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POLICY SUPPORT PROGRAMME**

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ECONOMIC DEVELOPMENT IN SOUTH AFRICA PROJECT
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FINAL SECTORAL REPORT –PLATINUM MINING SECTOR
(ICT DIFFUSION AND APPLICATIONS)**

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Submitted by

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Executive Summary

Background and Motivation to Information and Communication Technology (ICT) Diffusion Project

This report represents part of the second Phase of an eight-sector study, commissioned by the Department of Trade and Industry and funded by the European Union, to examine:

- i) The likely trajectories for the absorption of ICTs in a range of economic sectors; and
- ii) How to adjust the policies and strategies of the government and the domestic private sector to maximise the benefits to South Africa from the insights flowing out of i).

The project builds on existing research work but has at its heart the analysis of a number of 'vertical markets' for information and communication technology, first through a worldwide scan (Phase I) and then through sectoral research in each of the chosen eight sectors.

The sectors selected were drawn from three broad categories – traditional sectors, service sectors, and new economy sectors, as follows:

Traditional: Platinum Mining, Automotive Manufacturing, Clothing Manufacturing and Deciduous Fruit Farming

Service: Cultural Tourism and Healthcare Information Flows

New Economy: Biotechnology and Multimedia

The objectives of the research work included:

- To generate accurate, objective findings regarding patterns for absorption of ICTs in a range of SA Economic sectors, in order to guide South African participants in vertical markets for ICT;
- To provide recommendations for impacting public and private sector policies;
- To guide the government in directing some of its existing and future intervention strategies, including research and development programmes and industrial development facilities, whether through the science vote or departmental programmes, and to give government more guidance regarding the commitment of funds for human resource development

Project Research Methodology

The overall approach adopted by the lead consultants was to use Sectoral Experts to do the interviewing and primary research, with three ICT coordinators (responsible for up to three sectors each) ensuring consistency across the sectors. An International Consultant was employed to provide an 'outside' perspective of the research.

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The research methodology for Phase I of this project (The International Scan) involved:

- i) Defining each of the sectors;
- ii) Identifying the main players in the value chain; and then
- iii) Performing secondary research on each of the eight sectors to obtain current data about the diffusion of ICT technology into those sectors and to identify leading-edge applications, as far as possible.

Phase II (Diffusion of ICT in South Africa) involved using the sector and value chain definitions to identify the major role players and to set up interviews with selected stakeholders across the value chain.

The questionnaire that was used contained both a generic portion (i.e. used by all sectors) and a sector-specific portion (i.e. aimed only at those interviewees within the sector). Most of the questions relied on the *perception* of the interviewee; a rating scale was typically used, but a number of 'open-ended' questions were included to allow interviewees to express opinions in a less structured way.

The generic questionnaire was subdivided into six sections:

- Background Information (Name, Address, Organisation Size, etc);
- ICT Usage (of Technology and Applications);
- ICT Spending Patterns;
- Sources of ICT Information and Training;
- ICT Adoption: Drivers and Barriers (External Economic Factors, Supply Chain Issues, etc); and
- Diffusion of ICT into Organisation/Sector.

The sector-specific questions focused on issues of importance to that particular section.

Between 40 and 65 interviews were conducted per sector; these should not necessarily be construed as being representative of the sector, as the selection of interviewees was often dependent on personal contact from the sector researcher. Also, the responses from those interviewed undoubtedly contained an emotional bias (for example, the desire not to seem technologically backward), which would have influenced the responses. Hopefully, these biases have been minimized through the averaging process.

Analysis of the Results

The results from the questionnaires were captured on an Excel spreadsheet and a basic analysis performed centrally. This information was then fed back to the individual sector researchers for further analysis and comment. The generic portion of the questionnaire captured up to 117 separate items of information per respondent (either a rating, a comment or basic data), so that a typical sector analysis involved 5000 + items. These responses were subdivided into various categories (e.g. Large, Medium, Small organisations) as applicable and further iterations performed.

Most of the results were shown graphically for ease of comprehension, although only basic statistical analysis was performed due to the nature of the data.

Summary of the Platinum Mining Sector Results

This report was informed by results obtained from a survey of the Platinum Mining Industry both here and overseas (Phase I of this project). Based on a questionnaire designed to obtain general (generic) information about ICT Use plus that specific to the Platinum Sector, over 60 people were interviewed across the Value-Chain.

Chapter 3 of this report describes the Platinum Sector in South Africa, noting the dominant position of this industry worldwide plus the fact that about 56% of identified resources are found here.

Chapter 4 covers the Research Methodology used, from the nature of the questionnaire used and descriptions of the sector-specific information sought to the questionnaire administration, interviewee selection and the interview process itself.

