



The Australian Mining and ICT Industries: productivity and growth

A Report to NOIE and DCITA

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Contents

1.	Executive Summary	4
2.	Background to Study	8
3.	The Australian Mining Industry	9
4.	The Mining ICT Sector	16
5.	Key issues.....	18
6.	Survey method	19
7.	Findings	24
8.	Conclusions and Implications for Policy.....	49
	References	56
	Attachment A: Survey Questionnaire Instrument for Miners	57
	Attachment B: Survey Questionnaire Instrument for ICT Providers	65
	Attachment C: Composition of Survey Respondent Groups	74

1. Executive Summary

1.1 INTRODUCTION

This study has been commissioned by the National Office for the Information Economy (NOIE) and the Department of Communications, Information Technology and the Arts (DCITA) to gain a better understanding of the contribution of ICT to the Australian mining industry and of the relationship between the mining industry and the mining ICT sector. In particular the study examines the way in which Australian mining ICT providers have developed export markets and the role of their Australian mining clients in that process.

1.2 APPROACH TO THE STUDY

Ovum has undertaken a survey of mining and mining ICT companies using a comprehensive survey questionnaire to understand the issues involved at firm level. Many respondents preferred that the survey be administered by telephone as a more convenient way of transferring information rather than compiling written answers themselves. This provided an opportunity to conduct interviews in the course of survey administration, and to capture a greater wealth of information. In addition Ovum conducted interviews of selected mining ICT providers where the nature of their businesses and overseas activities suggested that interesting and useful insights about the dynamics of the business processes and behaviour might be on offer.

1.3 KEY FINDINGS

The key findings and conclusions of the study are set out in full in Sections 7 and 8 of the report. In summary, however, the major conclusions are:

A. The Australian mining industry and its approach to productivity and ICT

- With limited ability to influence prices, the Australian mining industry tends to concentrate on controlling its costs in order to remain competitive. As such, demonstrable cost savings are an important element in the ICT purchase decision process for miners.
- Like most other industries, the Australian mining industry generally does not conduct post-implementation assessments of ICT investments. Moreover, few firms claim to measure productivity improvement. Where productivity is measured it tends to be in simple terms such as input costs per unit of physical output. The performance on such measures is generally not widely communicated throughout the firm.
- The Australian mining industry operates in a highly competitive global industry, with robust commodity-based price competition, and as such, is likely to have generated high levels of overall productivity relative to other industries. This would suggest, therefore, that the latent potential for further productivity gains, whether ICT-driven or otherwise, may be more limited than in other industries.

B. On the relationship of Australian miners and ICT providers in Australia

- ICT providers to the mining industry are typically much smaller in employee size and revenue terms than their clients, and generally pursue niche markets with one, or a small number of, specialised ICT products.
- Most ICT providers to the mining sector derive all or most of their income from the mining sector, and adapt their products for clients in other industry sectors only on an ad hoc or opportunistic basis.
- Most mining ICT providers consider that the primary source of competitive advantage is the quality of their products and their support services, which gives them leadership within specialised niches in the mining industry. Product innovation is viewed as the key to future success.
- Miners take a similar view. They consider that the strength of Australian mining ICT providers lies in the quality of their products, and the level and flexibility of the arrangements they implement to support these products.

C. On how Australian ICT providers develop their export businesses

- Australian ICT providers to the mining industry do not develop export businesses for the purpose of serving Australian mining clients overseas. Rather, they proactively develop international business opportunities within their particular ICT specialisation.
- Australian ICT providers obtain some leverage from the reputation of Australian mining in overseas markets. However, their prime competitive advantage rests on the quality of their products relative to those available from Canada, the United States, South Africa and the United Kingdom.
- Australian mining ICT providers identify the challenges associated with international business in terms that are universal (that is, not industry-specific). The key challenges are associated with access to capital to establish overseas operations, finding reliable, motivated and technically competent business partners, and addressing differences in language and business cultures.
- A large majority of Australian mining ICT providers do not mention on-going government services and support as significant for the continuing success of their export businesses.

D. On the relationship of Australian miners and ICT providers overseas

- In their overseas operations, some Australian mining companies have a pre-disposition in favour of Australian ICT providers, based on successful relationships in Australia. However, most adopt a pragmatic approach, selecting ICT that is fit for purpose, supported and easy to use in the overseas mining environments concerned.
- Where Australian mining personnel recommend or directly adopt Australian ICT in overseas mining operations, this typically occurs at an individual level, based on individual networks of contacts, rather than as a result of corporate policies, marketing strategies or systemic approaches to the adoption of ICT.

- There is anecdotal evidence of a 'cultural cringe factor' amongst some Australian mining firms. Anecdotal evidence suggests cases where Australian ICT products are only considered after the ICT provider demonstrates sales and successful implementations overseas.
- Increased globalisation of mining is likely to lead to greater centralisation of purchasing, and R&D activities. This will favour the more mature mining ICT markets and providers, as they will already have established a reputation and will have the resources necessary to undertake major R&D programs. For many Australian firms, increased centralisation could be a positive development, but the benefits will fall disproportionately across the sector.
- With greater centralisation, including the possibility of further relocation of corporate Head Offices overseas, mining ICT firms may find sales and marketing more difficult, particularly new entrants and those offering corporate, as opposed to individual mine site, solutions.

E. In relation to future business growth for mining ICT providers

- Australian mining ICT has a range of growth opportunities over the next five years, mostly associated with product innovation and development for both Australian and overseas markets. In technology terms, the opportunities include the deployment of systems integration technologies, the web enablement of applications, and the enrichment and quality improvement of graphical interfaces through 3D and other capabilities delivered over broadband communications systems.
- The major threats to the growth of Australian mining ICT are perceived by the ICT providers to relate to innovation by competitors that results in products superior to those provided by Australian firms. The ICT providers see competition in their sector, and the source of their competitive advantage, being based on technology and product excellence. This contrasts with the competitive environment that their clients face, which is principally based on price and is realised through scale economies in production, cost control and efficient marketing.
- Most Australian mining ICT providers consider their futures to be totally bound to the mining industry and its fortunes. A small proportion of such ICT providers are taking measures to reduce their exposure to the cyclical nature of the mining industry through expansion into other sectors, changing their business model, and expanding product ranges (to include consultancy, for example).

1.4 IMPLICATIONS FOR FUTURE ACTION

Mining firms do not measure their productivity or assess the contribution of ICT investments as a regular part of their management activity.

ICT providers to the mining industry generally identify very strongly with the mining industry and generally seek to expand their businesses within mining, whether domestically or overseas. This alignment generates a high level of business cycle risk for mining ICT providers, risk that they cannot manage or mitigate without changing the business model that they have followed to date. Assistance may be required to provide best practice models for them to do this. Business model change may include moves to –

- Expand into other industries in which their ICT products and services may be deployed
- Expand research and development activity to stimulate product innovation and development
- Expand into consultancy incorporating the deploying of ICT products and solutions
- Merge with other firms to provide an enterprise with sufficient product coverage and critical mass to be able to expand into other industry markets in Australia and into foreign markets

The role of government in improving the business environment for ICT providers to the mining industry is not clear-cut. In many respects the need for support expressed by mining ICT providers are no different from those of firms in other industries. The firms surveyed did not identify any gaps in governmental support programs in relation to their overseas business development activities. Indeed, they recognised that the success of these initiatives lay with themselves.

The main area in which government assistance might be targeted directly to this sector is through the R&D START program. Respondents who had experience of this program or who had received assistance from it were appreciative of the arrangements in place. The future of mining ICT is heavily related to the continued leadership of the sector in terms of product quality and market leadership. R&D will be important for continued innovation and development, and will also play a major role in enabling mining ICT firms to reduce their exposure to the business cycle risks of the mining industry. For that reason, consideration should be given to the use of policy measures to encourage the engagement of mining ICT providers with the broader ICT sector to explore new opportunities in areas such as road construction, transport generally, agriculture and other spatial systems. Such measures would act to smooth the fluctuations in R & D efforts, and create an environment that is more conducive to the development of transformative technologies.

The Government may wish to consider initiatives to assist greater collaboration with other firms both within and outside the mining sector so that mining ICT providers might develop more generally applicable services for use in other sectors and for sale into new foreign markets. Such initiatives would assist in the development of the Australian ICT industry generally and facilitate further leveraging on Australia's pre-eminent position in mining. Such initiatives may take the form of grants to assist collaboration with other firms. This would address the problems of scale and resources that have been identified by smaller mining ICT firms repeatedly in the course of the present study.

2. Background to Study

2.1 INTRODUCTION

NOIE and DCITA have commissioned this study to examine the way in which the Australian mining industry has used and fostered the development of ICT, and the way in which Australian ICT providers to the mining industry have developed their businesses both in Australia and overseas.

Of particular interest to NOIE were the conclusions from economic modelling, made in the course of a study undertaken by Ovum and ACIL Tasman earlier this year (*Productivity and Organisational Transformation: optimising investment in ICT*). Using the Tasman-Global economic model of the Australian economy, the study established as a reference scenario annual productivity gains from ICT of 0.84% for the next five years. However, the mining sector, in this scenario, would only experience annual productivity gains from ICT of 0.21%. This compares with much larger increases for most other sectors, including the communications sector and electronic equipment sector (both 2.32% per annum) ([7], Figure 5.12). The study noted, at Figure 5.12, that 'the figures presented in this table represent a base scenario, or what we consider to be the most likely scenario for the next 5 years based on the available evidence, but are far from a definitive guide'.

One of the purposes of the present study, therefore, is to examine through survey the contribution of ICT to the mining industry and to mining industry productivity, as seen by both the mining industry itself and the providers of ICT products.

2.2 OVUM'S APPROACH

Ovum's approach has been to research the industry, using existing publicly available sources to dimension both the mining and mining ICT industries, and provide descriptions of both the mining and mining ICT industries. Ovum has developed and administered detailed survey instruments to representative samples of both miners and ICT providers in order to understand how they inter-relate and to address the issues outlined above. In order to understand better how ICT providers to the mining sector have developed their businesses, particularly into overseas markets, and the extent to which they have done this with the support of their Australian mining clients, we have conducted interviews with selected ICT providers.

This approach is more fully described in Section 6.

3. The Australian Mining Industry

Definitions and dimensions of the mining industry

Definition of Mining

Various definitions of the mining sector have been used in recent major studies. In the Minerals Industry Survey Report for 2002 [2], produced by the Minerals Council of Australia (MCA) the *minerals industry* is defined as including exploration for, and extraction and primary processing of, minerals in Australia. Primary processing is taken to include the processing of minerals up to the first pouring of refined metal but fabrication beyond that stage is excluded. The Mineral Industry Survey Report, which we will refer to later in this report, excludes the oil and gas, and iron and steel, industries from the survey. ABARE recently conducted a study titled Mining Technology Services in Australia, which will be referred to later in this report. In that study, the *mining sector* excluded the petroleum industry [1].

In this study, however, Ovum has adopted a more inclusive definition of the mining sector, incorporating the petroleum sub-sector in analyses.

Mining in the Australian economy – dimensions

Recent History of the Australian Mining Industry

In the 1950s the mainstays of the industry were lead, zinc, copper, gold and coal. The level of exports was relatively low, and coal in particular was not exported in meaningful quantities. In the mid-1960s, the Australian mining industry began to expand with growth in both production and exports, combined with a change in the relative importance of the various commodities. Gold and base metals declined in importance, while coal, iron ore and 'other minerals' became more important. By the late 1960s Australia was a world force in black coal, bauxite, iron ore, nickel, manganese, titanium and zirconium, and the first major uranium deposits had been found [5].

The foundation for this expansion had been laid from the late 1940s. From this time, there had been continual improvements in, and increasing use of, systematic geological and geophysical surveys across the continent. This was a direct result of the establishment of the Bureau of Mineral Resources in 1946 [5]. The mining industry grew rapidly for the next three decades, until the late 1970s. At this time, the rate of growth began to slow. New mines had been developed around the world to meet a forecast demand for minerals, which turned out to be overly optimistic. The Australian industry's costs had increased during a period of growth, but at this point in time, mineral prices generally had not [5].

The 1990s was a period of significant change for the mining industry. It was a period of consolidation with considerable focus on improving efficiency and safety of operations, and preparing for 'globalisation'. Diversity increased, with a reduction in dependence on a few major customers for minerals and metals. It was a period in which the industry, despite far-reaching changes in world mineral production and consumption patterns and a financial crisis in Asia, was able to retain its role as a major source of export income for the Australian economy [5].

Share of economy

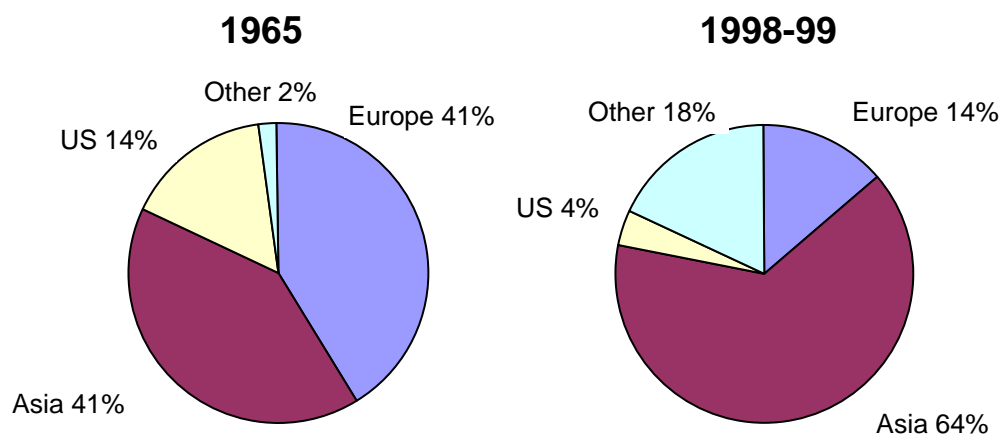
The Australian mining industry is an integral part of the Australian economy. According to the Australian Bureau of Statistics the Australian mining industry represented 4.7% of GDP in 2001.02 [10]. Figure 3.2 compares the contribution of the mining industry to GDP with the contribution of other sectors of the economy. GDP contribution per employee is higher in the mining industry, at \$405,100, than for the economy as a whole (\$73,360) and more than for any other individual economic sector. [10]

Exports

The Australian manufacturing industry, despite its growth, absorbed only a small part of the greatly increased mineral production during this period of historical growth. Instead, much of the increased mineral production was exported. In 1969-70, the value of mineral and petroleum products exported represented 27% of the total value of Australian goods and services exported. This percentage subsequently climbed to 41%, before declining to 35% in 1998-99. Mineral exports have relieved the pressure on the Australian balance of payments, but also made the industry very dependent on demand, currency exchange rates and the health of the world economy [5].

Importantly, the destination of exports changed significantly between 1965 and the end of the century. This reflects Australia's proximity to the Asia region, where several major countries have been undergoing rapid industrial growth. The table below illustrates the change in the destination of exports over this period [5].

