation and the financial markets (FMG 2013a).

Andrew Forrest is an Ambassador of the Australian Indigenous Education Foundation (AIEF).

6.3.11 Response to skills shortage

FMG believes that skills shortages have not occurred to the extent other mining companies expected and that the labour situation in the Pilbara has not impacted the company's growth targets (Regan 2012).

6.4 Summary of the approaches of three mining companies in response to key findings

In summary, the two diversified multinational mining companies have a) acknowledged most of the key findings, and b) have a structural advantage towards smaller mining companies simply due to their size, commodity diversification and financial power. Volatility and uncertainty hit smaller mining companies such as FMG harder than the majors.

While BHP Billiton and Rio Tinto need to overcome the aftermaths of their M&A activities and try to make use of synergies, Fortescue Metals Group drives a greenfield approach and benefits from lessons learned and benchmarks from other companies. Also, FMG still drives an aggressive approach to engage with new clients and joint venture partners overseas.

BHP Billiton focuses on internal clean up such as process and data consolidation while Rio Tinto promotes their values and focuses on their social licence to operate.

HSEC and especially safety is equally important to all three companies. Both Rio and FMG highlight their collaboration with the Aboriginal communities. Diversity is a relatively new key word for FMG whereas BHP and Rio have already implemented diversity plans and related performance goals.

BHP and Rio try to outperform each other in terms of innovation in automation. However, none of the companies openly provides an approach on how they want to manage the changing skills requirements and what their future skills requirements look like.

Regarding the demographic challenge and knowledge transfer, the three companies provide no insight to their strategies. FIFO concepts are well established but there seem to be very little innovation in terms of flexible work pattern or culture and accommodation on site.

There is no clear understanding in regards to career pathways and transferrable skills.

In regards to external collaboration and management, there seems to be punctual interaction with other labour market stakeholders. Expectations towards each other remain undiscussed and workforce demand undifferentiated.

And finally, the temperature seems to have dropped suddenly from the once urgent call for solutions against the skills shortages.

7. Further recommendations to address key findings

In this section, I provide further recommendations which are relevant to holistically address the previously examined key findings.

But first of all, I briefly elaborate on cultural limitations which have to be considered.

7.1 Cultural limitations

Geert Hofstede's (2013) cultural comparison highlights in Figure 36 the difference between Swiss and Australian culture which I considered when examining and suggesting below further recommendations:

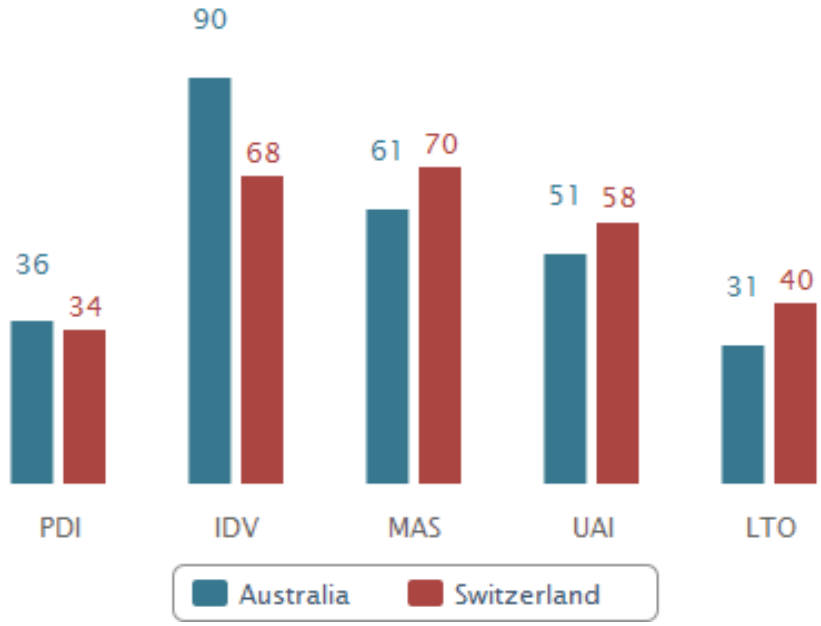


Figure 35: Cultural comparison between Australia and Switzerland

Australia is a highly individualistic culture (IDV) and collaboration in business do not mean as much as in Switzerland.

Australia has an above average masculinity score (MAS) which indicates that Australia is driven by competition, achievement and success. However, this score is lower than in Switzerland which means that compared to Switzerland Australia is more relaxed and laid-back.

Australia has a lower uncertainty avoidance (UAI) score than Switzerland. People are fairly relaxed and not adverse to taking risks, decisions can be altered at short notice and improvisations made.

Switzerland has a far higher long-term orientation (LTO) than Australia. Australian businesses measure their performance on a short-term basis and drive individuals to strive for quick results within the work place.

For further information see Appendix 6.

7.2 Considerations to volatility and uncertainty

To consistently create value in a volatile and uncertain environment means that the right people make the right long-term decisions - also in Human Capital decisions.

The top management therefore has to be able to lead the company based on accurate business information. That requires *integrated, quick and reliable information* flow and that the HR department is involved in strategic discussions and works closely together with other departments such as Sales, Finance or Supply. A reliable workforce planning processes also depends on *regular, structured and effective collaboration* between HR and the operations managers. Workforce planning should also

Besides that, *key roles in the organisation have to be identified* and filled with people with the right skills set – preferably not through contractors as these people not provide a long-term commitment. Currently the mining workforce consists of more than 50% contractors (current data in section 3.4.1) and these people not only work in execution but also inherit key decision making roles. I therefore suggest to develop a strategy how to *manage contractors* (workforce planning, engagement via service contracts or via HR, quality of skills, skills enhancement, knowledge transfer, obligation to follow code of conduct, access to systems and data, access to collaboration tools, information flow if no access, performance etc.).

However, all employees and contractors need to talk the "same language", foster a long-term orientation and work towards the same strategic goals which might be a challenge itself when considering the cultural differences described by Geert Hofstede (see *cultural limitations* in section 7.1).

7.3 Considerations to industry image, culture and work environment

Do good things and talk about it!

Image and culture *cannot directly* and immediately be changed by someone. This only happens with time and through the summary of consistent actions of all employees. Most important is the leaders' credibility and to "walk the talk" which means that they do in real life what they say they will do in strategies and policies. There is still lot of potential in this regard in the mining industry. For example, mining companies have started to implement policies for diversity and safety but according targets have not been achieved as yet.

On the contrary, policies, processes and innovative models can *directly* contribute to a more appealing work environment. Therefore it is important to *listen to the stakeholders* and to embrace their suggestions (also see section 7.11). Continuous improvement processes might be more effective than the "zero error culture" and KPI's.