Chapter 5 details the results obtained, using graphical techniques as far as possible.

The study focused on PGM Mining in areas already demarcated as having known or highly probable PGM Resources. Accordingly, the Geographic Areas involved were those of the Bushveld Complex known as the Western Limb, Eastern Limb and Northern Extension.

There is a dramatic spectrum of size when reviewing the organisations in the sector, from producers in the sector, each with many thousands of employees, to several medium sized mining companies relatively new to the area. These companies are involved in the production value chain from mineral rights to sale of refined metal. They are supported by large to medium size suppliers, contractors and service providers. Other stakeholders with a lesser presence in terms of the Platinum Mining Sector include mining systems suppliers, industry and regulatory bodies and research institutions.

The group that is growing significantly in numbers but does not have any strength as yet in the mining business is that comprising regional and local authorities, as well as the local interested and affected parties throughout the three provinces where platinum mining rights are located.

The results obtained from the generic part of the questionnaire show the following:

ICT HARDWARE

- i) Basic Hardware and Communication technologies such as Personal Computers, Servers, CAD/CAM, and Local Area Networks are well used with the expected variation across size of firm, and with a lower response as far as the use of emerging technologies and mobile phones/pagers is concerned.

INFORMATION ACQUISITION AND COMMUNICATION

- ii) E-Mail is the most commonly used application followed by Business Support Activities such as finance/accounting applications, personnel management, etc.

Videoconferencing and teleconferencing are both not used extensively.

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STREAMLINING BUSINESS PROCESSES

- iii) The use of ICT in streamlining business processes (i.e. applications such as marketing and sales, stock and inventory control) is average to low, and probably indicates some opportunity 'gaps'
- iv) More sophisticated applications such as e-commerce, teleworking and the use of the World Wide Web for conducting business are not widely used.

ICT SPENDING PATTERNS

- v) Expenditure on ICT within the Platinum Sector is felt to be less than the Global norm

SOURCES OF ICT INFORMATION AND TRAINING

- vi) ICT Information is obtained primarily from ICT suppliers, experts within company and consultancies or service providers. Trade and Business Associations, Chambers of Commerce and the Government initiatives are hardly used.
- vii) The pattern for ICT Training is similar, but here in-house training is extensively used.

ICT DRIVERS AND BARRIERS

- viii) As far as factors which influence an organisation's ability to invest in ICTs is concerned, practically all were seen as having either a positive or at worst a neutral influence, with the exception of the cost of ICT.

EXTENT OF ICT DIFFUSION

- ix) Respondents in the Platinum Mining Sector feel that they are slightly behind the rest of the Mining Sector in South Africa in their adoption (diffusion) of ICT, although Mining globally is seen to be in the early majority

The sector-specific part of the questionnaire examined both present realities and future trends within *categories of respondents* e.g. mines, process and metallurgical plants, equipment suppliers.

While in some cases the number of respondents per category mitigates against placing too heavy an emphasis on these results, a number of interesting trends were identified.

- i) Usage of ICT was forecast to grow in practically all areas of the business, across categories, over the next two years. This probably matches the position with the other major mining sectors. The mining sector with its traditional large company involvement has been amongst the early majority of ICT users when compared with other sectors.
- ii) Information warehousing is seen as increasing in use in future. This probably reflects a trend towards greater integration of systems across the value chain, as was also highlighted in the international scan. This is also indicated by a sharp increase in the use of ERP systems such as SAP in future. However, it seems clear that not all players are putting in the same effort or even have the same understanding of the issues involved.

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- iii) In recent times there has been increasing political pressure to prevent known mineral rights from lying undeveloped. Further it is becoming a requirement to have empowerment partners involved in the exploitation of these mineral rights. The pattern of Joint Venture projects up until now has been of two types. The first is where two of the traditional major companies have collaborated to optimise the exploitation of adjacent mineral rights (e.g. the Pandora 50:50 project between Anglo Platinum and Lonmin Platinum).

The second has been between one of the large companies (who hold most of the mineral rights) and a development with an empowerment partner in the form of a Black-controlled mining investment company e.g. the Anglo Platinum and African Rainbow Minerals project at Maandagshoek.

There is now however a growing group of aspirant mining entrepreneurs, who are aware that mineral rights are being made available by the major companies and wish to be included as empowerment partners in Joint Venture projects. There were a number of these people (*new entrants*) included in the survey.

Future Joint Venture partners have little usage of ICT, although usage is forecast to increase over the next two years. There is clearly a need for an education and support programme here, not just in ICT.