FIGURE 3.1: DESTINATION OF MINING INDUSTRY EXPORTS, 1965 TO 1998-99



In 1998-99 mining industry exports (unprocessed and processed minerals and petroleum) amounted to \$38.8 billion (35% of total exports of goods and services; 61% of commodity exports; and 45% of merchandise exports) [5].

FIGURE 3.2: INDUSTRY GROSS VALUE ADDED AND EMPLOYMENT - 2000-01

Industry	Industry gross value added at current prices		Employment		Industry gross value per Employment
	Contribution to GDP	Contribution to total employment	Contribution to total employment	Contribution per employment	Contribution per employment
	\$m	%	'000	%	\$'000
Agriculture, forestry and fishing	21,647	3.2	429	4.7	50.46
Mining	31,598	4.7	78	0.9	405.10
Manufacturing	78,266	11.7	1,119	12.3	69.94
Electricity, gas and water supply	16,339	2.4	68	0.7	240.28
Construction	33,543	5	668	7.3	50.21
Wholesale trade	31,378	4.7	431	4.7	72.80
Retail trade	33,915	5.1	1,348	14.8	25.16
Accommodation, cafes and restaurants	16,331	2.4	465	5.1	35.12
Transport and storage	32,484	4.8	424	4.6	76.61
Communication services	19,710	2.9	189	2.1	104.29
Finance and insurance	43,950	6.6	354	3.9	124.15
Property and business services	74,779	11.2	1,066	11.7	70.15
Government administration and defence	24,054	3.6	373	4.1	64.49
Education	29,287	4.4	629	6.9	46.56
Health and community services	37,466	5.6	910	10	41.17
Cultural and recreational services	11,542	1.7	225	2.5	51.30
Personal and other services	14,490	2.2	359	3.9	40.36
Ownership of dwellings	61,117	9.1 ..	..	..	..
Taxes less subsidies on products	58,171	8.7 ..	..	..	..
Statistical discrepancy	-38 ..	..	..	..	..
Total	670,029	100	9,134	100	73.36

Source: Australian System of National Accounts, 2000-01 (5204.0); Labour Force, Australia, May 2002 (6203.0). ABS

In 2000-01 Australia's mineral resources exports (excluding petroleum) were \$43.7 billion, representing 29% of Australia's total exports of goods and services [1]. The absolute value of mining industry exports continues to increase, although it is declining as a proportion of total export of goods and services. These results are broadly consistent with ABARE statistics (which provide broader coverage than the MCA survey) The value of exports of minerals rose by 4% in 2001-02 to \$41.2 billion, as a result of improved world prices, a lower average exchange rate, and increased export volumes [2]. This level of exports represents approximately 37% of Australia's total merchandise exports and 28% of total exports of goods and services [3][4].

Profits

In the early 1980s, lower mineral prices resulting from decreased world demand for minerals caused a drastic decline in the Australian industry's profitability. The industry achieved a return of only 2.2% on shareholders' funds in 1981-82. Several measures were introduced to increase efficiency, including a greater focus on higher-grade ores, a reduction in workforce size, changed work practices, and the closure of marginal mines. These changes produced a positive effect, and by 1985-86 the return on shareholders' funds had increased to 4.9% [5]. These structural reforms have also contributed to much higher return on shareholder funds in recent years. Net profit on average shareholders' funds for the minerals industry was 12.9% in 2001-02, compared with 13.9% on 2000-01. However the industry still has strong cyclical characteristics, as demonstrated by the relatively low 4% return on shareholders' funds in 1999-2000. The most recent 10-year average is 7.5%[2].

Price movements

In 2001-02, average US dollar world mineral prices were effectively unchanged following a 1% fall in the previous year. However, the depreciation of the Australian dollar between 2000-01 and 2001-02 by around 3% produced a corresponding rise in the Australian dollar commodity price index over that period [2]. The appreciation of the Australian dollar over the past 18 months is introducing significant new pricing pressure for Australian mining organisations.

Production

Production has risen on average at a moderate rate over the past 10 years. According to the MCA Mine Production Index, production has risen by 37% over the last 10 years (average annual growth rate 3.2%) [2]. This has accelerated in recent years – production rose by 6.9% in 2001-02.

Industry revenues

ABARE statistics indicate that the value of exports of minerals rose by 4% in 2001-02 to \$41.2 billion. This occurred primarily as a result of improved world prices, a lower average exchange rate, and increased export volumes [2].

Employment

In 1998-99, 80,000 people were employed directly in minerals and petroleum extraction, representing 1% of national employment. In addition, there were 325,000 manufacturing jobs, or about 3.8% of total employment, in the related areas of metal products, non-metallic mineral products and petroleum, coal and chemical products [5].

Total employment in the industry has fallen in recent years. Despite increases in overall production, the total number of Full Time Equivalents (FTE) fell by 5% during the year 2001-02 (representing a reduction in total workforce size of approximately 3,058 FTE). This indication of increased labour productivity is supported by organisational restructuring, improved work practices and a shift from direct to contract employment. In 2001-02, direct mining contractual employment rose by 4%. In assessing the extent of increased labour productivity, the figures should be interpreted with some caution as the shift towards contract employment relationships may disguise some labour costs.

Around 25% of full-time equivalent positions in the industry are currently contracted out [2].

FIGURE 3.3: NUMBER OF FULL TIME EQUIVALENT PEOPLE EMPLOYED IN THE MINING INDUSTRY

	1999-2000	2000-01	2001-02	% change 2001-02 Year on Year
<u>Direct employment</u>				
Exploration	2,214	1,447	1,011	-30.1
Mining Operations	35,336	35,362	32,106	-9.2
Smelting & Refining	14,503	14,135	14,886	5.3
Total Direct Employment	52,053	50,944	48,004	-5.8
<u>Contractor Personnel</u>				
Contract Mining	11,894	11,595	12,022	3.7
Other Contracting	5,739	4,474	3,929	-12.2
Total Contract Employment	17,633	16,069	15,951	-0.7
<u>Total Employment</u>	69,686	67,013	63,955	-4.6
% Contract employees	25.3	24.0	24.9 [2]	

Source: Minerals Council of Australia [2]

Note. The table above only includes those considered to work full time in the mining industry. It excludes part time contractors, who are included in total number of people employed statistics.

Exploration

Annual surveys by the MCA show that from the mid- to late-1990s, respondents spent an average of over 40% of their total exploration budgets overseas [5]. During this period, there was considerable fluctuation, before the level of exploration reached peaks of \$981 million for petroleum in 1997-98, and \$1,149 million for minerals in 1996-97. In 1998-99, expenditure on exploration was \$1.7 billion (minerals and petroleum). This was made up of petroleum (\$868 million), gold (\$486 million) base metals (\$177 million) and other minerals (\$175 million) [5]. By 1999-2000, Australia's mineral and energy exploration expenditure had fallen to just \$1.4

billion, representing a decline of 18% from the previous year and 32% since 1997-98 [5]. Exploration expenditure in Australia is forecast to fall by a further 31% in 2002-03 [2].

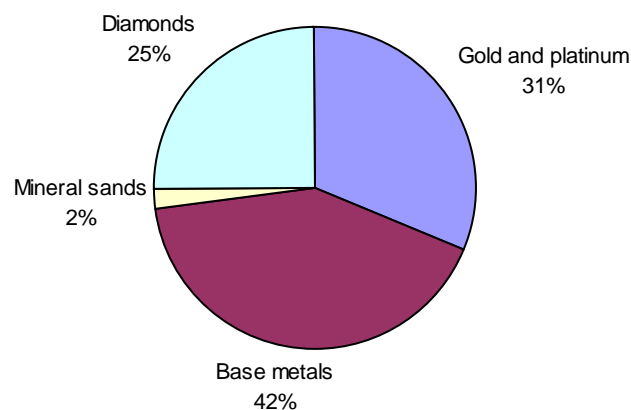
The MCA Minerals Industry 2000 Survey report [2] noted that offshore mineral and petroleum exploration expenditure totalled \$250 million in 1999-2000 (30% of total exploration expenditure by Australian based companies in the sample).

The MCA survey respondents spent the following on exploration in 2001-02:

- Overseas: \$132 million (22.7%)
- Australia: \$450 million (77.3%)
- Total: \$582 million (17% lower than in 2000-01) [2]

Excluding oil, petroleum and iron, which were not included in the MCA survey, the composition of overseas exploration expenditure by commodity sought is provided in Figure 3.4 below.

FIGURE 3.4: COMPOSITION OF OVERSEAS EXPLORATION EXPENDITURE BY COMMODITY SOUGHT (% OF OVERSEAS EXPLORATION EXPENDITURE)



Source: MCA Survey

Investment

Net capital investment on fixed and deferred assets rose by 57% in 2001-02 to \$5,643 million. It rose by 189% in the mining sector but fell by around 41% in the smelting and refining sector of the industry [2].

Research and Development (R&D)

The Australian Bureau of Statistics [8] notes that, in 2001-02, business expenditure on R&D was estimated to be \$5,546 million at current prices, 13% higher than in 2000-01. In volume terms, after removing the effects of changes in prices, salaries and wages, the increase was 8%.

The level of R&D expenditure growth in the mining industry was 16% over the same period, comparing well with the economy as a whole (13%) and with manufacturing industry (10%). [8]

The globalisation of mining also presents important implications for mining R&D. Globalisation is likely to lead to increased centralisation of purchasing, and R&D activities. This will favour the more mature mining ICT markets and providers, as they will already have established a reputation and will have the resources necessary to undertake major R&D programs. For many Australian firms, increased centralisation could be a positive development, but the benefits will fall disproportionately across the sector.

4. The Mining ICT Sector

Definitions and dimensions of the MTS sector

Definition of MTS

The Mining Technology Services (MTS) sector, which includes but extends beyond ICT [1], has emerged as a result of Australia's significant presence in the mining industry [1].

According to a recent ABARE study, the MTS sector includes –

- Products that may be based on ICT, such as computers, software, telecommunications equipment and related electronic components;
- Products that incorporate other scientific, technical or engineering based technologies, such as automated and remote control technologies; and
- Services that provide expertise within these technology areas on a fee or contract basis, such as technical consulting and training ([1], p.12).

Historically, mining and mineral processing have been important export industries for the Australian economy ([1], p.1). The expertise acquired from Australian mining operations has underpinned the development of the MTS sector [1]. And for aspiring MTS firms, Australia provides a sizeable domestic market that is large enough to provide an opportunity to reach critical mass in most MTS product categories. Indeed, at 30 June 2001, 83.3% of MTS sector businesses were 100% Australian owned [1]. By way of a broad comparison this might be contrasted with the economy as a whole, where the level of foreign ownership of equity in Australia, both listed and unlisted, in 2002 was 28.7%. This economy wide level has been relatively stable for the past four years. [9]

Dimensions of the MTS Sector

MTS sector gross sales in 2000-01 were estimated at \$3120 million, of which \$2490 million was earned by selling MTS goods and services directly to mining and exploration companies. MTS sales are projected to increase to \$5600 million in 2005-06 ([1], p.2).

Gross export sales revenue for MTS were estimated to have been \$611 million in 2000-01. Two of the largest target markets are NE and SE Asia (\$201 million), and Central and South America (\$135 million). Gross export sales revenue is projected to increase by ABARE to \$1900 million in 2005-06 ([1], p.2).

In the ABARE survey, 27.7% of the MTS firms reported R&D collaboration with exploration and mining companies ([1], p.3).

Recent history of the MTS sector

Many small companies supplying specialised services to the mining industry are benefiting from export market opportunities for their products and services. Australia has established an international reputation in mining software and, according to the Minerals Council of Australia

and the Centre for International Economics (1999), supplied 60-70% of mining software worldwide ([5], p.9).

In 2000, one of the more fascinating developments in the information technology field involved successful demonstrations by CSIRO Australia of mine modelling with Internet-based virtual reality tools. Interactive 4-D (place-time) virtual mine technologies are being developed to, inter alia, reduce mining risk in relation to both investment and safety, and win gains in productivity ([5], p.9). Most recent greenfield discoveries have resulted from integrated multi-disciplinary exploration approaches, combining a high level of geological interpretation with advanced geophysical and geochemical survey methods. Many use state-of-the-art computer processing and visualisation ([5], p.11).

Commercial behaviour of MTS firms

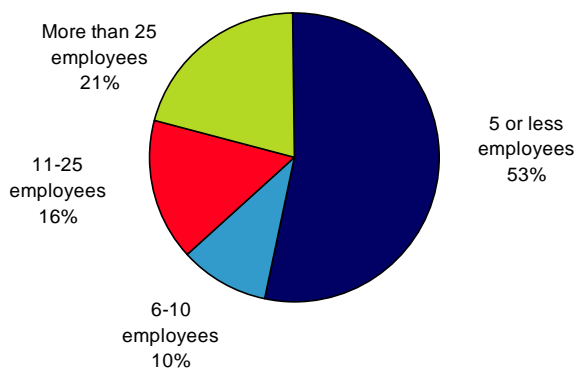
In the recent ABARE analysis of the MTS sector, firms reported a number of approaches that they adopt to protect their competitive advantage. These include efforts to move rapidly up the learning curve to reduce costs, and developing superior sales or service capabilities.

MTS firms use a number of methods to develop their markets. These included development of personal contacts, using the Internet and email, and by using industry associations. When asked to nominate the source of their competitive advantage, MTS firms produced a wide range of responses. Those that were nominated by more than 80% of respondents included superior products and services, reliability of the MTS supplier, intellectual capital, access to and familiarity with Australian markets, and management skills.

Size of MTS sector firms

MTS firms are generally small. As illustrated in Figure 4.1, the ABARE survey indicates that 53.1% of MTS firms employ 5 people or less on MTS functions (in terms of full time equivalent employees), 63.1% employed 10 or less, and 78.9% employed 25 or less ([1], p.34). Many of the firms are focussed on very narrow market niches.

FIGURE 4.1: EMPLOYMENT BY MINING TECHNOLOGY SECTOR FIRMS



Source: ABARE Survey (1)

Note: Employment is in terms of full time equivalents

5. Key issues

There are a number of key issues that this study seeks to explore and better understand, including –

- Issues about the mining industry itself, and the way in which mining firms invest in and use ICT, and the way they perceive ICT in relation to the establishment and maintenance of competitive advantage
- Issues about whether the mining industry is achieving appropriate productivity improvement from ICT relative to industry as a whole
- Issues about the relationship between ICT providers who produce specialised mining products and services and the mining sector
- Issues about the way in which Australian ICT providers have been able to develop export and overseas markets, and the role of the Australian mining industry
- Issues about the abilities of specialised ICT providers to the mining industry and their ability and motivation to extend their coverage to other industries, both in Australia and overseas

6. Survey method

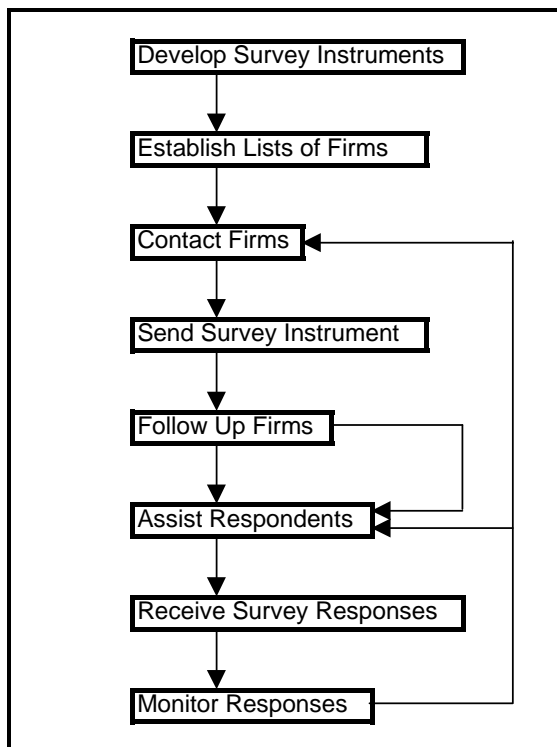
6.1 OVERVIEW

In order to explore the key issues Ovum developed survey questionnaire instruments to systematically explore the attitudes and experience of both the mining industry and ICT providers to the mining industry on a number of key matters. Two survey instruments were developed – one for miners and one for ICT providers.