So far recommendations for diversity seem to be quite stereotypical. Tapping on women and Indigenous people seems to be political correct and maybe a good start. But for other minority groups, the mindset in the minds seems not to be ready yet (compare with section 5.2.1).

And this uniformity is not only reflected in demographics but also in the work environment: Percentage of full-time contracts (compare with section 3.2.4) and motel style accommodation does not allow much personality or creativity.

My recommendations for a changing image and culture include to engage a highly diverse professional leadership team who "walks the talk" and to communicate successful initiatives. For example give women and Aboriginal people speech time at university days or at conferences – also outside of mining events. Organise "family days" at mine sites. The wider community needs to understand mining better, especially all the indirectly dependent companies.

Recommendations regarding work environment again *includes listening to current and potential workforce need*: Rethink rosters, commuting time (compare footnote in section 3.2.4), maybe 3 shifts instead of 2 per day[61] (compare with benchmarks in other industries which operate in remote locations such as the petroleum industry or the navy), try wish list instead of prefixed roster. Very importantly provide (better) mobile and internet connection for better connection to the "real world" back home.

7.4 Considerations to demographic challenge

Professionalise HR towards a *strategic and proactive* acting department.

Rather than assume, *analyse* long-term future demographics as per job profiles, locations and operations – and then talk about it with internal managers, with unions, with governments.

A follow-up task might be to develop *processes* for retention, knowledge transfer, succession planning, talent pools (see section 7.5).

7.5 Considerations to talent pool and labour force diversification

Many relevant strategies have been named to address this key finding but I assume that recommendations may be not enough for mining companies to actually take on responsibility. Maybe the government has to issue state regulations to commit the mining companies to take on more responsibility. Examples could be to spend a percentage of total remuneration into training or to offer a percentage of the total workforce to apprenticeship or WIL places or to encourage international students to remain in Australia after graduation.

My suggestion is that the mining companies themselves *take on responsibility* and link this key finding with the social license to operate and with the productivity challenge.

One topic that has not been discussed yet is, that a couple of years ago, the pre-requirements for job seekers to enter the mining industry were relatively low. In the future, this barrier gets higher and higher due to the technological and regulations development. Mining companies will demand qualifications and ambition that goes against the relatively laid-back culture in Western Australia (see *cultural limitations* in section 7.1).

7.6 Considerations to changing skills requirements

This key finding has the biggest need for action and the least awareness and sophisticated suggestions so far. It is not only the question which skills will be required in the future and when and where and how many.

It is a broader complexity as the challenge is influenced by all stakeholders and impact current as well as future staff and even the wider society:

- Strategy change (for example commodity portfolio, key markets, automation, 3D printing etc.)
- Structural change (for example M&A activities, capital projects, restructuring, transfer from construction to production etc.)
- Cultural change (for example minority groups, client-orientation, participation and collaboration, flexibility, long-term orientation, entrepreneurship and common sense)
- Technological change (for example system integration, transparent reporting, online collaboration, mobile work stations etc.)

[61] Outcome includes better safety due to less fatigue, however more people commuting, feeding, sleeping

I suggest a *high level of collaboration* and approaching the complexity of this finding on the one hand company internally but on the other hand in discussions with representatives from government, education institutes, employers and employees. A constraint herewith might be that mining companies do not want full transparency and might be reluctant to open discussions.

Company internal structured *change management* approach will be needed, lead by the top management and cascaded through the whole organisation. Support might come from specialised (internal or external) Change or Workforce Transition Agents, Business Engagement, Learning & Development as well as Communications.

The change has not only to be managed on the "project side" but also on the "people side" whereas all stakeholders will go through different phases of change acceptance, reaction and hopefully commitment.

7.7 Considerations to productivity challenge

The productivity challenge involves a *cultural challenge* as most of today's mining workforce have experienced and benefited from the recent boom times, high wages and subsequent financial wealth.

Mining companies will need to maximise full *human capital potential* under the consideration, that human capital can only be utilised when people *can, want and may* provide their potential (Meyer-Ferreira 2010). "Can" relates back to the abilities to do the job well hence fulfilling the (changing) skills requirements as outlined in section 7.6. "Want" relates to the motivation to do the job well. Motivation may suffer in tightening work environment. Proactive and transparent *communication* is important where people understand the respective HR initiatives. "May" relates to the effective work environment to do the job well and includes processes, infrastructure, tool, competences etc.

7.8 Considerations to legal environment

The legal environment builds the framework of the labour market in which the mining companies operate. The government has to constantly improve the framework and timely renew outdated work agreements but it should not swing its course with every new election[62].

7.9 Considerations to data and terminology

Mining companies are advised to strategy-align and integrate all their internal processes. Simplify and standardise terminology and data. Rather than filling in Excel spread sheets, use an *integrated management system* which leads to relevant KPIs and helps the top management to holistically and proactively steer the company by keeping individuals or departments accountable.

The government needs to request for *standardised data* but not to "create" data themselves. This helps to prevent misunderstanding and increases reliability in future predictions.

As mentioned in section 7.2, I suggest to also *managing contractor* data and processes.

[62] Liberal party won national elections in September 2013 and new Premier Minister Tony Abbott announced to keep but improve the Fair Work laws

7.10 Considerations to social license to operate

Expand and target HSEC.

Open operations to *public viewing* without compromising on safety targets (for example for tourism, communities but especially family members of employees). This helps for a better understanding, maybe improvement and even to attract new staff.

As long as mine camps remain in their remote blur, as long female and young y-generation people will not be attracted (despite by high salaries but these maximally leads to retention out of financial dependency but not to retention out of passion).

7.11 Considerations to collaboration and management

Apart from already mentioned strategies, formalise *skills round table* with university, TAFE representatives as well as industry leaders. Together, create *career paths* with transferrable skills and development opportunities.

7.12 Considerations to skills shortage

Be specific in short- and long-term workforce planning statements.

On a rolling basis, analyse quantitative and qualitative skills need by geography and on a *long-term* time-line to communicate differentiated skills demand.

Thereupon the other labour market stakeholders can react in a timely manner without urgent activism.