- iv) There is general consensus that services provided by Telkom need improvement. Concerns were expressed over the cost of telephone services, the speed of data transfer and the unreliability of connection. The problem seems to be most acute in the more remote mining areas, *where all aspects of communication except the fixed line network were ranked as being inadequate both now and into the future.*
- v) The *processing and metallurgical plants* as well as the *contractors* were concerned particularly about videoconferencing and satellite communications, since both groups are reliant on international communications.
- vi) *Suppliers* as a group were particularly unhappy about the adequacy of their overall communications infrastructure, rating it the lowest of all groups going into the future.
- vii) The question on which projects should get the priority of diffusion, in terms of their importance to the speedy implementation of development projects planned, elicited some interesting responses. The mines, for example, rated no basic technology or sector-specific application above a 3 on average, indicating that they see no particular ICT as requiring high priority for development. Mining Companies, Process Plants, Suppliers and ICT Suppliers rated E-Commerce as a high priority.
- viii) Mine systems suppliers place low priority on all sector applications except Mine Planning and Design, their area of specialisation.
- ix) The mines in particular seem to suffer from a shortage of trained people, with their ratings being at the 'insufficient' or below level in every category. The mining companies are relatively satisfied, presumably largely because they operate out of the major centres and have the resources to buy skills; most other groupings show shortages or acute shortages in selected areas.
- x) There are some interesting anomalies. For example, the availability of skills in the 'Mine Planning and Design' area is rated as 3 or below in every group except the ICT Suppliers (of mine planning and design software) – who have presumably cornered the market! Mining companies will therefore require the management skills for the technology uptake.

Chapter 6 provides an analysis and interpretation of the results obtained.

These vary somewhat between sectors, but there are some general trends that should be highlighted.

There are notable opportunities to improve efficiencies through better communications; to make greater use of Mine Planning and Design software and skills; and to improve the integration of systems through common standards that apply to the various stakeholders. For the major advanced players, technical applications are no longer the top priority. Focus is now more on organisational processes. However, the use of ICT to control mechanisation, particularly underground, is believed by some to be an area of great promise.

There is also clearly a need to upgrade JV partners, in both an understanding of the Mining Industry and in the use of ICT if they are to play a meaningful role in the development of this sector.

Chapter 7 dealt with the Conclusions and Recommendations of this Study.

The following points are made in the expectation that the sector will develop in accordance with the desire of many stakeholders. These are broadly as follows.

The sector will grow strongly as a result of the major expansion projects that are taking advantage of the favourable supply/demand imbalance forecast for the next five years.

The major companies are going ahead with programmes to increase the number of joint venture and empowerment partnerships.

In accordance with the intentions of the new Minerals and Petroleum Resources Development Bill there will be increased involvement of local businesses and communities in the areas where there are new mining operations being developed in the sector. The recommendations fall into three categories:

1) **What the Sector can do to better exploit ICT?**

The objective is to improve the productivity of operations and improve communications capabilities. Key Recommendations are:

- Adopt a more progressive attitude towards the adoption of ICT;
- Integrate applications across the Value Chain;
- Initiate in-house training on ICT use to meet forecast requirements; and
- Educate and support JV partners.

2) **What can ICT Industry do for this sector?**

The objective is to promote expansion of ICT usage. Key Recommendations were:

- Find ways of supporting new entrants with a view to future industry growth
- Specialised support in the area of streamlining business processes

3) **What can Government do?**

The objective is to facilitate an enabling environment where it is unreasonable for any company to take individual responsibility. Key Recommendations were:

- Upgrade the telecommunications infrastructure;
- Educate and Support JV partners;
- Provide general ICT training in the communities where the Mines are based; and
- Provide a storehouse of relevant information pertaining to all initiatives (e.g. Telecentres) taking place in the area.

1. Overview of the Platinum Sector

Platinum Group Metals (PGMs) comprise the metals platinum, palladium, rhodium, iridium and osmium. These metals usually occur together in the same ore. So interlinked are they that the terms 'platinum mining' and 'PGM mining' are used interchangeably. Their properties include high density, strength, high melting points and catalytic properties. These properties make them suitable for jewellery and many industrial uses, notably as catalysts in autocatalytic converters.

South Africa is the world's top producer of PGMs, accounting for 46% of total world supply. It also has 56% of the world's identified resources, showing the potential for sustained future production and continued world dominance. Export sales reached nearly R25 billion in 2000, compared to R5 billion in 1990, and are set to increase further. With the decline of the ageing gold mining sector, the role of platinum mining in South Africa's economy is becoming more and more significant.

Between 1980 and 2000, global platinum consumption increased by an average of 5,7% per annum. The fastest growing use was for jewellery, which increased by an average 14% per annum in the same period. During 1999, global supplies fell 6.3%, due largely to decreased Russian output, while at the same time global demand rose by 7%. In 2000 Russia increased output, and global supplies grew marginally. Demand for palladium decreased, which lowered global PGM demand slightly. However, by the end of 2000, supply was still outweighed by demand (supply was 88% of demand). This supply shortfall is predicted to continue in the near future, ensuring that prices remain high.