Initially it was intended to administer the survey questionnaire electronically – by e-mail and fax. In the event few responses from either group – miners or ICT providers – were received without major telephone follow-up and reminders. It proved to be more acceptable to respondents if the survey was administered over the telephone and the documentation compiled by Ovum. This amended process had the advantage of enabling the capture of additional observations and information of a kind that might not have been included by a respondent seeking to keep written answers to survey questions short.

The overall approach taken to survey miners and ICT providers is illustrated in Figure 6.1.

FIGURE 6.1: SURVEY METHODOLOGY



Note: Method applied for both Miners and ICT providers

The method for each stage is described in more detail below.

6.2 SURVEY INSTRUMENTS

The survey instruments were designed for each group of respondents to be completed within 15-20 minutes in a typical case.

Miners' survey instrument

The survey of miners was structured into four parts, as follows –

- Part 1 – Your business: This was designed to establish the identity and contact points within the business, together with details about revenue, revenue growth, and export exposure.
- Part 2 – Technology expenditure: Questions in this part were designed to elicit responses about the firm's levels and types of ICT expenditures, and the factors that are causing change in ICT budgets. The questions seek to identify the sources of generic ICT products and the sources of mining-specific ICT products, and the proportion that is spent on Australian providers. The questions also elicit views on the strengths and weaknesses of Australian ICT providers, and the way in which the firm might decide what products to use in other operations, elsewhere in the world. Finally, questions in this Part are directed to the way in which the firm measures productivity and assesses the effectiveness of ICT's contribution to the business.
- Part 3 – Outlook: Respondents are asked about any changes they foresee in the way they might invest in ICT, and are invited to comment further on ICT and productivity in their businesses.
- Part 4 – Enterprise classification: The questions are about linking respondents to relevant sub-sectors of the mining industry, and about firm size (by employment). These questions assisted in monitoring the representative nature of the sample.

The survey instrument for miners is included at Attachment A.

ICT providers' survey instrument

The survey of ICT providers was structured into four parts, as follows –

- Part 1 – Your business: This Part was designed to establish the identity and contact points within the business, together with details about revenue, revenue growth, and export exposure. In addition, questions were included to clarify the areas of the mining industry with which the ICT provider was involved, and the nature and purpose of the ICT products provided. Revenue and export growth is also addressed, together with the respondent's assessment of the major factors that will drive changes. Questions are included on the extent to which the respondent is dependent on the mining sector, and how products may have been developed for application in other industries. Finally, in an attempt to understand Australian client relationships, questions about the support of Australian clients in product development and modification are included.
- Part 2 – Technology exports: Questions in this Part seek to establish the proportion of revenues from exports and the export imperatives operating on the business. The respondents were questioned about experiences as an exporter of ICT product, including

the challenges addressed and the lessons learned. Finally, questions are included relating to the perceived competitive advantage of the respondent and of the Australian mining ICT industry in general.

- Part 3 – Outlook: Respondents are asked about changes to their businesses that they anticipate in the future, the threats and opportunities that will arise, and their general observations on ICT service provision to the mining sector.
- Part 4 – Enterprise classification: The questions are about linking respondents to relevant sub-sectors of the mining industry, and about firm size (by employment). These questions will assist in monitoring the representative nature of the sample.

The survey instrument for miners is included at Attachment B.

6.3 LISTS OF FIRMS

Ovum established lists of firms in the Australian mining industry and of firms involved in the provision of ICT products and services to the mining sector.

For these purposes Ovum purchased from Dun & Bradstreet an initial list of mining firms, and from ABARE an initial list of ICT providers to the mining industry. To these lists, Ovum added further names from directory, referral and other sources.

The final lists contained –

- around 1,500 entries for the mining industry (note that around 200 of these entries were found to be outdated or non-operational when attempts were made to contact them). The entries included information on ANZSIC classification and on employment numbers, thereby permitting some segmentation by type and size of firm; and
- around 90 entries for the mining ICT sector.

The composition of the mining firms in the final list is set out in Figure 6.2.

FIGURE 6.2: COMPOSITION OF AUSTRALIAN MINING INDUSTRY

Segmentation	Number of mining companies in D & B List (approx.)	Proportion in D & B List
by employment		
1 to 19	990	66%
20 to 99	285	19%
Over 100	225	15%
Total	1500	100%
by Industry sub-sector		
Coal Mining	135	9%
Oil and Gas Extraction	15	1%
Metal Ore Mining	405	27%
Other Mining (including Construction Materials Mining)	495	33%
Services to Mining	450	30%
Total	1500	100%

6.4 CONTACT AND FOLLOW-UP

Ovum attempted to contact all firms on the revised lists in a random sequence to seek their involvement in the survey. In the case of the mining firms contacted, an attempt was made to speak to or leave appropriate messages for the person responsible for ICT, by whatever title. In the case of the ICT providers contacted, an attempt was made to speak to or leave appropriate messages for the relevant person responsible for business development or marketing, by whatever title.

Once suitable contact was made, the identity and continued operation of the firm was established. This was an important step in the case of mining firms, because of the numbers that had become non-operational since the list was first established. The firm was then invited to participate in the survey. Most were positive about the survey and approximately one third undertook to send a response. Survey instruments were sent by email in most cases, and by fax in a few.

It was necessary to follow-up most firms with further phone calls. At that stage further assistance in the completion of the survey instrument was offered.

6.5 ASSISTANCE TO RESPONDENTS

It became apparent that, notwithstanding undertakings to respond to the survey, no priority was attached to doing so in respondent firms. Consequently, in following up, Ovum staff offered to complete the survey over the phone with the respondent contact person. The immediacy of this arrangement proved very convenient to many of the respondents, and the survey was largely completed in this way. This approach had the further advantage of permitting Ovum to capture additional comments that might not have been included if the respondents had had to fill out the survey form themselves.

6.6 MONITORING OF RESPONSES

Ovum staff monitored the composition of the respondent sets to ensure that the main categories that constituted each group – miners and ICT providers – were represented in the result. In the event no additional measures were considered necessary to modify the composition of the responses received.

The composition of both the miner and ICT provider respondent samples is set out in Attachment C.

6.7 INTERVIEWS

Additional interviews were held with a number of ICT providers to explore more discursively the way in which they had: developed their business; related to the mining industry; established export sales; and developed overseas office and partner networks. These additional interviews were instructive, and confirmed the overall picture of the way the mining ICT industry operates in Australia that was derived from the survey interviews and survey responses.

7. Findings

7.1 AUSTRALIAN MINING INDUSTRY

The mining firms that responded to the survey represented a very wide cross-section of the industry in terms of sub-sector category, operating location, employee size, revenue and export orientation.

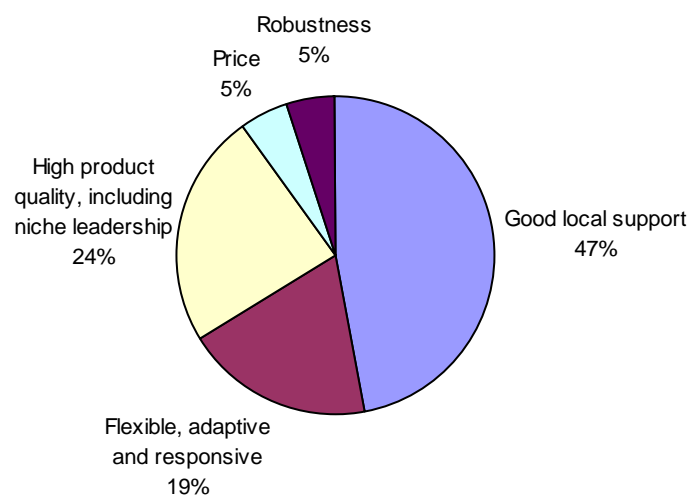
ICT purchasing

The respondents varied substantially in size, with a median reported annual revenue of around \$10 million. The median reported annual expenditure on ICT was \$100,000, or 1% of revenue. ICT expenditure was reported to be lumpy, with occasional significant purchases on computer software and hardware. The respondents cited a wide range of items included in their ICT budgets, with repeated mentions of software, IT hardware and communications services.

Perceptions of Australian ICT providers

The mining industry had a clear view of the strengths of Australian ICT providers, This was reflected in the lists of specialised ICT providers to miners - more than 60% of the ICT companies mentioned as providers to mining company respondents were Australian. Without prompting they typically nominated good local support, flexibility, adaptability and responsiveness as the key set of strengths. Figure 7.1 shows an analysis of the strengths mentioned.

FIGURE 7.1: PROPORTION OF AUSTRALIAN ICT PROVIDER STRENGTHS MENTIONED



Source: Ovum Survey, 2003

The three categories with the highest proportions of mentions are related. The survey suggests that Australian mining firms see that that part of the Australian ICT industry which addresses mining requirements are producing good quality products and product support, and

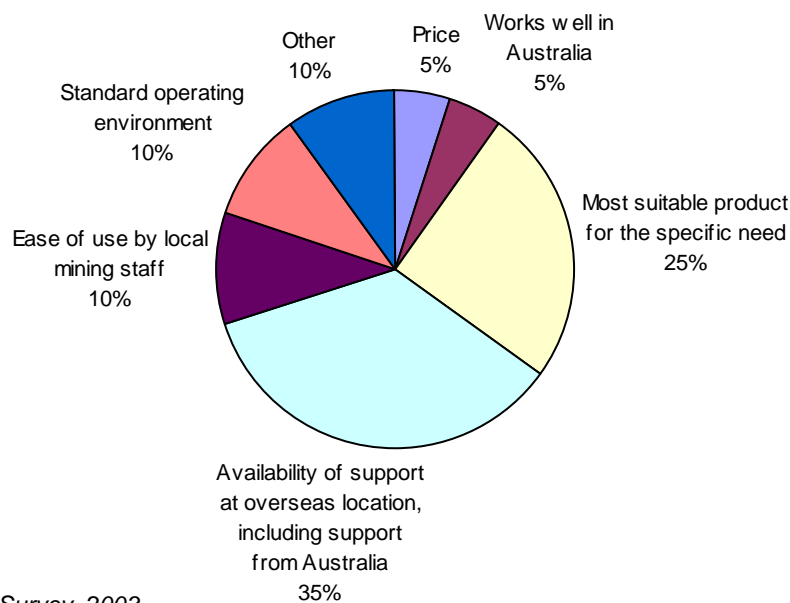
are adaptable, flexible and supportive in doing so. Price and robustness were mentioned less, indicating that the basis on which the mining firms purchase is more related to the other dimensions raised in the assessment. However, anecdotal evidence suggested that price is still an important issue in mining sector ICT purchases, albeit not the only one.

By contrast, there were very few unprompted mentions of ICT provider weaknesses, and no particular item was mentioned more than once. Price was mentioned. Some respondents did note that on occasion no suitable product was available from Australian ICT providers. This was not necessarily a criticism, because the suggestion was that Australian providers would be given very serious consideration, based on overall quality, if they had had a suitable product to offer.

Taking Australian ICT international

Mining firms have many considerations when they decide to adopt specialised mining ICT for their overseas operations. The culture of the firm and the level of autonomy that might be given to local mine managers are important factors. The respondents were asked, more specifically, what factors would influence whether they would take overseas Australian ICT that they were using successfully in Australia. This was an important enquiry, because it sought to gauge the extent to which Australian mining firms might be important for developing specialised Australian ICT exports, and the conditions under which this might occur. Figure 7.2 shows the extent to which various factors were mentioned.

FIGURE 7.2: DRIVERS OF ADOPTION OF SPECIALISED ICT IN OVERSEAS OPERATIONS



Source: Ovum Survey, 2003

There are a number of related concepts in the various categories of response. Some mining firms appear to be saying that, in some cases, they have or are striving for standard operating environments and seek to have to same ICT products and services in all of their sites.

However, most firms are saying that they make decisions on the basis of what product or service is most appropriate in the particular environment, and will adopt solutions that are supported in that environment (including supported from Australia) and that are easy to use by local mine staff. A number indicated that they had a pre-disposition to use Australian products and services. The responses display a high level of pragmatism, but fall short of any overwhelming systematic commitment to Australian ICT providers.

Mining firms were asked what categories of Australian ICT they would most likely take overseas and use in their overseas operations. Of those that responded to this question the overwhelming majority (77%) mentioned software that has worked in Australia. Most mentions related to mine management software that the companies had successfully implemented here, such as Micromine, Pulse Mining Systems, Zerus and Expac. Other forms of Australian ICT, such as Australian sourced communications services, are less transferable or transportable and provide a not unexpected response.

Assessing productivity and ICT effectiveness

The survey responses suggested that, in the main, mining companies had limited understanding of the ways in which ICT might contribute to the overall productivity growth of their firms, and that their perceptions were very focused on operational level outcomes. This was an outcome confirmed in interviews with ICT providers. However, we know from the history of the mining industry in Australia, that capital investment, including in ICT, has impacted heavily on productivity through the automation of large mines, automation of risky extraction, mine design and green fields exploration. The survey respondents in this case tended to emphasise more operational and incremental consequences of ICT use.