7.13 Summary of further recommendations to address key findings

Simplified, this leads to the following priorities for mining companies:

- Know where you are
- Know where want to go
- Know the environment and limitations
- Define the way
- Manage the change

In addition to the previously discussed strategies, I highlight three additional recommendations which have not been covered in academic or business literature but which help to identify the long-term workforce need and to support mining companies to meet the skills gap:

Recommendation	Explanation
Contractor Management	◗ Clear accountability and responsibility (engagement via service contracts or via HR?) ◗ Include in Workforce Planning ◗ Measure performance and quality of skills ◗ Include in skills enhancement ◗ Maintain knowledge transfer from/to employees ◗ Obligation to follow code of conduct ◗ Access to systems, data and online collaboration tools and guarantee information flow if no access
Change Management	◗ Structured and proactive approach ◗ Led by business leaders, supported by internal or external Change or Workforce Transition Agents, Business Engagement, Communication and Training ◗ Stakeholder Readiness Assessment including stakeholder segmentation and their current and planned status on change curve ◗ What is in for me? ◗ For all different sorts of change projects (strategy change, structural change, cultural change, technological change) ◗ Also for contractors
Stakeholder & Expectation Management	◗ Listen to stakeholders' expectations ◗ Formalise who talks to whom about what and when ◗ Talk about successful initiatives ◗ Report on strategies, status and performance

Table 20: Summary of further recommendations to address key findings

8. Conclusion

In this paper, I discovered the characteristics of the Western Australian mining industry and focused on iron ore.

Figure 36 shows that since 2003, production output of iron ore has steadily increased but the value of the exported ore peaked in 2011. The workforce which includes not only employees but also contractors has also constantly increased to a level of almost 40'000 people – trough organic growth and through migration – but is expected to peak in the next two years as major construction projects come close to an end and mines enter a new stage of technological development.

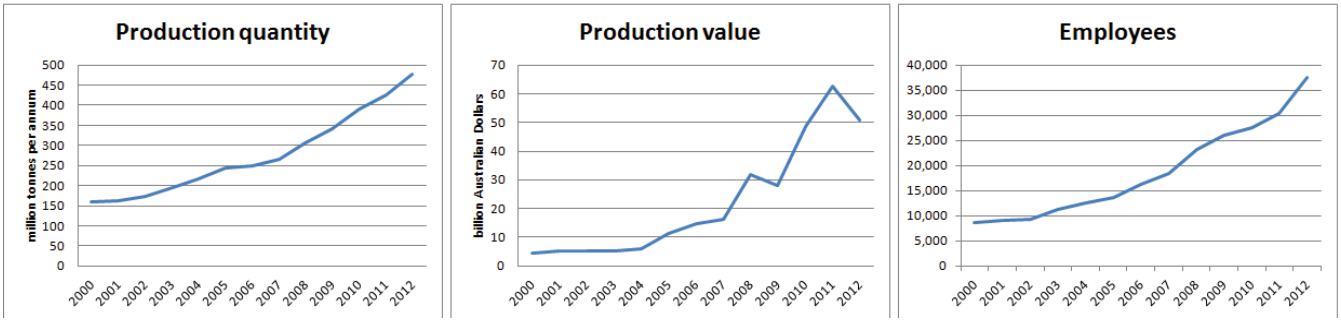


Figure 36: Development of the WA iron ore production, value and employees between 2000 and 2012

There is evidence that mining companies face business and financial risks if they cannot find the amount and quality of required skills in the WA labour market. However, these risks have not lead to actual damage or financial losses yet. The call for skills shortages remains a rather vague one and bases on perceptions rather than differentiated workforce predictions.

There is no agreed understanding between the labour market stakeholder, which skills will be short and by when. The main reason is that mining companies a) lack reliable workforce and demographics data and analytics and b) that they do not release information about their Human Capital strategies.

In conclusion, the labour market in the WA mining industry faces the following key findings:

- Volatility and uncertainty
- Industry image, culture and work environment
- Demographic challenge
- Talent pool and labour force diversification
- Changing skills requirements
- Productivity challenge
- Legal environment
- Data and terminology
- Social license to operate
- Collaboration and management
- Skills shortage

I discussed the effect of these findings and examined how they all influence each other but that they all impact the perception and severity of the skills shortage in the WA mining industry.

I presented strategies which have been published by various authors to address the identified key findings and I examined how the three biggest iron ore producers in Western Australia, BHP Billiton, Rio Tinto and Fortescue Metals Group – respond to the key findings and the suggested strategies.

The two diversified multinational mining companies have a) acknowledged most of the key findings, and b) have a structural advantage towards smaller mining companies simply due to their size, commodity diversification and financial power. Volatility and uncertainty hit smaller mining companies such as FMG harder than the majors.

However, it is argued that HR departments are not professional enough to strategically manage human capital and only operationally support their business. Punctual initiatives are in place (for example for diversity goals or regarding Learning & Development) but there is little public information on the processes and tools used today by the mining companies, to identify their workforce need and on strategies to meet the respective requirement.

In this regard, I failed to provide a comprehensive answer to the initial question which processes are used today by diversified multinational mining companies in Western Australia to identify the workforce need and to meet the respective requirements. The mining companies I contacted did not respond to my requests.

Therefore, instead of being able to develop particular advises for each of the examined mining companies, I discussed the previously published strategies under consideration of cultural limitations. As an outcome, I highlighted two additional recommendations which have not been covered in academic or business literature but which help to identify the long-term workforce need and to support mining companies to meet the skills gap:

- Contractor Management as more than half of the mining companies' workforces are contractors but these are neither planned nor managed via HR.
- Strategic approach for effective Change Management lead by business leaders, supported by Change Agents, Business Engagement, Communication and Training.
- Stakeholder & Expectation Management to support and professionalise internal and external collaboration.

More important than to list recommendations though is to discuss them, decide on applicability and relevance in companies and to implement and execute them. This paper provides a basis for further discussion within the mining companies and in collaboration with other labour market stakeholders.

Therefore, a positive outcome of this paper is that I achieved my personal goal to gain a better understanding of the parameters and correlations in the labour market in the WA mining industry and that I can use this paper as a basis for industry knowledge transfer to my colleagues and business partners.