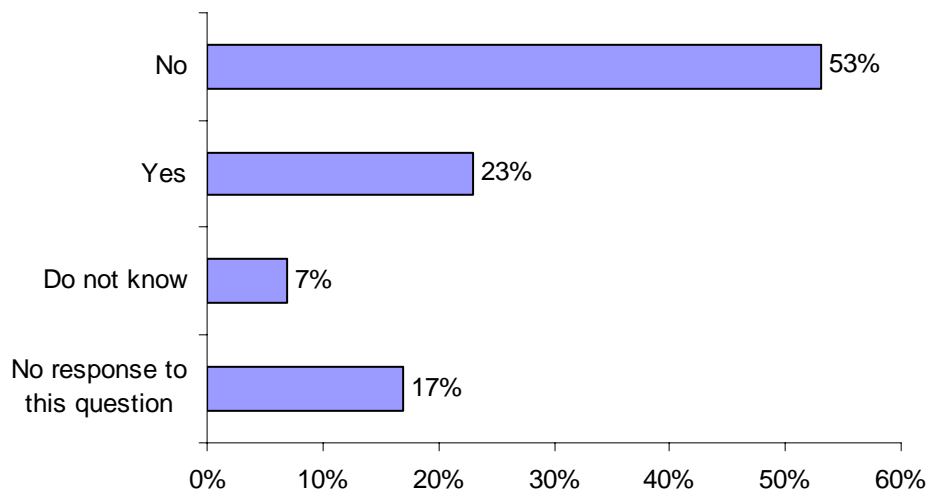
Only 33% of mining firms claimed to assess the value and measure the effectiveness of their ICT expenditure. An additional 10% claimed to simply “buy what we need”, which suggests that there was no systematic post-implementation assessment of any kind. Many respondents confused valuation and measuring ICT effectiveness with the decision-making processes leading to purchase and investment in the first place. In no case did the response suggest a culture of systematic post-implementation assessment and measurement. However, the responses are consistent with an implicit, but not explicitly tested, understanding of the purpose and value of ICT.

To put this in context, a significant proportion of ICT is of a generic nature, such as standard operating software and computer hardware. This ICT might be found in any business, not necessarily just in the mining industry, and the effectiveness and contribution of these purchases is typically not assessed at the firm level. As one respondent said, in relation to both generic and specialised ICT, there are some applications “that we simply need”, suggesting a perception that some applications are so basic that further evaluation is considered pointless. The overall result from the miner survey is partly borne out by the anecdotal evidence from interviews with ICT providers. They have stressed the importance of being able to use case studies and reference sites to show the returns that the mining clients will achieve from using their products and services. This suggests that assessments of value and return occur in the mining industry at the time of purchase or investment, rather than subsequently, with little post-implementation review to examine the outcomes and whether the planned benefits were gained. Insofar as comparisons can be made with the cases in the

NOIE study of ICT productivity earlier this year, this result is broadly in line with practice across industry as a whole.

Of the mining firms that responded to the survey generally, only 23% claimed that they measured productivity growth generally in their organisations, as shown in Figure 7.3.

FIGURE 7.3: MEASUREMENT OF PRODUCTIVITY GROWTH IN MINING FIRMS



Source: Ovum Survey, 2003

A significant outcome was that a majority of respondents answered the question with a clear 'no', and this not confined to any of the sub-sector categories.

Some of the 23% that claimed to measure productivity growth nominated measures or techniques used, such as cost per physical unit of output. Ovum would expect a substantial majority of companies to be using a range of key result indicators of this kind, but from the responses such indicators were not generally known to the operating managers in charge of ICT and ICT purchasing.

In the case of those firms claiming to measure productivity growth, none responded specifically to the question about the change or growth such measurements showed. There was a similar failure to engage on the question about ICT contribution to productivity growth within the firm. In the light of previous answer patterns, this was hardly surprising, since –

- there was no evidence of any systematic post-implementation assessment of the value and effectiveness of ICT; and
- there was no evidence from these respondents of the production of productivity indicators that separated out contribution by cost category (one of which might have been ICT).

However, the outcome was disappointing for a number of reasons –

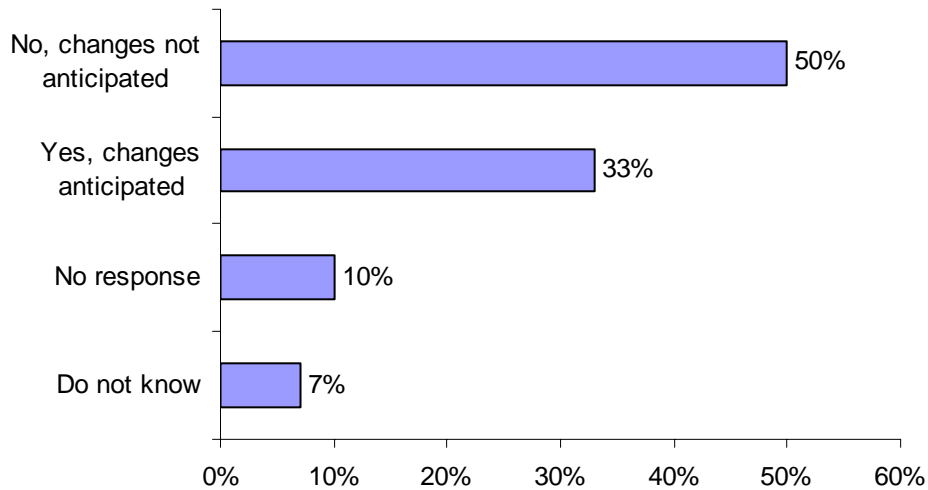
- The managers completing the surveys were those responsible for delivering ICT services to their firms, whether through the use of internal staff or through purchasing/outsourcing.
- The managers involved would have had the obligation to justify ICT budgets and report results to more senior management, and to convince senior management of the value of ICT purchases from time to time. They would also have the responsibility for demonstrating the value achieved through ICT purchases.
- If the contribution of ICT to firm productivity is not fully understood at the level of the staff responding to the survey (ie. those responsible for ICT in the firm), it is unlikely to be better understood elsewhere in the organisation.
- The firm is therefore unlikely to develop a culture in which the current and potential value of ICT's contribution is fully appreciated, with the possible result that the benefits of more obvious, short term applications are achieved, but other, less obvious benefits and applications are not pursued.

Mining companies tended to regard ICT as only a small element in the overall cost of production, and therefore did not tend to regard ICT issues as critical to the overall success of their businesses. The respondents regarded ICT as a cost of doing business, rather than as enabling technology that could generate significant productivity improvement (either through modified work practices or displacing or deferring other capital investment) or could transform their businesses. Their expectations were tactical and operational, rather than strategic. They did expect ICT investments to save operational cost, and would look to ICT providers to show how savings would result from implementation.

Future use of ICT

Respondents were asked about anticipated changes in their ICT investments. As indicated in Figure 7.4, 33% of respondents indicated that they had planned changes, but most of these related to the completion of current or committed projects.

Overall, there appeared to be a lack of foresight in the use of ICT, as indicated by the fact that 50% of respondents were not anticipating any changes in the levels of their ICT investments. Given the absence of any measurement of the contribution of ICT productivity, there would appear to be no compelling reason for management to advance ICT in its spending priorities.

 FIGURE 7.4: ANTICIPATED CHANGES IN ICT INVESTMENT AND USAGE


Source: Ovum Survey, 2003

7.2 ICT PROVIDERS – SURVEY

The Australian ICT firms that responded to the survey represented a very wide cross-section of the industry in terms of sub-sector category, operating location, employee size, revenue and export orientation.

Figure 7.5 shows the location of the ICT providers, and indicates a good spread of firms geographically. No State dominated the sample.

All of the firms surveyed were providers of ICT specialised to the needs of the mining industry. Some had extended the application of their products and services to other sectors of the economy. None were generalist firms providing non-industry specific services for use across all sectors of the economy.

Product and service coverage

Figure 7.5 shows the ICT fields in which the firms covered in the survey are actively engaged in business.

FIGURE 7.5: ICT PROVIDERS – LOCATION AND PRODUCT AND SERVICE TYPES

State	% of respondents	ICT products and services	% of respondents
NSW	14%	Communications Hardware and Services	16%
Victoria	10%	Computer Hardware	7%
Queensland	24%	Computer Software	33%
South Australia	10%	Computer Services	17%
Western Australia	37%	Consultancy	17%
Tasmania	5%	Other	10%

Source: Ovum Survey, 2003

Note: Some respondents operate in more than one product and service category.

The products and services of the respondent ICT providers support a complete range of mining activities as shown in Figure 7.6. Many operate in multiple mining activity categories.

FIGURE 7.6: MINING ACTIVITIES SUPPORTED BY PRODUCTS AND SERVICES

Mining Activities	% of respondents	Mining Activities	% of respondents
Bulk handling	33%	Occupational health and safety	19%
Mine business management	38%	Processing	52%
Education and training	38%	Research and development	33%
Environment	19%	Surface mining	81%
Exploration	48%	Underground mining	76%
Feasibility studies	38%	Other	5%
Mine construction	19%		

Source: Ovum Survey, 2003

Nature and range of mining ICT products

In aggregate, there was a wide range of technologies offered by the ICT providers that participated in this research study. Broadly, the technologies could be classified in the following categories:

- Supply chain and ERP software
- 3D graphical software

- Mineral analysis technologies
- Seismic monitoring analysis software
- Maintenance technology such as lubricant analysis software
- Communications technologies
- Strategic planning software

The supply chain software that was offered by participating firms included stockpile management systems, transport management systems, integration with accounting systems, quality management, and decision support systems. As mining operations increase in size and become more complex, supply chain and ERP systems enable the extraction and processing operations to occur more efficiently, with fewer bottlenecks and increased responsiveness to the market.

3D graphical solutions are used principally in exploration, ore body evaluation, blast design and mine design. These technologies enable mining operations to be much more efficient, reducing the significant amount of wasted effort that was associated with mining operations in the past. This reduces markedly the time and money expended in resource discovery. The data management aspects of these technologies are also a powerful source of productivity. In the past, it was necessary to record surveying information in field notes, and then enter the data in a central office. Today the data entry occurs at a single point into a device in the field, and is ready for analysis with minimal data handling effort.

Another ICT provided by the participants in this study was software related to mineral sampling and analysis, including quality analysis that is conducted using radiation and microwave analysis as material moves on conveyers. According to one ICT provider, these enable clients to optimise the mining process so that the contract specification is met, without 'high-grading' the deposit, in other words, over-delivering to the client's financial detriment.

The data management activities associated with seismic monitoring and geologic sensing were addressed by a number of the participants. This ICT is very useful for mine design, as well as in monitoring pure production shortfalls.

ICT providers related to maintenance of equipment were also important. For example, software that facilitated lubricant analysis for the purposes of scheduling maintenance provided clear examples of productivity improvements.

A range of communications technologies was discussed in the surveys and interviews. These included radio communications used in the general management and supervision of mines, communications for the management and transfer of data, satellite services, remote blast initiation, and tracking and tagging systems for the management of equipment. These ICT providers enable mining organisations to monitor equipment in real time. By developing a greater awareness of the equipment, mining managers are able to fine-tune performance and reduce the downtime and repair reaction times that occur as a result of poor information about the location of equipment. Communication systems also enhance mine safety by facilitating the provision of emergency warnings and evacuation alerts.

Although it can be more difficult to demonstrate the direct link between communications and productivity, both the mining organisations and the ICT providers were very clear in recognising the impact that communications have on the efficiency of a mine site.

Finally, strategic planning software is clearly becoming a more important part of the mining ICT landscape, although adoption has been slower than some ICT providers had hoped. This software provides, for example, decision support for the scheduling of major new projects.

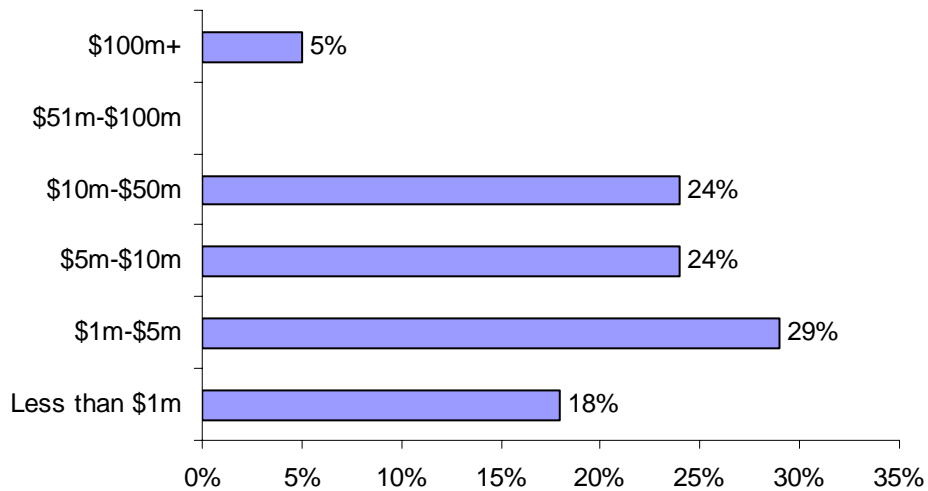
It was clear from discussion with mining organisations and ICT providers that much of the investment in ICT is designed to improve asset utilisation. Mining is an asset intensive industry and to the extent that ICT can extend the life of capital equipment and make it more productive, it will have a substantial impact on the profitability of mining organisations.

Revenue

The median annual revenue of the ICT providers sampled was around \$5 million, ranging from less than \$1 million (20% of respondent firms) to \$208 million. The reported annual revenues of the sampled firms are shown in Figure 7.7.

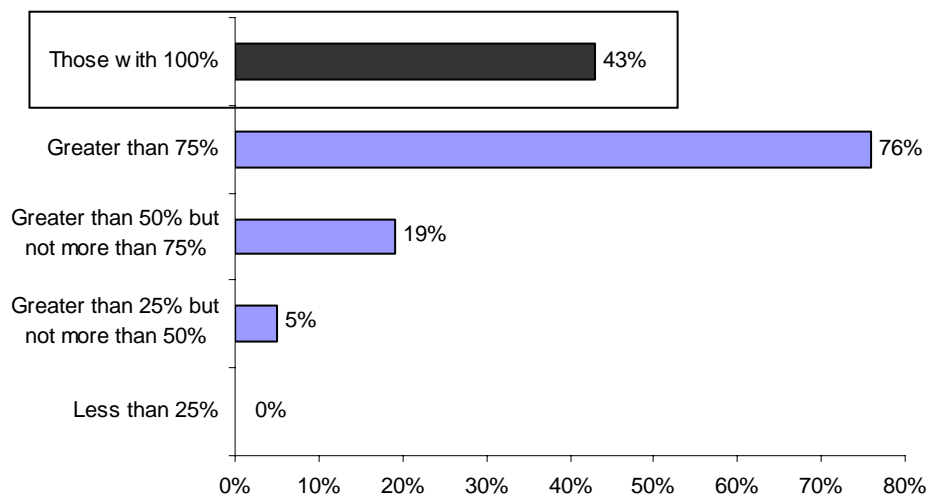
ICT providers are generally dwarfed by their clients in terms of annual revenues. A large majority of the ICT providers that participated in this research had annual revenues of less than AU\$10m, and nearly all had revenues of less than \$50m.

 FIGURE 7.7: ANNUAL REVENUES – SAMPLED ICT PROVIDERS



Source: Ovum Survey, 2003

 FIGURE 7.8: REVENUE FROM MINING CLIENTS



Source: Ovum Survey, 2003

Most of the firms specialised in mining applications, and this was reinforced by the sources of revenue. As shown in Figure 7.8, 62% of the firms derived more than 95% of their revenue from the mining industry, and 43% derived all of their revenue from the mining sector.

It appears from the responses that the larger the ICT firm the more its revenue might be diversified out of mining. The largest of the respondent firms was the only one with less than

50% of revenue from non-mining clients (at 37%). The smaller firms tend to be the most mining oriented, and therefore more subject to the fortunes of the sector.

In general, mining ICT providers viewed growth opportunities in terms of international expansion rather than diversification into other industries, due partly to the global nature of the mining industry. Growth was sometimes viewed in this way because the technology was not appropriate for other industries, but much more often due to weaknesses in marketing and distribution within other industry sectors. The mining ICT providers generally believed that they had neither the contact networks nor the resources to be successful in other sectors.

Revenue growth

ICT providers reported median annual growth over the past 3 years as 10-15%. The strongest historical growth factors were the introduction of new products and entry into new areas of the mining sector (such as health and safety), international market development, cyclical upturns in the mining sector, acquisitions, and new distribution relationships.

Most firms reported a high degree of product and service focus, not only directed towards the mining industry, but to specific niche activities within mining. This focus was confirmed in the factors that were mentioned as contributing most to growth, as reported in Figure 7.9.

FIGURE 7.9: FACTORS CONTRIBUTING TO ICT REVENUE GROWTH

<i>Factors contributing most to growth</i>	<i>Proportion of mentions</i>
New products and technology	42%
New markets overseas	24%
New markets in Australia	5%
Acquisition based expansion	5%
Good service levels to clients	9%
Strategic alliances	5%
Other (various)	10%

Source: Ovum Survey, 2003

Many of the factors mentioned are inter-related. There is a strong product emphasis that reflects the product-specific orientation of the firms in this area. Respondents note that there has been limited new market development within the Australian mining industry in recent years, with reduced R&D and fewer new mines being developed. The new markets that have contributed to ICT provider growth are overseas opportunities in the mining sector, and this factor had the second highest number of mentions.

There were fewer responses to the question of constraints on growth. Overall the ICT providers considered their businesses to be highly subject to the fortunes of the mining industry. This is consistent with the finding that ICT providers are generally dwarfed by their clients, and also tend to be relatively narrow in their revenue bases. The constraints nominated

were all problems for mining at present, such as declining commodity prices, market saturation, and access to ore (land titles, etc). Importantly, no ICT specific constraints were nominated. This shows the extent to which the mining ICT providers, and the smaller providers in particular, see themselves as part of the mining industry ahead of being part of a broader ICT sector.

Respondents forecast the revenue growth rate of about the same order as reported current growth – with a median in the range 10 to 15%. The factors that they considered would drive continued growth of this kind were product innovation and development, and overseas marketing. In other words, the factors that would drive most of future revenue growth were the very same factors that had driven growth in recent years.

Developmental relationship with the mining industry

All of the ICT providers surveyed commenced their business lives in the mining industry, and all but one of those commenced in the mining industry in Australia. Most have stayed very focussed on the needs of the mining industry as evidenced by the source of their revenues (see Figure 7.8 above). In the main they have continued to develop the majority of their products in Australia. 90% of respondents developed 50% or more of their products and services in Australia, and 74% of respondents developed 90% or more of their products and services in Australia.

The relationship with mining industry clients in the development and modification of their products is interesting. A number of respondents noted that their clients' requirements have led to product development and modification to meet to meet legislative requirements, to meet the specific needs of particular sub-sectors in the mining industry, and to meet the general physical demands of the mining sector. This includes, for example, ruggedising - the process of adding robustness to products to enable them to operate in extreme or unfriendly environments. ICT providers indicate that the main way in which clients have assisted is through feedback either directly to prospective new clients or through user group forums, or, in a few cases, through co-funding of product development by both the ICT provider and a client.

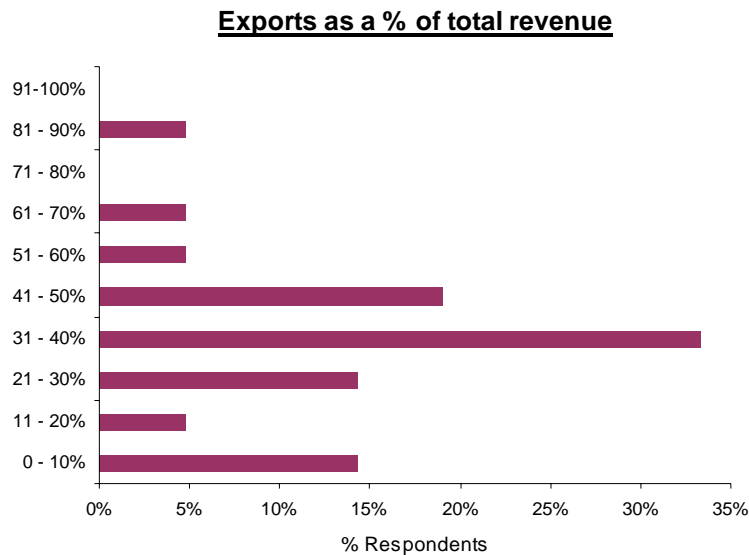
Expansion to other industry sectors

29% of the ICT providers surveyed noted that they had modified their products for use in other industries. However, most of these noted that the modifications were either very small or limited, or that the development was opportunistic rather than part of a planned approach to addressing other sectors with similar characteristics to the mining industry. The mining industry is capital intensive and must be cost competitive at the international level. Miners have no control over commodity prices or price influences such as exchange rates. They are able to manage their capital assets and ensure that they operate them efficiently. ICT services that help them plan to best maximise asset utilisation were in evidence in many of the survey responses. In only some cases were the software and other systems developed to be of use in other capital intensive industries where utilisation is critical for success (such as transport, utilities and defence).

Exports and overseas market development

Figure 7.10 shows the impact of exports in the respondents' revenue mix.

FIGURE 7.10: EXPORT REVENUE



Source: Ovum Survey, 2003

Note: Additions subject to rounding.

None of the respondents were 100% revenue dependent on exports. 86% of respondents had 55% or less of their revenues from exports. The median mix was between 30 and 40% exports, but with a wide range. There appears to be no direct relationship between ICT provider size and the proportion in revenue from exports.

57% of respondents said that their mining clients in Australia were of assistance in supporting their export operations, particularly at the outset. However 43% said their clients were of no assistance at all. Of those who attributed assistance, three types of assistance stand out, in descending order –

- Where the client provided references, recommendations or operated a reference site
- Where the client takes the product overseas
- Where individuals from a client firm move overseas and recommend the product to overseas operations (not necessarily the mining firm that the individual worked for in Australia)

In the last situation the role of the client mining company may be relatively passive, with the essential work falling on the ICT provider concerned. The responses on this point, taken as a whole, are not consistent with any view that the Australian mining ICT industry is riding on the back of Australian mining clients into export operations. The situation is more complex than that. In *some* cases, the Australian client may take a product overseas and use it in overseas operations. In many more cases, the client is a reference site that the ICT provider can use to support marketing and sales overseas, and to establish a name for both itself and its product.

In yet other cases the network of itinerant professionals in the mining sector provides a means of informal reference as those professionals recommend to new or different employers the adoption of solutions they know to have worked in Australia. In all cases, ICT provider export operations are supported by Australian mining in the sense that the mining sector provides an opportunity for them to initially develop their products. They gain from the reputation of Australian mining, and more recently of Australian mining ICT, internationally.

This overall picture is supported by the reasons that ICT providers have given for exporting in the first place. The main reasons mentioned in response are, in order –

- to exploit new revenue opportunities
- to gain international market leadership in a specialised niche
- to serve a client organisation as the latter expands overseas

The responses, taken overall, tell us that assisting local clients in their offshore operations is important, but not the most important, aspect of ICT providers moving into export mode, and setting up their own arrangements for distribution in other countries.

Figure 7.11 sets out the challenges to exporting that were reported, in descending order of the number of mentions.

FIGURE 7.11: CHALLENGES FOR EXPORTERS

<i>Main Challenges / Factors</i>	<i>Proportion of total items mentioned</i>
Language and business culture *	26%
Finding good local partners, distributors and staff	26%
The cost and effort needed to maintain an active local presence, overseas offices, etc.	16%
Supporting overseas staff and technology	10%
Other (various)	22%

Source: Ovum Survey, 2003

* The problems of operating in the United States were mentioned in this context.

Two aspects of these responses are very interesting. Firstly, the challenges do not appear to be particularly ICT-specific or mining-specific. They could be the same export challenges faced by a number of industry sectors. Secondly, most of the factors are associated with establishing reliable partnering networks (whether local offices, agents or distribution arrangements) that are cost effective. This aspect of exporting is considered further in the interviews with ICT providers.

Respondents reiterated the same themes when asked for the major lessons they had learnt through their exporting experiences. Many emphasised the need for patience and persistence

in the light of different business cultures with, often, long decision cycles. Associated with this, and associated with the challenges referred to above, were lessons such as –

- ensuring arrangements for the effective management of overseas offices and agents
- selecting strong, reliable and technically competent local partners, with compatible business objectives
- hiring the right sales representatives and training them well
- maintaining a concentration of effort, rather than spreading export activity too thinly and widely

Once again the lessons are those for exporting across a range of sectors, and there appears to be nothing mining or ICT-specific about them.

Respondents were asked to identify the key competitive advantages that they felt they had in exporting. The claimed advantages are set out in Figure 7.12, in descending order of mentions.

FIGURE 7.12: COMPETITIVE ADVANTAGE OF AUSTRALIAN MINING ICT EXPORTERS

<i>Main sources of competitive advantage</i>	<i>Proportion of mentions</i>
Quality of products and specialised niche focus	50%
Being Australian and leveraging off Australia's reputation in this field	14%
Individual firm reputation, including proven track record and being independent	14%
Having large mining clients	7%
Competitively priced	7%
Other (various)	8%

Source: Ovum Survey, 2003

The providers of mining ICT strongly regard their competitive advantage as linked to the quality of their products and services, including the quality of the support that they provide. Included in this category of response is the notion, mentioned in 18% of cases, of being a leading firm in a specialised niche area of mining ICT. This response aligns strongly with the response from miners that they judge the suitability of ICT for use in their overseas operations on its merits, and on its being fit for the specific purpose for which it will be deployed. There is no suggestion, in these answers, that ICT operators are riding on the back of, or have any level of on-going dependency, on existing Australian mining customers to take them overseas and to support the further development of their export operations. It is the ICT operators that are taking the initiative, leveraging their client contacts whenever appropriate. Only 7% of responses related to having large mining clients as an advantage, and these were not

necessarily Australian. Having an impressive clientele is a marketing advantage, and goes to credibility and general standing.

In fact, however, the level of support is greater than this picture suggests, because Australian mining companies actually assist ICT providers in the development of their products by, generally, being the initial users. The products are refined and improved based on these early applications.

Respondents noted that Australia has a high or very high reputation in both mining and mining ICT, and that this was an advantage. No respondent on this question had any alternative view. However, only 14% nominated this as a key advantage. Respondents nominated the United States, Canada, the United Kingdom and South Africa as countries in which key competitors are based. Others were mentioned less frequently. One respondent noted that the government support for the export efforts of mining ICT operators is much better organised and delivered in Canada than in Australia, and felt that Austrade's capacity to assist was impaired by funding cuts over a long period. Other respondents noted the important support from various Federal Government programs, such as START grants. In the main, ICT operators expected that the success of their export operations would depend on their own efforts.

Major changes over the next five years

ICT operators expected change to their industry and to their market conditions over the next five years. Most expect change in terms of technology, growth strategies that they themselves will put into place, and mining and ICT industry consolidation. As a group they expected much more change within the ICT industry than the miners expected in terms of their use and purchase of ICT products.

Respondents nominated the major threats to their businesses that they anticipated in the next five years, as shown in Figure 7.13.

FIGURE 7.13: ANTICIPATED THREATS IN THE NEXT 5 YEARS

Major Threat	Proportion of mentions
Technical innovation by competitors *	38%
Complacency and need to keep ahead of the world	19%
Market conditions (poor world economy and strong Australian dollar)	15%
Commoditisation, reducing niche specialist advantage	5%
Agglomeration of mining customers	5%
Availability of skilled staff	5%
Poor Government support for export	5%
Other (various)	8%

Source: Ovum Survey, 2003

* Including product development and, in the view of survey respondents, IP infringements

Technical and product advances by competitors are relative matters, and are therefore linked to recognition of the threat posed by complacency in development of Australian ICT products and services. As already noted, the respondents as a group were very definite that their competitive advantage was heavily bound up in the quality and niche leadership of their products. Threaten that, and competitive advantage is at risk.

FIGURE 7.14: ANTICIPATED OPPORTUNITIES IN THE NEXT 5 YEARS

Major Opportunity	Proportion of mentions
Development and commercialisation of products *	45%
Demand growth from mining sector **	20%
Overseas expansion ***	15%
Opportunities associated with changing the business model ****	15%
New mine development in Australia	5%

Source: Ovum Survey, 2003

* Specific product opportunities mentioned include tracking goods, integrated technical solutions of various sorts, and the development of web enabled solutions

** Including, especially, increased requirements for greater mining efficiency

*** Especially to developing countries and China

**** Changes varied from increased levels of outsourcing in the mining industry to opportunities outside the mining industry

Respondents also identified a range of opportunities for the expansion of their businesses, particularly in overseas markets, over the next five years, as shown in Figure 7.14.

Consistent with their view of competitive advantage and possible threats, respondents anticipated that opportunities for future growth would arise primarily through product development and expanded product range, including the outcomes of current research and development. This response was related to the second most mentioned opportunity – the ongoing need of miners for greater efficiency. A lesser number saw opportunities through overall expansion into new markets, and even fewer saw the development of new mine sites as a major opportunity to expand their businesses.

Expansion of mining ICT providers into other industries was largely constrained by the attitude of the ICT providers themselves. Mincom, and other larger ICT providers, provide clear evidence that cross-sectoral expansion can be undertaken successfully. The constraints that are often cited as being in the way are:

- the threat that cross-sectoral expansion would pose to the sharp focus on mining solutions considered to be integral to success to date
- size (the lack of sufficient mass to both afford and execute such a strategy)
- lack of knowledge of other industries and of the distribution and other partnering arrangements that would underpin success
- lack of reputation and potential client awareness

7.3 ICT PROVIDERS – INTERVIEWS

A number of ICT providers were interviewed in the course of and after survey completion. These interviews concentrated on the perceptions of the mining industry's attitude to and use of ICT, and the approach of the ICT provider to business development, both in Australia and overseas. The interviews added a deeper understanding than from survey responses alone about the way in which individual ICT providers approached these issues. Key points from four of the more interesting interviews have been included in the boxes below.

The mining industry, productivity and ICT

ICT provider interviewees considered that mining companies embrace ICT and technology generally, and are adept in using ICT relative to other industries. This greater relative ability was the view of ICT providers that had clients outside the mining industry. ICT providers considered that mining companies had been exposed to international competition for a long time, and therefore knew that they had to take all reasonably available measures to reduce their costs and to remain cost competitive in the market for their commodities. Some interviewees noted that their larger mining clients took a longer term view on cost containment, especially compared to clients in other industries. For example, one major ICT provider noted that its mining clients had invested in outsourced supply chain management systems, that had cost containment as well as business process transformation potential, and were well in advance of that provider's finance sector clients in this respect.