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9.2 Figures

Figure 1 from *DMP - Statistical Digest 2012*

Figure 2 from *DMP - Statistical Digest 2012*

Figure 3 based on *Rio Tinto - Chartbook*

Figure 4 from *DMP - Statistical Digest 2012*

Figure 5 from *Index Mundi - Iron Ore Monthly Price*

Figure 6 based on *Accenture – Introduction to Mining Course*

Figure 7 from *Tonts - Labour Market Dynamics in Resource Dependent Regions*

Figure 8 is a picture taken by Irène Studhalter at Coondewanna Airport

Figure 9 from *AMMA - Training and 457 visas in the mining industry*

Figure 10 from *DMP - Employment 2012*

Figure 11 from *DMP - Employment 2011-12*

Figure 12 from *AMMA - Activities Report 2011*

Figure 13 from *ABS - Employee Earnings and Hours*

Figure 14 from *AusIMM members' employment survey*

Figure 15 from *DOCEP - Mining in WA: 2011 labour market overview*

Figure 16 from *AMMA - Human Resources Consultancy*

Figure 17 from *DMP - Employment 2010*

Figure 18 from *AusIMM members' employment survey 2013*

Figure 19 based on *ABS - Australian Historical Population Statistics*

Figure 20 from *DEEWR - Skill Shortages Western Australia*

Figure 21 from *Business risks facing mining and metals 2013-2014*

Figure 22 from *Commodity booms and their impacts on the Western Australian economy: The iron ore case*

Figure 23 from *Commodity booms and their impacts on the Western Australian economy: The iron ore case*

Figure 24 from *CME - State Growth Outlook 2013*

Figure 25 from *CME - State Growth Outlook 2013*

Figure 26 from *FMG – Annual Report 2012*

Figure 27 drawn by Irène Studhalter

Figure 28 from *Business risks facing mining and metals 2013-2014*

Figure 29 based on *BHP Billiton - Sustainability Report 2012*

Figure 30 from *BHP Billiton - Annual Report 2012*

Figure 31 from *Rio Tinto - Chartbook*

Figure 32 from *Rio Tinto - Chartbook*

Figure 33 from *FMG – Annual Report 2012*

Figure 34 from *FMG – Annual Report 2012*

Figure 35 from Geert Hofstede - *Australia in comparison with Switzerland*

Figure 36 based on *DMP - Statistical Digest 2012*

Figure 37 from *DMP - Statistical Digest 2012*

Declaration

Ich erkläre hiermit, dass ich die vorliegende Arbeit selbständig, ohne Mithilfe Dritter und nur unter Benützung der angegebenen Quellen verfasst habe.

Winterthur, Januar 2014 Irène Studhalter

Appendix 1

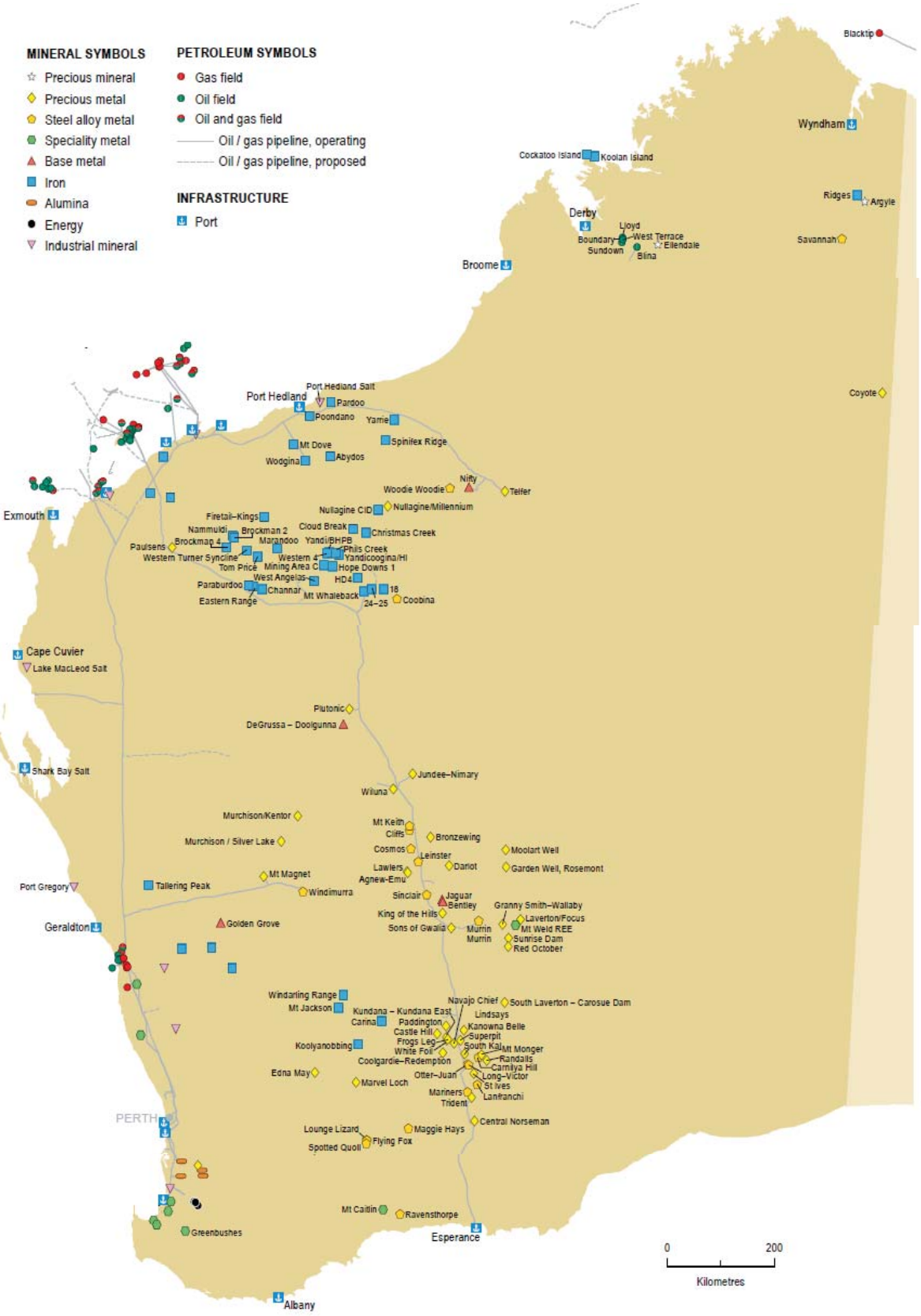

Figure 37: Major mining and petroleum projects in Western Australia

Appendix 2

Extract from http://www.royhill.com.au/content/project (accessed 9 September 2013)

Roy Hill Project

The 55 million tonne per annum Roy Hill Project is the next iron ore mining, rail & port project to be developed in the Pilbara region of Western Australia. It is a world-class, low phosphorus, Marra Mamba iron ore deposit located in the Pilbara – one of the world's premier iron ore provinces – and the only independent iron ore project with West Australian majority ownership.

Situated approximately 115 kilometres north of Newman, the Roy Hill Project lies on the flat plains at the eastern end of the Chichester Range.

The Roy Hill Project has a defined mineralisation of more than 2.4 billion tonnes of +55% Fe iron ore, enough to sustain a mine life of more than 20 years, with Roy Hill aiming to load its first shipment of ore for export by 2015.

Mine

The geology of the Roy Hill deposit lends itself to a conventional open pit, drill and blast, truck and excavator bulk mining method from multiple production benches. The bulk of the overburden and waste produced from mining activities will be dumped into the previously mined out pit voids.