Associated with the perception of cost consciousness in the mining industry was a view that some miners had so reduced their costs and their labour requirements that they often did not have mine site staff with the time or skill to implement ICT solutions. The effect of such "shearing resources to the bone" was that some opportunities for improving operating

efficiency through ICT-based systems were foregone, particularly if outsourcing of measurements and local data entry into ICT systems was not an option. On this point one ICT provider said: *“The days of selling software and education to the mining sector are long gone. Miners have downsized to such an extent that it is difficult for them to focus on their strategic issues – they are always fighting fires. It is now necessary to partner with miners and be focused on their financial goals. People are too busy to make a decision so it is necessary to engage them more deeply in order to make progress with them.”* Dingo Maintenance Systems (see Box 2) noted that staffing limitations at mine sites had encouraged many mining managers to adopt a short term focus, since they were always *“battling between the urgent and the important”*.

Some interviewees drew a distinction in the attitudes of mining companies to ICT, and to Australian ICT providers, based on the size of the mining company and its exposure to the benefits of ICT elsewhere in its operations. One ICT provider noted: *“We have found it far harder to sell our product within Australia than overseas. Overseas, Australian mining products are seen as the best, therefore there is high demand for quality by the large international companies. However at home the smaller companies don’t seem to see the advantage of using and buying Australian products.”*

Box 1 Mincom

Mincom develops and distributes a suite of integrated software applications for asset intensive industries. Its revenue has come principally from the mining sector, although it has achieved some success in diversifying revenue across related industries. Mincom also provides related consulting services.

Historically, Mincom's most important product has been Ellipse, an Enterprise Resource Planning (ERP) solution that accounts for approximately 90% of revenues. Mincom competes with the major multinational ERP vendors including SAP, JD Edwards, and Peoplesoft, but unlike these vendors, focuses exclusively on asset intensive industries. Ellipse focuses on four key areas. These are Assets and Works Management, Supply Logistics, Financial Management, and Human Resource Management.

Although mining remains the most important sector for Mincom, other sectors such as Utilities, Transport, Defence, and Government collectively account for almost two-thirds (63%) of revenue. Mincom primarily supports asset management activities in these sectors.

Mincom's other products include:

Mincom Minescape™ - mine planning software that provides geological modelling and mine design functionality.

Minescape contributes to mine productivity by assisting managers to model the optimal mine processes, which enables more productive use of plant and machinery.

Mincom MineMarket™ - a system that enables users to determine the volume, value and location of mine product, and sell it based on contracts or spot prices. The application supports the process of extracting, blending and shipping, to reduce the time minerals spend in stockpiles or in transit.

Effective asset utilisation is a key determinant of productivity in the mining sector. This was a recurrent theme in surveys and interviews with other ICT providers, and is also reflected in the nature of ICT providers that have succeeded in the mining industry.

Mincom representatives commented that despite arguments that the mining industry lags other industries in its ability to generate productivity gains through the use of ICT, their experience has been that the mining industry is skilled in the application of ICT, relative to other industries. One example that was nominated in support of this was adoption of e-business by major mining organisations.

Mincom, with 18 offices in 12 countries, also has significant experience in the export of software and related services, and the establishment of international offices. Mincom has not relied heavily on its relationships with Australian mining organisation to generate international revenues. Rather, it has developed new business that adds to its existing relationships with Australian miners. 'Australia' has been strong as a brand in the mining industry, and Australian accents have proven useful in winning credibility with clients, although the impact of this was muted in the US, where Mincom believes it is very important to present a local face to clients.

According to Mincom, one of the key factors in the success of international operations is the presence of an effective local partner. Cultural factors were also cited as an important factor, including getting to know "how Latin Americans think". Decisions on whether to use a local distributor or open up an office will vary according to the circumstances in each country. For example, Indonesia was cited as a market in which it is important to have a local partner who understands aspects of local business culture that may be unfamiliar to Western firms.

Mincom website: www.mincom.com

ICT providers concurred about the importance of case studies in selling ICT solutions to miners. In all cases it is necessary to show how the ICT will result in the miners saving money. This may involve a sense of longer partnership, extending decision cycles beyond those that applied in the past.

Some ICT providers noted that immediate savings and cost reductions were the basis for selling tactical solutions and tools. Such solutions are relatively short term in their impact, and have limited impact on transforming day to day operations. On the other hand, ICT providers find tactical solutions readily saleable, subject to provenance on cost savings. Strategic solutions – such as life of mine tools and total mine modelling – are far more difficult to sell. Marketing effort for strategic tools needs to be addressed to much higher levels in mining organisations, where decisions are taken prior to commitment to new mine operations or mine expansions.

Branching out to other industries

Many mining ICT provider products would seem to be relevant to the needs of other industries, and could, with little modification, be adapted for use elsewhere. Transportation, utilities and defence, for example, share certain characteristics with mining, including –

- Remote and rugged operating environments, with logistical and support challenges
- Capital intensity
- Major focus on occupational health and safety
- Major focus on asset utilisation, preservation and optimisation to reduce down times
- Little control over revenues because of regulation, government funding or very competitive commodity markets
- Long periods of cost containment and reduced human resource levels at operating interfaces

Why then, do not more ICT providers pursue opportunities in these other industries? In fact some have. Larger ICT providers, such as Mincom (see Box 1) have expanded their client base to these other industries. Mincom earns less than 40% of its revenue from mining. Other ICT providers report that they have made modifications to their products for other industry clients, but, in most cases, they have indicated that such arrangements are opportunistic (rather than systematic) and of small scale and revenue impact. This is supported by the survey findings (see Figure 7.8, above).

ICT providers have noted the cost and effort required to develop customer relations and agent / distributor networks overseas. In order to market their products to other industries they would need to become part of those other industries' distribution networks, at additional time and cost. Some, but not all, ICT providers have been prepared to make the investment. The prospect of returns depends on the type of ICT products they have, how mining-specific, and the extent to which the need for such solutions is already served in those other industries. Generally it is the larger ICT providers that have had the resources and are prepared to take the risk of serving a broader clientele. Some ICT providers, such as Surpac (see Box 4),

report that they have made attempts to address markets beyond the mining industry but are no longer pursuing that course actively.

Box 2 **Dingo Maintenance Systems**

Dingo Maintenance Systems develops reporting, trending, and decision support tools designed to extend the life of mining equipment. The tools are used in the analysis of oil and grease lubricants that are used in heavy machinery, such as conveyer belts and haul trucks.

By using Dingo tools in the analysis of lubricants, mining organisations are able to optimise the scheduling of maintenance. This extends the life of equipment, and reduces unnecessary maintenance-related downtime. For example, in previous applications of its technology, Dingo claims to have been able to increase the life of haul truck engines from 12,000 hours to 18,000 hours. Effective delivery of maintenance also reduces the number of breakdowns, which has a direct impact on productivity by reducing bottlenecks and inefficiencies in the mining and production process. Dingo is developing related tools that support vibration analysis, an alternative technique that is also designed to guide decisions on equipment maintenance. In most cases it is ideal to use both lubricant and vibration analysis to assess the maintenance needs of equipment.

Dingo's analysis software competes with other applications that are provided by heavy machinery manufacturers. These manufactures bundle the software applications with the machinery at the time of the sale. However many miners prefer to use at least one independent source of analysis information about the state of lubricants in their machinery. Dingo is independent of machinery manufacturers, and is therefore not exposed to perceptions of a conflict of interest between the desire to provide optimal maintenance scheduling with the desire to earn revenue through machinery and machinery parts replacement, both of which naturally are related to equipment breakdown. Dingo's independence from machinery manufacturers provides a clear point of differentiation from competitors.

Dingo's lubricant analysis software was initially developed by external contractors at Tarong Coal, to meet a specific need for that mine. The contractors persuaded Tarong Coal that the lubricant analysis tools should be sold to other mines as this would fund further development. Ultimately Dingo Maintenance Services was established as a separate entity, and now generates annual revenues of approximately AU\$3.5m. About 60% of Dingo's revenues are generated within the mining industry. Other important industries for Dingo include construction, power generation, transport and natural gas.

Dingo has a major office in Denver in the US, which serves North America and the Caribbean. In addition, Dingo operates through a reseller in Santiago in Chile. Dingo has made significant headway in expanding internationally. Several lessons emerged from this experience. First, selection of the best possible office location is very important - Dingo's Denver office provides ready access to many mine sites. Second, it is important not to underestimate the capital required to develop a new office, and the challenge of finding and hiring appropriate staff. Third, the benefits provided by a strong partner are demonstrated clearly by Dingo's relationship with Conoco, a US-based integrated, international energy company involved in the discovery, development, production and sale of oil and gas. Conoco has made an equity investment in Dingo and has provided a strong distribution network for Dingo in the US. An indirect benefit of success in the US has been that it has enabled Dingo to win additional credibility in the eyes of Australian clients as a result. Australian clients have provided an important, but not critical, contribution to Dingo's international expansion, primarily by acting as reference sites for prospective clients in other countries.

Dingo Maintenance Systems website: www.dingo.com

Box 3 Mine Site Technologies

Mine Site Technologies (MST) specialises in the development and supply of communications technologies to the mining industry. MST has a particular specialisation in underground mining, and focuses on radio communications, data handling and transfer, remote blast initiation and tracking systems. MST also provides related services to maintain and upgrade in-mine communications systems. Some of the technologies employed by MST are used in tunnels, but most are specific to mining applications.

The solutions offered by MST improve communications, and therefore enhance the ability to manage mine sites so that they are more productive. Some of MST's applications, such as its blast initiation system (BlastPED), streamline blasting operations, producing a corresponding increase in productivity. In addition, some of the technologies are designed to provide emergency warnings to staff communicating the need to evacuate a mine. Although these technologies do not have a direct impact on day-to-day productivity, they are a critical part of ensuring overall safety at the mine site. The Occupational Health and Safety requirements of Australian mine sites have been a key driver of uptake of MST's technologies and services.

According to MST, the Australian mining sector has been through several decades of fierce competition, and is now very lean. Mine managers are continuously seeking to squeeze productivity gains from technology investments. Although most managers acknowledge the impact that communications have on mine site productivity, it is difficult to demonstrate this in a tangible way. MST has addressed this problem by conducting observational studies of mine site activities, in order to identify real-life situations where communications would have led to significant savings for a prospective client. MST has also developed scenarios that describe situations where communications can have a major impact on productivity.

Virtually all of MST's revenues are generated within the mining sector. One quarter of revenue is generated internationally, and the company expects that international revenue will grow as a proportion of total revenue. MST has recently opened offices in Canada and the US, and has developed relationships with distribution partners in China, Chile, Peru, Mexico, and Sweden. In developing international business MST sees important long-term opportunities in the modernisation of less developed mining industries, such as exists in China.

A recurrent theme in the discussions with mining ICT providers about their international expansion has been the importance of an effective distribution partner. MST has found several sources useful in identifying effective distribution partners. One important source has been in-country mining clients. Trade Shows have also been important. Austrade has assisted MST to make business connections in China.

MST has found that its Australian origins have been an advantage in establishing credibility with international clients as the Australian mining industry has a strong reputation. Overseas, MST has made extensive use of reference sites in Australia to win credibility with prospective clients that are not familiar with its track record. Beyond that, MST has not expanded in concert with Australian clients, but rather has proactively identified and pursued its own international opportunities.

MST Website: www.minesite.com.au

Box 4 Surpac

Surpac is a provider of Computer Aided Design (CAD) software-based solutions and related consulting services. Surpac's applications are used by surveyors, engineers and geologists to address such activities as ore body evaluation, open-cut and underground mine design, water waste design, feasibility testing, and exploration.

The data management functionality of 3D software developed by firms such as Surpac have significantly enhanced productivity. For example, prior to the development of this software, it was necessary to take field notes, and then enter these data into a database upon returning to the office. Today data management happens seamlessly as field observations are entered directly into a device by the surveyor while in the field, and then simply downloaded and analysed at the office. Data entry occurs only once rather than twice.

Surpac's technology can be applied beyond the mining sector, in such areas as civil engineering and construction. Although Surpac has experimented with expansion into other industries, it has elected to continue to focus on the mining sector, at least for the short to medium term, due to constraints on expansion into other industries that are related to marketing and distribution. Surpac continues to enjoy substantial growth opportunities within the global mining sector, and has not yet found it necessary to tackle the marketing and distribution issues of other sectors yet. Indeed, Surpac has already made significant headway internationally, and currently generates approximately 60% of its revenue internationally. The major geographical areas that provide this revenue are the UK, China, Indonesia, Canada, Latin America and Africa.

Surpac is also considering outsourcing some of the routine development work, such as 'bug-fixing' to companies in India. According to Surpac, bug-fixing is a relatively tedious activity that does not require a broader knowledge of the business and can be implemented much more cheaply in India.

Surpac's software is highly technical in nature, and to get the full benefit of the software, the user must have significant technical knowledge. Surpac credits its success in international expansion to its efforts to make this software as user-friendly as possible, and the expertise it has developed in providing training to people who speak English as a second language. The latter capability has been a source of competitive advantage in exporting its technology to developing countries. Surpac has also made strong efforts to ensure that support is available in as many countries as possible. Based on the surveys and interviews in this study, the availability of local support is one of the most important factors that influence ICT purchase decisions.

Surpac credits R & D Start grants, administered by the Industry Research and Development (IR & D) Board, with having helped it build momentum for projects that might not otherwise be undertaken, and of being a key factor at certain points in the development of some products. There are significant costs of compliance associated with these grants, but nevertheless the overall impact is considered by Surpac to have been very positive.

Surpac Website: www.surpac.com

Exporting

ICT providers who are exporting emphasise the importance of establishing reliable overseas partners (such as office managers, agents and distributors) with congruent aims. Exporting mining ICT requires developing a presence in overseas markets, and reinforcing the perception that ICT solutions will be supported. The only alternative to establish a network of offices and distribution agents is to make frequent visits from Australia, at considerable further expense. The ICT providers interviewed have set up offices in various countries, but mainly in North America, South America (notably Chile), Southern Asia (especially Indonesia), China and Europe.

Although ICT providers acknowledged the importance of making the right arrangements with overseas staff, especially locals, agents and distributors, and were aware of the pitfalls from their own experience, they tended to establish their presence in other markets on a trial and error basis. Some have engaged Austrade's assistance, with reported varying results, and others have sought the help of their in-situ clients. There does not appear to be any other way to establish offices and partnering networks other than through trial and error, every time and at each location.