The processing plant for the Roy Hill project will utilise low risk, proven technology and will be the largest single feed processing plant in the region.

Rail

A 344 kilometre single line, heavy haul railway will be constructed to transport the processed iron ore from the Roy Hill Mine, to a dedicated port stockyard facility located to the south of Port Hedland.

The independently owned and operated Roy Hill railway will operate five ore trains per day, each consisting of three locomotives hauling 232 ore cars with a total payload of 31,450 tonnes of ore.

Port

Roy Hill's purpose built iron ore port facility at Port Hedland will be constructed to receive, stockpile, screen and export 55Mtpa (wet) of direct shipped iron ore as lump and fines and will be designed to accommodate future expansion.

The wharf has been designed to accommodate an average vessel size of 206,000 tonnes, but is capable of handling larger 320,000 tonne cape size vessels.

Corporate Headquarters and Remote Operations Centre

Roy Hill will introduce a significant new dimension to the mining industry, with the construction of a Perth-based integrated Corporate Headquarters and Remote Operations Centre (ROC).

The amalgamation of the Corporate Headquarters and the ROC will provide Roy Hill with the ability to integrate the operations, marketing and corporate services functions, to optimise production throughput, quality and reliability across the entire business.

The ROC will provide end-to-end integration of operations by managing safety, human capital and production through the adoption of state-of the-art automation.

Additional Infrastructure

To support mine construction and operations, Roy Hill will construct and operate an airport, well equipped, modern workforce accommodation for 3,600 construction workers and approximately 2,000 operational staff and contractors, site access roads, and mining and processing support facilities.

Project Progress

All primary environmental and other approvals are in place, a A$3.2 billion equity agreement has been finalised with a consortium comprising Marubeni Corporation, POSCO and China Steel Corporation. Major co-lead debt financiers have been appointed and debt finance is progressing well.

The Roy Hill Project continues to move from strength to strength, with a significant number of milestones achieved to date. Early works such as clearing the centreline for the railway and dredging of the harbour have been completed, long lead items have been ordered, four 300 room Rail Camps have been constructed, Ginbata Airport (capable of handling 737 aircraft) is operating, construction is well advanced on the 2000 room Permanent Mine Accommodation Village and 1200 room Gateway Village in Port Hedland, bulk earthworks have commenced for the Mine Processing Plant and the Corporate HQ & Remote Operations Centre is scheduled for completion in November 2013.

Applying knowledge from previous mining ventures and a spirit of innovation, Roy Hill with its partners is poised to become a major independent international player in the provision of premium lump and fines iron ore products to the world market.

Appendix 3

Skilled Occupation List as of 1 July 2013 published by the Department of Immigration and Border Protection (IMMI 2013b). Highlighted in yellow are the relevant occupations for the mining industry:

ANZSCO Code	Occupation
133111	Construction Project Manager
133112	Project Builder
133211	Engineering Manager
133513	Production Manager (Mining)
134111	Child Care Centre Manager
134211	Medical Administrator
134212	Nursing Clinical Director
134213	Primary Health Organisation Manager
134214	Welfare Centre Manager
221111	Accountant (General)
221112	Management Accountant
221113	Taxation Accountant
221213	External Auditor
221214	Internal Auditor
224111	Actuary
224511	Land Economist
224512	Valuer
231212	Ship's Engineer
231213	Ship's Master
231214	Ship's Officer
232111	Architect
232112	Landscape Architect
232213	Cartographer
232214	Other Spatial Scientist
232212	Surveyor
232611	Urban and Regional Planner
233111	Chemical Engineer
233112	Materials Engineer
233211	Civil Engineer
233212	Geotechnical Engineer
233213	Quantity Surveyor
233214	Structural Engineer
233215	Transport Engineer
233311	Electrical Engineer
233411	Electronics Engineer
233511	Industrial Engineer
233512	Mechanical Engineer

ANZSCO Code	Occupation
253515	Otorhinolaryngologist
253516	Paediatric Surgeon
253517	Plastic and Reconstructive Surgeon
253518	Urologist
253521	Vascular Surgeon
253911	Dermatologist
253912	Emergency Medicine Specialist
253913	Obstetrician and Gynaecologist
253914	Ophthalmologist
253915	Pathologist
253917	Diagnostic and Interventional Radiologist
253918	Radiation Oncologist
253999	Medical Practitioners nec
254111	Midwife
254411	Nurse Practitioner
254412	Registered Nurse (Aged Care)
254413	Registered Nurse (Child and Family Health)
254414	Registered Nurse (Community Health)
254415	Registered Nurse (Critical Care and Emergency)
254416	Registered Nurse (Development Disability)
254417	Registered Nurse (Disability and Rehabilitation)
254418	Registered Nurse (Medical)
254421	Registered Nurse (Medical Practice)
254422	Registered Nurse (Mental Health)
254423	Registered Nurse (Perioperative)
254424	Registered Nurse (Surgical)
254425	Registered Nurse (Paediatric)
254499	Registered Nurse nec
261111	ICT business Analyst
261112	Systems Analyst
261311	Analyst Programmer
261312	Developer Programmer
261313	Software Engineer
263111	Computer Network and Systems Engineer
263311	Telecommunications Engineer
263312	Telecommunications Network Engineer
271111	Barrister

233513	Production or Plant Engineer
233611	Mining Engineer (Excluding Petroleum)
233612	Petroleum Engineer
233911	Aeronautical Engineer
233912	Agricultural Engineer
233913	Biomedical Engineer
233914	Engineering Technologist
233915	Environmental Engineer
233916	Naval Architect
234111	Agricultural Consultant
234112	Agricultural Scientist
234113	Forester
234611	Medical Laboratory Scientist
234711	Veterinarian
234912	Metallurgist
234914	Physicist (Medical Physicist only)
241111	Early Childhood (Pre-Primary School) Teacher
241411	Secondary School Teacher
241511	Special Needs Teacher
241512	Teacher of the Hearing Impaired
241513	Teacher of the Sight Impaired
241599	Special Education Teachers nec
251211	Medical Diagnostic Radiographer
251212	Medical Radiation Therapist
251213	Nuclear Medicine Technologist
251214	Sonographer
251311	Environmental Health Officer
251312	Occupational Health and Safety Advisor
251411	Optometrist
252111	Chiropractor
252112	Osteopath
252311	Dental Specialist
252312	Dentist
252411	Occupational Therapist
252511	Physiotherapist
252611	Podiatrist
252712	Speech Pathologist
253111	General Medical Practitioner
253211	Anaesthetist
253311	Specialist Physician (General Medicine)
253312	Cardiologist
253313	Clinical Haematologist
253314	Medical Oncologist
253315	Endocrinologist
253316	Gastroenterologist