8. Conclusions and Implications for Policy

8.1 CONCLUSIONS

The Australian mining industry and its approach to productivity and ICT

1. The Australian mining industry has been exposed to robust and intense competition at a global level for some decades, and, with limited ability to influence prices, it concentrates on controlling its costs in order to remain competitive.
2. The Australian mining industry is a major user of specialised mining ICT to enhance the cost effectiveness of its operations.
3. The Australian mining industry recognises, albeit in a general sense, the efficiency improvements and cost benefits associated with the implementation of ICT in its operations. The survey responses suggest a heavy emphasis on the deployment of ICT for the improvement of operational processes.
4. The Australian mining industry typically requires providers of ICT to demonstrate the cost savings or other benefits of particular ICT solutions and applications as part of the purchasing decision process.
5. The Australian mining industry does not, as a general rule, conduct post implementation assessments of ICT investments. In this respect the industry is not significantly different from other industries in the Australian economy.
6. The Australian mining industry does not claim, as a general rule, to measure its productivity improvement. Those mining firms that do, generally claim to do so through the use of input costs per unit of physical output. The results of such measures, where applied, are not widely known throughout the firms concerned.
7. The Australian mining industry does not generally seek to measure or assess the contribution of ICT to its productivity and a representative sample of mining firms would likely reveal that none are doing so.
8. Because the Australian mining industry competes in a highly competitive global industry, and has done so for decades, it is unlikely that it has failed, at industry level, to achieve reasonable levels of productivity outcomes from its investments in ICT relative to its competitors. The unaddressed potential for further productivity gains may well be more limited than in the case of other industries that have not had this level of competition for so long.
9. Given the lack of focus of mining firms on ICT assessment and productivity measurement, it may be useful to undertake longitudinal, historical and comparative studies of a representative sample of firms to measure the contribution of ICT to productivity in the mining industry. Such a study might cover more than the mining industry and extend to other similar industries.

The relationship between Australian miners and ICT providers in Australia

10. Many Australian providers of mining-specific ICT commenced operation with a single mining client, and built up their range of specialised products and services from that initial start.
11. ICT providers to the mining industry are typically much smaller in employee size and revenue terms than their clients.
12. ICT providers to the mining industry generally pursue niche markets with one or a small number of specialised ICT products.
13. Most ICT providers to the mining industry derive all or most of their income from the industry, and with the exception of the largest firms, adapt their products for clients in other industry sectors only on an opportunistic basis, or to a relatively minor extent.
14. Most mining ICT providers consider that their main competitive advantage is in the quality of their products and their support services, which gives them leadership within specialised niches of ICT activity in the mining industry. Most consider that their future competitive advantage and their ability to keep ahead of rivals lies in sustaining leadership in specialised fields based on product innovation and development.
15. Miners recognise the overall strength of Australian mining ICT providers and their products. They consider that the strength of Australian mining ICT providers is based on the quality of their products for specialised or niche applications, and on the level and flexibility of the arrangements they implement to support their products.
16. Australian mining companies do not identify any significant weaknesses associated with Australian ICT providers to the mining industry. From this it may be concluded that there are no evident systemic weaknesses of a widespread or continuing nature associated with the products or operation of Australian ICT providers to the mining industry.

How Australian ICT providers develop their export businesses

17. Australian ICT providers to the mining industry do not develop export businesses for the purpose of serving Australian mining clients overseas. However, some have received an initial export boost because of the overseas operations of Australian mining clients.
18. The main reasons that Australian ICT providers to the mining industry address overseas markets is to exploit business opportunities for the sale of their products and to gain, in the process, market leadership in their ICT specialisation. Supporting Australian mining clients overseas may be an aspect of their overseas marketing activities, but is not a major purpose of these activities.
19. Australian ICT providers obtain some leverage from the recognised strength of Australian mining and of Australian mining ICT in overseas markets. However, their

prime competitive advantage rests on the quality of their products relative to those available from Canada, the United States, South Africa and the United Kingdom.

20. Australian mining ICT providers identify the challenges and lessons associated with the development of overseas business operations and establishing foreign client relationships in terms that are universal and equally applicable to other industries. The key challenges are associated with capital, partnering and business culture – specifically, managing the establishment and ongoing costs of overseas operations; and finding reliable, technically competent business partners, with congruent aims, in overseas countries. Such partners include agents and distributors. The challenge is complicated by differences in language in some locations, and by different business cultures, including in the United States. The quality of staff in overseas locations is part of the same challenge.
21. Most Australian ICT providers establish overseas offices and partner networks on a trial and error basis in each new overseas location, notwithstanding successes and failures elsewhere. The choice of countries in which to build a presence is determined by the assessed business growth opportunities involved.
22. Where available, Australian ICT providers use the resources and assistance of the Australian Government, such as Austrade and financial support, to establish their business activities overseas. Reported experience on the usefulness of these services varied.
23. A large majority of Australian mining ICT providers do not mention on-going government services and support as significant for the continuing success of their export businesses.

The relationship between Australian miners and ICT providers overseas

24. Some Australian mining companies have a pre-disposition to favour of Australian ICT providers in their overseas operations, based on successful relationships in Australia. Most adopt a pragmatic approach to acquiring ICT products for their overseas operations, and will use ICT from providers that is fit for purpose, supported and easy to use in the overseas mining environments concerned.
25. Most Australian ICT providers to the mining industry rely on their Australian mining clients only in a passive way to aid their overseas business development. The main support from mining clients is providing recommendations and serving as a reference site for proving the effectiveness and benefits of the ICT solutions being sold. They are active in developing their markets, rather than reliant on the efforts of Australian mining industry clients.
26. Where Australian mining personnel are responsible for recommending or directly adopting Australian ICT in overseas mining operations, this typically occurs at an individual level, based on individual networks of contacts, rather than as a result of corporate policies or systemic approaches to the adoption of ICT. Informal ties and networks are more important for this process than formal links.

27. There is anecdotal evidence of a ‘cultural cringe factor’ amongst some Australian mining firms, especially those with mainly Australian operations. This suggests that Australian ICT products are only considered after the ICT provider demonstrates sales and successful implementations overseas.

Future business growth for mining ICT providers

28. Australian mining ICT has a range of growth opportunities over the next five years, mostly associated with product innovation and development for both Australian and overseas markets. In technology terms, the opportunities open to the industry are mostly of a kind applicable to industry generally. These include the deployment of systems integration technologies, the web enablement of applications, and the enrichment and quality improvement of graphical quality through 3D and other capabilities delivered over broadband communications systems.
29. The major threats to the growth of Australian mining ICT, particularly in overseas markets, is the possibility that the gap between Australian products and the products of foreign competitors will narrow. This could occur if Australian ICT providers cease to be innovative in the development of their products or if foreign competitors continue to improve on a relative basis.
30. Most Australian mining ICT providers consider their futures to be totally bound to the mining industry and its fortunes. A small proportion of these providers are taking measures to reduce their exposure to the cyclical nature of the mining industry through expansion into other sectors, changing their business model, and expanding product ranges (to include consultancy, for example).

8.2 IMPLICATIONS FOR POLICY

The conclusions from this research have a number of implications for policy development for ICT in the mining industry and for ICT generally. By policy implications, we mean the implications for action at the government and industry level that are aimed to facilitate the further growth and development of the industry and to support its expansion overseas. The purpose of this section of the report is to signal matters with implication for policy, rather than to set out precisely what that policy might be.

1. Management education and development

The present study reinforces the broader issues that were identified in Ovum’s report on *Productivity and Organisational Transformation: optimising investment in ICT* (2003), and the need for recognition, at the level of firm management, of the impacts of strategic ICT investment. This study reinforces that the mining industry also requires development in terms of –

- The strategic management of technology beyond the deployment of ICT solutions for incremental efficiency improvements in operational processes.
- Understanding of developing and new technologies in order to better anticipate and plan how to exploit new ICT resources as they become available. (The mining industry generally considered that its future use of ICT would be similar to the past, not only in

terms of expenditure levels, but also in terms of specific technologies and solutions. The industry displayed no strategic view of the use of ICT or significant levels of activity in the planning of new uses of ICT.)

- Improved ICT lifecycle management, and recognition of the need for systematic review of current applications to ensure that they represent best practice in their respective fields.
- A systematic approach to the assessment of ICT impacts on the firm and the measurement of the results achieved through ICT implementation.
- The need to improve the successful management of technology projects, and to develop technology project management skills across all sectors of industry.

2. More detailed study of ICT impacts on productivity

Mining companies typically do not measure the impact of ICT and other factors of production on their productivity. This is not unexpected, given that many mining companies consider that their competitive advantage lies in maintaining best mining practice through the efficient deployment of substantial equipment and mining assets, of which ICT is only a very small part. In order to stimulate industry focus on the productivity consequences of ICT investment longitudinal studies, based on the identification and measurement of the results achieved within representative groups of mining companies, may be desirable. If such studies were to be conducted, they might usefully extend to other similarly capital intensive industries.

Such studies may also establish and describe best practice in terms of ICT management within particular areas of the mining industry, thereby providing value to the industry as a whole.

3. Brand Australia

The Australian brand is a valuable asset for both the Australian mining industry and the Australian mining ICT industry. It is a brand that enables Australian mining ICT providers to be seriously considered by foreign mining companies who may not be aware of individual ICT providers and products. In policy terms the brand needs to be enhanced and supported wherever possible, and the potential impact of other policy initiatives on the brand always needs to be considered.

The Australian brand ultimately depends for its existence and continued effectiveness in the area of mining ICT on the accumulated impact of the efforts of many different providers in many markets via many products. The brand characteristics are of quality products that are robust and supported by professionals who are leaders in their specialised fields. The brand depends on product and service quality both in absolute terms and relative to the products from competing foreign ICT providers. Product and service quality can only remain ahead of the field through innovation supported by research and development.

4. ICT export development

The challenges identified by Australian mining ICT in developing their overseas businesses are largely the same types of challenges faced by other industries in exporting. The most commonly mentioned challenges relate to access to capital, finding suitable staff and partners in overseas market locations, and dealing with language and cultural (especially business

culture) differences. In terms of overall policy therefore, the clear implication is that support arrangements designed to assist Australian exporters generally will likely be useful for Australian mining ICT providers.

5. Government support programs

Research and Development

Many of the technologies developed and applied by the mining ICT sector are equally applicable to other industry sectors, including utilities, construction, transport and government. However, in seeking new growth opportunities, mining ICT providers have tended to market their products to the international mining sector, rather than expand domestically to other industry sectors. International expansion has proven easier than development of the marketing and distribution expertise required for success within other industries domestically. This strategy leaves mining ICT providers very exposed to cyclical swings in the mining industry, because of the effect on mining organisations' capacity to spend on new ICT products and services.

This presents a special problem for R & D, which involves long lead times, and requires a constant flow of funds. During the low parts of the cycle, R & D departments experience significant pressure, as mining ICT providers are not earning the level of revenue that is necessary to continue to fund development projects.

A policy measure that might help to address this problem would be to encourage mining ICT providers to engage with the broader ICT sector to explore new opportunities in areas such as road construction, transport generally, agriculture and other spatial systems for the further development of solutions and applications. Such measures would act to smooth the fluctuations in R & D efforts, and create an environment that is more conducive to the development of transformative technologies.

Other support

The study revealed no clear gaps in Government support for the industry. Although individual ICT providers had particular expectations that were not being met (for example, in terms of the type and depth of support that should be available through Austrade offices overseas) such views were not reflective of ICT providers as a whole. There were no recurring themes about the types of support that should be forthcoming through the government programs. ICT providers appeared not to expect more systemic support from either government or their Australian mining clients for their export programs, and saw themselves as the parties primarily responsible for the success of such programs.

6. Changing the business model

In general, Australian mining ICT providers prefer to remain aligned with the mining industry. They consider that they have built relationships and networks, and established reputations and leading products in mining. They would need to develop new networks and relationships to support moving into other industries. Diversification into other industries requires capital and potentially sustained effort for longer term gain. Some of the larger ICT providers, such as Mincom, have been able to make the move. Smaller and more focussed ICT providers have not.

The problem with this approach is that it generates substantial risks for the ICT providers, and, more importantly, risks that they cannot reasonably manage. They are aligned to the fortunes and business cycles of that part of the mining industry that they serve. These cycles are often global, and therefore cannot be mitigated through diversification into export markets.

Policies for this sector might therefore usefully explore how smaller mining ICT providers might best develop counter-cyclical, lower risk diversification strategies, including –

- Expanding the range of products to reduce exposure to a narrow range or to a single product
- Expanding into consultancy, which might incorporate the use of specific ICT solutions
- Modifying products and marketing programs to address the needs of related industries or industries with related problem sets
- Merge with other ICT firms to provide an enterprise with sufficient product coverage and critical mass to be able to expand into foreign markets

In all cases the management of diversification needs to be carefully considered to avoid compromising the niche expertise, focus and leadership on which the success of Australian mining ICT has been built to date. However, Mincom and some other larger mining ICT providers have been able to successfully address the needs of other industry sectors and reduce their reliance on mining.

We believe that although focus and product leadership is important, the attainment of critical mass may be necessary to facilitate adaptation of products to meet the needs of a diversified customer base, extending beyond the mining industry. Simply put, some of the ICT firms surveyed are too small to exploit the potential of their products in other industries. In principle, the ICT industry, even in specialised ICT sectors, is based on enabling technologies with an inherently general range of applications across the economy. ICT has therefore a wealth of opportunities available to it, relative to the mining industry. We therefore see a major potential outcome of the current study is to assist those mining ICT providers that have the capacity and products to extend beyond the mining industry, to modify their business models and to address other industries.

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Attachment A: Survey Questionnaire Instrument for Miners

INFORMATION TECHNOLOGY, PRODUCTIVITY IN THE MINING SECTOR AND THE DEVELOPMENT OF ICT SERVICES TO THE MINING SECTOR

Ovum has been engaged by the National Office of the Information Economy (NOIE) to conduct research into the role of Information and Communications Technology (ICT) in the Mining Industry and the impact of the mining sector on the growth of the ICT industry. NOIE is responsible for the international promotion of Australia's role in the information economy and for advising government on technology issues, and is interested in understanding how ICT can be used to enhance productivity within the mining industry. Another important objective of the research is to understand the ways in which the sector of the ICT Industry that provides services to the mining industry can be enhanced. Your responses are very important to us.

Participants

In conducting this research project, Ovum is seeking the views of mining executives responsible for ICT Management, and executives in organisations that provide ICT-related services to the mining industry. We are seeking your support through completion of the attached survey.

Study Objectives

The study seeks to:

- Identify the ICT technologies that have been successfully applied to mining operations
- Understand the ways in which ICT technology is impacting on productivity in the mining sector and the broader business processes that are associated with successful implementation of ICT in the mining sector
- Understand the ways in which the mining industry organisations, especially those that are international in their operations, have assisted technology partners to grow and gain international reach and exposure
- Distil the lessons learned by mining organisations and by technology partners in achieving productivity improvement in the sector

In exchange for your participation in this research, Ovum will provide you with feedback on the results of the study when it is completed. In addition, NOIE intends to publish a report on the study.

Your responses will remain anonymous, and all information collected in the study will be analysed and published in aggregate form, unless you give us permission to do otherwise.

Participation in the research

To participate in the research, please complete the following questionnaire.

1. For questions requiring a written response, provide your response between the square brackets. Please provide as much detail as you can in your response.

2. For multiple choice questions, place an [X] between the square brackets next to the most appropriate response
3. E-mail the completed questionnaire to Andrew Sergeant at Ovum, e-mail address: ais@ovum.com. Alternatively, fax the completed questionnaire to (02) 9247 6722.