271311	Solicitor
272311	Clinical Psychologist
272312	Educational Psychologist
272313	Organisational Psychologist
272314	Psychotherapist
272399	Psychologists nec
272511	Social Worker
312211	Civil Engineering Draftsperson
312212	Civil Engineering Technician
312311	Electrical Engineering Draftsperson
312312	Electrical Engineering Technician
313211	Radio Communications Technician
313212	Telecommunications Field Engineer
313213	Telecommunications Network Planner
313214	Telecommunications Technical Officer or Technologist
321111	Automotive Electrician
321211	Motor Mechanic (General)
321212	Diesel Motor Mechanic
321213	Motorcycle Mechanic
321214	Small Engine Mechanic
322211	Sheetmetal Trades Worker
322311	Metal Fabricator
322312	Pressure Welder
322313	Welder (First Class)
323211	Fitter (General)
323212	Fitter and Turner
323213	Fitter-Welder
323214	Metal Machinist (First Class)
323313	Locksmith
331112	Stonemason
331211	Carpenter and Joiner
331212	Carpenter
331213	Joiner
332211	Painting trades workers
333111	Glazier
333211	Fibrous Plasterer
333212	Solid Plasterer
334111	Plumber (General)
334112	Airconditioning and Mechanical Services Plumber
334113	Drainer
334114	Gasfitter
334115	Roof plumber
341111	Electrician (General)
341112	Electrician (Special Class)
341113	Lift Mechanic

253317	Intensive Care Specialist
253318	Neurologist
253321	Paediatrician
253322	Renal Medicine Specialist
253323	Rheumatologist
253324	Thoracic Medicine Specialist
253399	Specialist Physicians nec
253411	Psychiatrist
253511	Surgeon (General)
253512	Cardiothoracic Surgeon
253513	Neurosurgeon
253514	Orthopaedic Surgeon

342111	Airconditioning and Refrigeration Mechanic
342211	Electrical Linesworker
342212	Technical Cable Jointer
342313	Electronic Equipment Trades Worker
342314	Electronic Instrument Trades Worker (General)
342315	Electronic Instrument Trades Worker (Special Class)
399111	Boat Builder and Repairer
399112	Shipwright
411211	Dental Hygienist
411212	Dental Prosthetist
411213	Dental Technician
411214	Dental Therapist

Table 21: SOL as of 1 July 2013

Appendix 4

Below find a summary of Australia's 10 National Employment Standards which can be reviewed via http://www.fairwork.gov.au/employment/national-employment-standards/Pages/default.aspx?friendlyURL=1&nes (accessed 25 September 2013):

- maximum weekly hours
- requests for flexible working arrangements
- parental leave and related entitlements
- annual leave
- personal/carer's leave and compassionate leave
- community service leave
- long service leave
- public holidays
- notice of termination and redundancy pay
- Fair Work Information Statement

The NES cover everyone in the national workplace relations system[63]. They started on 1 January 2010 under the previous Labour government. Together with the national minimum wage, NES build a minimum safety net for employees.

[63] about 85% of the total Australian workforce

Appendix 5

Appendix 5 provides a catalogue of all strategies to address the key findings – listed along focus or process areas:

Focus areas	Strategies	Responsibility[64]
Labour market regulation	◗ Provide a robust and fair workplace relations system ◗ Maintain an efficient and effective policy making process ◗ Introduce diversity legislation and policies, national health and safety regulations and Enterprise Migration Agreements for major projects ◗ Regulate temporary migration and allow more 457 visas, fast-track 457 visa holders to permanent residency and assist smaller mining companies with 457 visa processing ◗ Act as "Think Tank" and develop strategy for attracting and retaining women in the mining industry and small-to-medium sized Indigenous contracting businesses ◗ Fund pilot programs for brokers and FIFO development coordinators who include unemployed ◗ Clarify responsibilities and provide single point of contact for labour market questions, encourage industry players to create jobs for local people not currently in the workforce ◗ Manage collaboration between mining companies, education and employment service organisations regarding workforce planning and career pathways ◗ SkillsAustralia to report annually on the status of skills shortages in the natural resource sector	G
Education	◗ Develop strategy to enhance language, literacy and numeracy skills of job seekers and increase senior school students' participation in mathematics and science as these subjects build the basis for future required skills set in the mining industry ◗ Develop a marketing kit to promote agreed career pathways ◗ Develop connections between schools and educational institutes ◗ Ensure funding for education institutes with strong link to natural resource industry ◗ Ensure that (pre-)VET courses are fully recognised for quality and relevance by mining companies	G, E
Strategy alignment	◗ Substitute capital for labour through innovation, reassess longer-term demand for specific skills in light of expected automation ◗ Introduce strategy aligned competency framework including hard and soft skills ◗ Use strategic planning approach (HR strategy linked with business strategy) ◗ Develop strategies on how to attract untapped talent ◗ Clarify business strategy and strategy-align all business processes ◗ Develop strategies to harness corporate intelligence ◗ Weight training culture as high as safety culture	MC
HR policies and tools	◗ Develop career paths with permeability from and to other indus-	MC

[64] **Legend:**
MC = Mining companies and Industry Associations
G = Government and government departments
U = Unions
E = Education institutes

Focus areas	Strategies	Responsibility[64]
	tries ◗ Develop differentiated employee value proposition (EVP) ◗ Adjust work environment towards flexible and reduced rosters ◗ Balance career development and remuneration ◗ Establish FIFO as functional solution to combine flexible remote working with big-city lifestyle incl. social and cultural life	
HR process portfolio and design	◗ Standardise processes across locations and fully integrate all business processes ◗ Introduce joint decision making between corporate ad operations ◗ Clarify accountabilities in HR and HSEC processes ◗ Introduce early labour scheduling and sourcing within mine planning Implement HR risk management ◗ Develop HR/skills retention processes, foster knowledge sharing ◗ Introduce succession planning (to replace retirees) and maintain talent pools ◗ Have anti discrimination processes and measurements in place	MC
HR process execution	◗ Top management to be good example in executing policies ◗ Focus on effective HR actions, do what supports the strategy but nothing that does not ◗ Consistent, consequent and effective practise with any HR initiatives (walk the talk)	MC
Workforce Planning	◗ Provide workforce impact statement and workforce planning details when applying for state project approval ◗ Plan quantitative and qualitative future workforce demand (short- and long-term) ◗ Introduce strategic workforce planning including a demographical inventory and involve executive, business and finance team in workforce planning ◗ Make the planning focussed on strong data ◗ Anticipate skills need of future workforce under the aspect of automation and other technological development ◗ Segment the workforce in meaningful groups when planning	MC
Learning & Development	◗ Increase general level of economic skills of managers and business leaders ◗ Up-skill Human Resources departments ◗ Introduce general HR skills to managers ◗ Up-skill Union leaders ◗ Increase the number of apprenticeships and traineeships, explore "bonded scholarships" and increase WIL places ◗ Launch accelerated apprenticeships for adults ◗ Encourage semi-skilled workers to up-skill ◗ Develop sustainable skills development programs and innovative ways to develop new career paths (despite the traditional model wherein a worker joins the sector after completing an undergraduate program and stays in the job or organisation for years) ◗ Offer industry specific and soft skill training ◗ Offer options to gain wider experience to understand their impact in the mining value chain ◗ Foster knowledge transfer from elderly to younger workforce ◗ Introduce mentoring programs and networking opportunities ◗ Explore innovative ways in training including online, collaborative, simulated and blended learning	MC
Talent pool	◗ Grow the talent pool ◗ Increase number of apprenticeships	G, MC