If you have any questions on this research, please call Andrew Sergeant on 02 9247 6711, or Michelle Scott, who is the NOIE supervisor for this research on (03) 9667 8008. Thank you in advance for your participation in this important research.

Ovum: www.ovum.com. NOIE: www.noie.gov.au

PART 1 - YOUR BUSINESS

- 1) Please enter your contact details between the square brackets below, eg: [Ovum Pty Ltd]:

Company name: []

Contact name: []

Position Title: []

Location city/town: []

E-mail Address: []

Phone: []

- 2) Describe the nature of your CORE business.

We are interested to know whether mining is your organisation's sole business. If not we are interested to know whether other lines of business are more or less important than mining. If mining is your organisation's sole business, we are interested to know what aspect and type of mining is the most important to you.

[Provide answer here]

- 3) What was the total revenue of your organisation in the most recent completed financial year? If this has varied significantly over recent years, please provide on average of the last three years.

[Provide answer here]

- 4) What percentage of your REVENUE is derived from customers in Australia, and what percentage is derived from exports?

Derived from customers in Australia = []%

Derived from exports = []%

(Should add to 100%)

- 5) What percentage of your MINING PRODUCTION OUTPUT (in dollar terms) is produced in Australia and what percentage is produced overseas?

Percentage of total mining production output that is produced in Australia = []%

Percentage of total mining production output that is produced overseas = []%

(Should add to 100%)

PART 2 – TECHNOLOGY EXPENDITURE

- 6) What is your annual ICT budget in dollar terms? If this has varied significantly over recent years, please provide on average of the last three years.**

ICT includes communications hardware and services, and computing hardware, software and services.

[Provide answer here]

- 7) What are the major items within your ICT budget? In your description it may be useful to distinguish between communications-related hardware and services, and it-related hardware, software and services.**

[Provide answer here]

- 8) What are the main uses of ICT goods and services in your organisation? (eg in-mine communication, mine management, scheduling, surveying, exploration)**

[Provide answer here]

- 9) Have the major components of your organisation's ICT budget changed significantly over the past 5 years – if so how?**

[Provide answer here]

- 10) What is the growth rate of your organisation's expenditure on ICT?**

[Provide answer here]

- 11) Please comment on the factors that will contribute to this growth rate.**

[Provide answer here]

12) Please indicate the percentage of each of the components of your ICT budget that is mining industry specific (as opposed to general applications and hardware that would be found in other industries)

- Communications hardware..... [] %
- Communications services..... [] %
- Computer hardware.....[] %
- Computer software.....[] %
- Computer services.....[] %
- Other [] %

(Should add to 100%)

13) Consider the ICT products and services your organisation purchases, which are also used widely in other industries. List the major suppliers of these products and services to your organisation.

[Provide answer here]

14) Consider the ICT products and services your organisation purchases, which are very specific to the mining industry. List the major suppliers of these products and services to your organisation

[Provide answer here]

15) What percentage of spending on technology is conducted with Australian technology providers, and what percentage is with international technology providers?

Technology expenditure with Australian technology providers = []%

Technology expenditure with international technology providers = []%

(Should add to 100%)

16) What do you consider to be the strengths and weaknesses of Australian mining ICT providers, compared with their international competitors?

[Provide answer here]

17) Thinking about the specialised technologies that you have sourced in Australia, what are the major factors you consider when deciding whether to utilise these technologies in other operations around the world?

[Provide answer here]

18) Considering the range of Australian technologies that you use, what categories of technology are you most likely to take with you to your international operations (if you have international operations)?

[Provide answer here]

19) How do you assess the value and measure the effectiveness of your expenditure on ICT in relation to your overall business? What output dimensions do you consider in determining whether to invest in ICT?

[Provide answer here]

20) Please estimate your organisation's average annual capital expenditure over the last 3 years. What proportion of this expenditure is allocated to ICT?

[Provide answer here]

21) Do you measure the productivity growth in your organisation, and if so how?

[Provide answer here]

22) What has been the productivity growth in your organisation over the past 3 years, using the measure(s) described in answer to Q.20?

[Provide answer here]

23) What proportion of the productivity growth in answer to Q.21 do you ascribe to ICT, and why?

[Provide answer here]

24) Was the productivity-enhancing ICT developed or modified in Australia...?

to suit your firm's requirements []

to suit the mining industry requirements []

Not modified or developed in Australia (off-the-shelf or standard implementation) []

Don't know []

(Select as many as apply)

PART 3 – OUTLOOK

25) Do you anticipate making any major changes to your investments in the way you invest in productivity-enhancing ICT and, if so, what changes?

[Provide answer here]

26) Please provide any further comments you would like to make concerning the use of ICT to enhance productivity in your organisation

[Provide answer here]

PART 4 – ENTERPRISE CLASSIFICATION INFORMATION

27) Please indicate which of the following categories of mining your organisation is involved in. select all that apply by placing an x between the square brackets. (the codes are ANZSIC codes for industry sector identification.)

Black Coal Mining (1101) []

Brown Coal Mining (1102) []

Oil and Gas Extraction (1200) []

Iron Ore Mining (1311) []

Bauxite Mining (1312) []

Copper Ore Mining (1313) []

Gold Ore Mining (1314) []

Mineral Sand Mining (1315) []

Nickel Ore Mining (1316) []

Silver-Lead-Zinc Ore Mining (1317) []

Metal Ore Mining (1319) []

- Gravel and Sand Quarrying (1411) []
- Construction Material Mining (1419) []
- Other Mining (1420) []
- Petroleum Exploration (for your own organisation) (1511) []
- Petroleum Exploration Services (1512) []
- Mineral Exploration (for your own organisation) (1513) []
- Other Mining Services (1520) []

28) How many people are employed in your business? Place an [X] against one of the following:

- 1-9: []
- 10-19 []
- 20-50: []
- 51-100: []
- 100 plus: (please specify number) []

Thank you for your participation in the study.

Ovum

Attachment B: Survey Questionnaire Instrument for ICT Providers

INFORMATION TECHNOLOGY, PRODUCTIVITY IN THE MINING SECTOR AND THE DEVELOPMENT OF ICT SERVICES TO THE MINING SECTOR

Ovum has been engaged by the National Office of the Information Economy (NOIE) to conduct research into the role of Information and Communications Technology (ICT) in the Mining Industry and the impact of the mining sector on the growth of the ICT industry. NOIE is responsible for the international promotion of Australia's role in the information economy and for advising government on technology issues, and is interested in understanding how ICT can be used to enhance productivity within the mining industry. Another important objective of the research is to understand the ways in which the sector of the ICT Industry that provides services to the mining industry can be enhanced. Your responses are very important to us.

Participants

In conducting this research project, Ovum is seeking the views of mining executives responsible for ICT Management, and executives in organisations that provide ICT-related services to the mining industry. We are seeking your support through completion of the attached survey.

Study Objectives

The study seeks to:

Identify the ICT technologies that have been successfully applied to mining operations

Understand the ways in which ICT technology is impacting on productivity in the mining sector and the broader business processes that are associated with successful implementation of ICT in the mining sector

Understand the ways in which the mining industry organisations, especially those that are international in their operations, have assisted technology partners to grow and gain international reach and exposure

- Distil the lessons learned by mining organisations and by technology partners in achieving productivity improvement in the sector

In exchange for your participation in this research, Ovum will provide you with feedback on the results of the study when it is completed. In addition, NOIE intends to publish a report on the study.

Your responses will remain anonymous, and all information collected in the study will be analysed and published in aggregate form, unless you give us permission to do otherwise.

Participation in the research

To participate in the research, please complete the following questionnaire.

4. For questions requiring a written response, provide your response between the square brackets. Please provide as much detail as you can in your response.

5. For multiple choice questions, place an [X] between the square brackets next to the most appropriate response
6. E-mail the completed questionnaire to Andrew Sergeant at Ovum, e-mail address: ais@ovum.com. Alternatively, fax the completed questionnaire to (02) 9247 6722.

If you have any questions on this research, please call Andrew Sergeant on 02 9247 6711, or Michelle Scott, who is the NOIE supervisor for this research on (03) 9667 8008. Thank you in advance for your participation in this important research.

Ovum: www.ovum.com. NOIE: www.noie.gov.au

PART 1 - YOUR BUSINESS

1) Please enter your contact details between the square brackets below, eg: [Ovum Pty Ltd]:

Company name: []

Contact name: []

Position Title: []

Location city/town: []

E-mail Address: []

Phone: []

2) In which of the following ICT segments is your business a provider? Mark more than one category if applicable.

Communications hardware (such as voice, video and data communications systems).....[]

Communications services (such as services provided by Telstra, Optus and ISPs, etc).....[]

Computer hardware (such as servers, PCs, printers etc)..... []

Software (whether packaged or custom) []

Computer services (such as systems integration, maintenance, etc..... []

Consultancy (including design and project management).....[]

Other.....[]

3) Which of the following mining activities do your services support? Select all that apply.

Bulk handling..... []

Mine business management..... []

Education and training..... []

Environment (including management and restoration) []

- Exploration..... []
- Feasibility studies..... []
- Mine construction..... []
- Occupational health and safety..... []
- Processing..... []
- Research and development..... []
- Surface mining..... []
- Underground mining..... []
- Other (please specify) []

4) a) Describe the specialised mining industry ICT products and services that your organisation provides

[Provide answer here]

b) How have these specialised mining technologies enhanced productivity in client organisations?

[Provide answer here]

5) a) Describe the ICT products and services that your organisation provides that are also used in other industries. Please indicate whether they have very broad or specialised application to those other industries, and whether these technologies have been modified in order to apply to these industries.

[Provide answer here]

b) How have these technologies enhanced productivity in client mining organisations

[Provide answer here]

6) What is your total annual revenue (in Australian dollars). Select the best answer by placing an X in the square brackets.

Less than \$1 million []

\$1 million to \$5 million []

\$5 million to \$10 million []

\$10 million to \$50 million []

\$50 million to \$100 million []

More than \$100 million []

[If \$100m+, provide amount here]

7) What proportion of your total revenue comes from the mining sector? Please specify other industries you make ICT sales to.

[Provide answer here]

8) What has been the average annual growth rate of your organisation's revenue over the past 3 years?

[Provide answer here]

9) What are the major factors that have contributed to this result?

[Provide answer here]

10) What do you expect the average annual growth rate of your organisation's revenue will be over the next 3 years?

[Provide answer here]

11) What are the major factors that will contribute to this result?

[Provide answer here]

12) a) Was the initial customer for your ICT goods and services...?

In the Australian mining industry []

In another industry within Australia []

In the mining industry overseas []

In another industry overseas []

b) Were there any special reasons that made it easier to break into the market at that location? If so, please specify (eg previous relationships, word of mouth within the industry etc)

[Provide answer here]

13) a) What proportion of the ICT goods and services that you sell are...?

Developed overseas []

Developed in Australia []

Developed overseas but modified to meet Australian conditions or requirements []

b) What requirements of your mining customer(s) led to modification to or development of your ICT goods and services for the mining industry?

To meet the general physical demands of the mining industry (eg ruggedising) []

To meet legislative requirements for the mining industry (eg safety, superannuation) []

To meet specific demands of a sub- sector within mining (eg underground mining, open cut)[]

Other (eg survey, geological mapping, exploration, risk management - please specify) []

None []

c) Have your customers been involved in the development of the modifications? (If yes, specify how)

[Provide answer here]

14) Have you modified Australian-developed ICT goods and services for application in other industries? (If yes, please specify which industries)

[Provide answer here]

PART 2 - TECHNOLOGY EXPORTS

15) What percentage of your REVENUE is derived from customers in Australia, and what percentage is derived from exports?

Derived from customers in Australia = []%

Derived from exports = []%

(Should add to 100%)

16) If you have exported ICT-related products or services, what have been the main reasons you have sought to do this? Select all that apply

To gain international market leadership in a niche area []

To serve a client organisation as they expand operations overseas []

To exploit new revenue opportunities []

Other [Please specify]

17) If you have exported ICT-related products or services to mining organisations overseas, have you been assisted by your mining industry clients in Australia? If yes, in what ways?

[Provide answer here]

18) If you have exported ICT-related products or services to mining organisations overseas, please describe up to 3 of challenges you have faced in doing this.

[Provide answer here]

19) What have been the most important lessons you have learnt in your experience exporting ICT-related products or services to mining organisations overseas? Describe up to 3 lessons.

[Provide answer here]

20) What do you view as the main competitive advantages that your organisation possesses in exporting ICT products and services to mining organisations overseas?

[Provide answer here]

21) How does Australia compare with other countries in its ability to export ICT-related products and services in the mining sector? Which countries are the leaders?

[Provide answer here]

PART 3 – OUTLOOK

22) Do you expect any major changes to your business over the next 5 years? If yes, briefly describe these changes.

[Provide answer here]

23) What do you consider to be the major THREATS, if any, facing your business as a provider of ICT services to the mining industry over the next 5 years?

[Provide answer here]

24) What do you consider to be the major OPPORTUNITIES, if any, facing your business as a provider of ICT services to the mining industry over the next 5 years?

[Provide answer here]

25) Please provide any further comments that you would like to make on the subject of ICT service provision to the mining industry in Australia and overseas.

[Provide answer here]

PART 4 – ENTERPRISE CLASSIFICATION INFORMATION

26) How many people are employed in your business? Place an [X] against one of the following:

1-9: []

10-19 []

20-50: []

51-100: []

100 plus: (please specify number) []

27) Which of the following sectors within the mining industry does your organisation provide services to? Select all that apply by placing an X between the square brackets. (The codes are ANZSIC codes for industry sector identification).

- Black Coal Mining (1101) []
- Brown Coal Mining (1102) []
- Oil and Gas Extraction (1200) []
- Iron Ore Mining (1311) []
- Bauxite Mining (1312) []
- Copper Ore Mining (1313) []
- Gold Ore Mining (1314) []
- Mineral Sand Mining (1315) []
- Nickel Ore Mining (1316) []
- Silver-Lead-Zinc Ore Mining (1317) []
- Metal Ore Mining (1319) []
- Gravel and Sand Quarrying (1411) []
- Construction Material Mining (1419) []
- Other Mining (1420) []
- Petroleum Exploration (for your own organisation) (1511) []
- Petroleum Exploration Services (1512) []
- Mineral Exploration (for your own organisation) (1513) []
- Other Mining Services (1520) []

Thank you for your participation in the study.

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Attachment C: Composition of Survey Respondent Groups

FIGURE C.1: COMPOSITION OF SURVEY RESPONDENT GROUPS

COMPLETED SURVEYS	Employee Size			Total
	1-19	20-99	100+	
Miners				
Coal Mining			2	2
Oil and Gas Extraction			3	3
Metal Ore Mining		3	4	7
Other Mining (incl. Construction Materials)	1	1		2
Services to Mining (including exploration)	5	1	1	7
<i>Several sub-sectors</i>	2	5	2	9
TOTAL	8	10	12	30
ICT Providers				
	1-19	20-99	100+	Total
Mining Technology Providers	7	12	2	21
Generic Providers				0
TOTAL	7	12	2	21