Focus areas	Strategies	Responsibility[64]
	◗ Trial alternative apprenticeship models(for example mobile training centres at mine sites) ◗ Industry skills councils to assist people in the recognition of their current trade certificates and definition of training gaps ◗ Mining companies to place priority on up-skilling existing workers before recruiting overseas ◗ Employment service providers to promote work in the natural resource sector amongst unemployed tradespeople ◗ Construction workers who lose their job to seek re-education in adult apprenticeships ◗ Government to broker higher education ◗ Universities to formalise and strengthen their ties with each other and with mining companies ◗ Industry associations to provide internships and mentoring for all first- and second-year engineering students	
Marketing initiatives	◗ Improve HSEC initiatives and measurements ◗ Keep staff motivated ◗ Encourage expatriates to return home ◗ Generate a culture of loyalty	MC
Recruitment	◗ Attract new talent to the industry and change the sector's image by opening up highly technical roles ◗ Broaden perspective of educational background when recruiting	MC
Retention	◗ Acknowledge woman and local workers as latent talent pool ◗ Acknowledge corporate social responsibility ◗ Source talent from aligned sectors and a broader demographic ◗ Encourage retired workers to re-enter the workforce ◗ Retain critical skills held by older workers	MC
HR controlling	◗ Measure diversity effectiveness and performance and link with remuneration ◗ Analyse diversity impact on social lice to operate	MC
Communication	◗ Open and transparent internal and external communication to reduce stigma ◗ Proactive and understandable communication of HR initiatives ◗ Communicate technological development to attract young people	MC
Technology	◗ Introduce standardised business processes, common data and integrated systems	MC
Infrastructure	◗ Consider funding infrastructure in regions affected by resource operations ◗ Address housing shortages, introduce more comfort in camps	MC
Collaboration	◗ Improve internal collaboration and support with understandable communication ◗ Improve collaboration across all labour market stakeholders ◗ Stop pursuing opportunistic and self-serving terms ◗ Develop strategic alliances with institutions and communities ◗ Formalise collaboration and build awareness of expectations and limitations	G, MC, E, U

Table 22: Summary of strategies per focus or process area

Appendix 6

Below find further information on Australia's cultural profile explained with Geert Hofstede's five dimensions on power distance, individualism, masculinity/femininity, uncertainty avoidance and long-term orientation.

Power distance (PDI)

This dimension deals with the fact that all individuals in societies are not equal – it expresses the attitude of the culture towards these inequalities amongst us. Power distance is defined as the extent to which the less powerful members of institutions and organisations within a country expect and accept that power is distributed unequally. It has to do with the fact that a society's inequality is endorsed by the followers as much as by the leaders.

Australia scores low on this dimension (36). Within Australian organizations, hierarchy is established for convenience, superiors are always accessible and managers rely on individual employees and teams for their expertise. Both managers and employees expect to be consulted and information is shared frequently. At the same time, communication is informal, direct and participative.

Individualism (IDV)

The fundamental issue addressed by this dimension is the degree of interdependence a society maintains among its members. It has to do with whether people´s self-image is defined in terms of "I" or "We". In Individualist societies people are supposed to look after themselves and their direct family only. In Collectivist societies people belong to "in groups" that take care of them in exchange for loyalty.

Australia, with a score of 90 on this dimension, is a highly individualistic culture. This translates into a loosely-knit society in which the expectation is that people look after themselves and their immediate families. In the business world, employees are expected to be self-reliant and display initiative. Also, within the exchange-based world of work, hiring and promotion decisions are based on merit or evidence of what one has done or can do.

Masculinity / Femininity (MAS)

A high score (masculine) on this dimension indicates that the society will be driven by competition, achievement and success, with success being defined by the "winner" or "best-in-the-field". This value system starts in school and continues throughout one's life – both in work and leisure pursuits.

A low score (feminine) on the dimension means that the dominant values in society are caring for others and quality of life. A feminine society is one where quality of life is the sign of success and standing out from the crowd is not admirable. The fundamental issue here is what motivates people, wanting to be the best (masculine) or liking what you do (feminine).

Australia scores 61 on this dimension and is considered a "masculine" society. Behaviour in school, work, and play are based on the shared values that people should "strive to be the best they can be" and that "the winner takes all". Australians are proud of their successes and achievements in life, and it offers a basis for hiring and promotion decisions in the workplace. Conflicts are resolved at the individual level and the goal is to win.

Uncertainty avoidance (UAI)

The dimension Uncertainty Avoidance has to do with the way that a society deals with the fact that the future can never be known: should we try to control the future or just let it happen? This ambiguity brings with it anxiety and different cultures have learnt to deal with this anxiety in different ways. The extent to which the members of a culture feel threatened by ambiguous or unknown situations and have created beliefs and institutions that try to avoid these is reflected in the UAI score.

Australia scores 51 on this dimension and is a fairly pragmatic culture in terms of uncertainty avoidance. This means that both generalists and experts are needed. There is focus on planning, and they can be altered at short notice and improvisations made. Emotions are not shown much in Australia, people are fairly relaxed and not adverse to taking risks. Consequently, there is a larger degree of acceptance for new ideas, innovative products and a willingness to try something new or different, whether it pertains to technology, business practices, or foodstuffs.

Long-term orientation (LTO)

The long term orientation dimension is closely related to the teachings of Confucius and can be interpreted as dealing with society's search for virtue, the extent to which a society shows a pragmatic future-oriented perspective rather than a conventional historical short-term point of view.

Australia scores 31 on this dimension and is a short-term oriented culture. As a result, it is a culture focused on traditions and fulfilling social obligations. Given this perspective, Australian businesses measure their performance on a short-term basis, with profit and loss statements being issued on a quarterly basis. This also drives individuals to strive for quick results within the work place. There is also a need to have the "absolute truth" in all matters.

Appendix 7

Links to further related news articles (only usable in electronic version):

The West Australian

West Australian Newspapers Limited belongs to Seven West Media, which call themselves "the leading listed national multi-platform media business based in Australia".

Date published	Title	Author
30.07.2013	WA mining projects losing pace	Shane Wright
	Roy Hill allies fund extra $170m	Nick Evans
01.08.2013	Resources slowdown pushes up vacancies	Marissa Lague
02.08.2013	Resilient miners set for Diggers	Peter Klinger
	Pay survey at odds with cuts	Sean Smith
03.08.2013	Explorers flee risk but not new challenges	Nick Evans
	Booms lift household incomes	Shane Wright
05.08.2013	We're not all billionaires: Diggers chairman	Peter Klinger
	China looks like pre-GFC America: Obama adviser	Peter Klinger
	FMG's Power tips more stable iron ore prices	Nick Evans
	Emotions take toll on projects: Deloitte	Neale Prior
	Juniors bedevilled despite demand	Nick Evans
	Sirius tells compelling story	Peter Klinger
08.08.2013	WA full time jobs drop	Shane Wright
09.08.2013	Figures point to gloomy jobs market	Shane Wright
	Agencies sound debt alarm	Shane Wright
	Buswell Budget hits hip pocket	Gareth Parker
21.08.2013	Worst over for resources job losses	Kim Macdonald
22.08.2013	FMG lifts profit by 12pc to $US1.74b	--
	Gold Fields pays $US300m for Barrick mines	Nick Evans
	NRW posts 24pc profit slide	--
	Atlas' operating profit plummets	--
	Hedland rejig a challenge for BHP	Nick Evans
02.09.2013	Rio ships first ore from expanded ops	--
03.09.2013	Rio boasts cost-saving initiatives	Peter Klinger
	BHP train drivers reject pay offer	Kim Macdonald

Table 23: News articles in "The West Australian"

Western Australia ABC News

According to the ABC Homepage "74% of all Australians use ABC services each week via television, radio and online with 8.4 billion hours of ABC content consumed annually".

Date published	Title	Author
29.01.2013	WA's population continues to grow	--
30.07.2013	Mining policy: where the parties stand	Eliza Borrello
	Farmers losing out as miners lure skilled labourers with better wages	Peter Lewis
	Insolvency expert predicts pain for miners as boom loses steam	Peter Ryan
	Politicians are powerless over Australia's economy	Chris Berg
02.08.2013	Low Australian dollar a boon for mining industry	Babs McHugh
	WA's population continues to grow	--

Table 24: News articles in "Western Australia ABC News"

Australian Mining

Established in 1908, Australian Mining aims to lead and inform the Australian mining industry of the latest innovations in mining technology and equipment.

Date published	Title	Author
23.07.2012	Two years left for mining boom: Deloitte	Andrew Duffy
09.10.2012	BHP will cut iron ore jobs	Cole Latimer
22.01.2013	Top 10 mining trends for 2013	Alex Heber
29.01.2013	Mining construction set to peak in 2013: Deloitte	Alex Heber
18.07.2013	Miners move from construction to production	Alex Heber
30.07.2013	Now is the time to develop new mines - easier said than done	Lawrence Williams
02.08.2013	Mining M&A activity down in 2013	Cole Latimer
09.08.2013	WA delivers budget amid mining slump	Malavika Santhebennur
	Infrastructure the answer to the fading mining boom?	Malavika Santhebennur
	Jobless rates up as mining slumps	Malavika Santhebennur
25.09.2013	Weaker commodity market here for the short term: BHP	Alex Heber
27.09.2013	Automation earns its stripes	Alex Heber

Table 25: News articles in "Australian Mining"

Mining.com

Mining.com is a web-based global mining publication focusing on news and commentary about mining and mineral exploration. They call themselves a "one-stop-shop for mining industry professionals, educators, investors, and the general public".

Date published	Title	Author
28.06.2013	BHP's cost cutting measures reach iron ore division	Cecilia Jamasmie
08.08.2013	Rio Tinto half year profit plummets 71% on weak commodity prices	Anthony Halley
23.09.2013	One in ten Australian mining professionals unemployed	Anthony Halley
	Swiss donate tax money from Glencore Xstrata to countries where firm accused of wrongdoing	Cecilia Jamasmie

Table 26: News articles in "Mining.com"

Mining Weekly

MiningWeekly claims to "provide real time news reportage through originated written, video and audio material on projects, products, policies, personalities and technoeconomic progress".

Date published	Title	Author
17.04.2013	BHP iron-ore output up, coal production down	Esmarie Swanepoel
10.05.2013	Resources sector warns against new taxes ahead of federal budget	Esmarie Swanepoel
16.07.2013	Rio Tinto Q2 iron-ore, copper output up, coking coal production drops	Esmarie Swanepoel
30.07.2013	Aus resources sector business confidence takes a dip	Esmarie Swanepoel
05.08.2013	Fortescue optimistic on China demand	Esmarie Swanepoel
	Eldridge encourages sector to improve perceptions	Esmarie Swanepoel
	Volatile commodities drives down Deloitte index	Esmarie Swanepoel
07.08.2013	BHP CEO says taking long view on potash	Reuters
09.08.2013	State budget disappoints miners	Esmarie Swanepoel
04.09.2013	BHP cuts ribbon at new coal mine	Esmarie Swanepoel
05.09.2013	Mining M&A activity to remain lethargic – PwC	Esmarie Swanepoel
09.09.2013	Australian miners cheer as Abbott defeats Rudd	Esmarie Swanepoel

Table 27: News articles in "Mining Weekly"

Thomson Reuters

Thomson Reuters claim to be "the world's largest international multimedia news agency, providing investing news, world news, business news, technology news, headline news, small business news, news alerts, personal finance, stock market, and mutual funds information available on Reuters.com, video, mobile, and interactive television platforms".

Date published	Title	Author
31.01.2013	Fat profit margins make iron-ore the apple of miners' eyes	James Regan
07.03.2013	BHP responds to China claim of iron-ore price manipulation	--
16.07.2013	Glencore says to suspend Australia iron ore mining, citing poor outlook	--
29.07.2013	Heavenly iron ore prices bound for purgatory as China reforms	Manolo Serapio Jr
08.08.2013	China's July iron ore imports hit record high	Ruby Lian and David Stanway
05.09.2013	Australia ships more iron-ore to China as demand stays strong	--

Table 28: News articles in "Thomson Reuters"