Demand for platinum, palladium and rhodium for auto-catalyst manufacture continues to increase. New uses for platinum, such as fuel cells, are being developed and demand from these uses is expected to come on stream in the near future. It is forecast that by the year 2020 platinum demand will have grown by a further 50% of today's figures.

In South Africa, platinum mining is spread around the Bushveld Complex. There are three main limbs of the Bushveld Complex where platinum mining is taking place, represented geographically as:

Western limb:	Thabazimbi to Rustenburg to Pretoria
Eastern limb:	Lydenburg to Steelpoort to Zebediela
Northern extension:	Potgietersrus to west of Pretoria.

Platinum mining is an important component of the economies of three provinces; North West, Mpumalanga and Northern Province, with the North West province being predominant. The synergy between the Bafokeng tribe and the platinum mining sector has seen a significant proportion of the revenue flowing directly into the surrounding communities. The resultant expansion in communications, health, education and social amenities infrastructure is a sterling example of what could be achieved in the platinum mining sector.

The industry operates on a free market basis, with no government subsidy. The sector employs 96 000 people on the mines. There are four major traditional mining companies, Angloplats, Impala, Lonplats and Northam. All these players have either embarked on, or are planning, major expansion projects to meet the predicted growth in demand. More recent entrants in the sector include Aquarius Platinum (Kroondal and Marikana) and Southern Era (Messina Platinum).

Joint ventures and participation by empowerment groups are becoming increasingly important in the sector. African Rainbow Minerals has gone into a R1.35 billion joint venture with Angloplats at Maandagshoek on the eastern limb of the Bushveld Complex. In 2000,

Mvelaphanda Platinum bought a 22.5% stake in Northam. During 2001, Lonmin and Angloplats agreed to develop the Pandora mine. Also Anglovaal and Implats announced plans to develop Dwars Rivier on the Eastern limb, most likely with an empowerment partner.

South Africa's PGM mining sector is therefore well geared for growth and is set to maintain its global dominance. The sustained growth of the PGM mining sector will produce extraordinary leverage in enhancing economic growth in the regional communities, and the provincial and national economies. This will occur through the knock-on effect that always follows developments in any mining sector.

2. Methodology

A structured questionnaire was compiled that combined a generic component applicable to all eight sectors of the study, together with a component particularly applicable to the PGM mining sector. This obtained information on i) The current use of ICT in the different parts of the sector and its operating environment; and ii) The areas where introduction and proliferation of ICT could enhance development of the PGM mining sector;

- Significant role-players in the supply chain were identified;
- Questionnaires were distributed;
- Interviews were arranged with over 60 participants;
- Questionnaires were processed; and
- A Report was produced on findings and recommendations for diffusion.

2.1 Nature of Questionnaire (Sector-Specific Components)

2.1.1 Specific Sectoral Issues & Outcomes

The following topics specific to the platinum mining sector were examined in conjunction with the items in the common survey instrument:

- Usage of Sector-specific ICTs
An assessment of current and anticipated usage of ICTs specific to this sector.
- Priority
An established priority in the sector for diffusion of ICTs to enable the planned developments to be enhanced and not retarded.
- Infrastructure
A statement of any shortcomings in available ICT support infrastructure in the areas where developments in the sector are planned.
- Staffing
A sector view as to whether there are sufficient personnel trained in the use of ICTs to support the planned level of development projects in the sector.
- Training

A sector view as to whether there are sufficient resources available to match the ICT training requirements for the sector's planned expansion.

- ICT sophistication level of partners
A sector view as to whether special effort is required to enhance the ICT sophistication level of joint venture or empowerment partners.

2.2 Questionnaire Administration

The intention was that there would be one questionnaire that would simultaneously seek to acquire knowledge in the ICT field concerning:

- Areas of interest that could be seen as generic across all eight sectors; and
- Areas of particular concern to the Platinum Mining sector in the opinion of the Researcher.

Therefore the survey instrument was divided into two parts that would provide the above information in one interaction.

In the Research Plan for the sector a diagram was developed that depicted in broad terms the Value Chain of the Platinum production processes and all the groups of stakeholder interests. This representation was termed the Value Network for the sector. (See Diagram in *Section 3.1.2*).

A large proportion (the more involved) of the groups were selected and a target number planned for consultation from each group, to make up the target total of 50+interviews. (See Tabulation in *Section 2.3*). The greater numbers were drawn from the mining companies and the organisations directly providing them with services.

For the majority of these organisations the Researcher identified individuals known to him. These persons were approached by the Researcher in person, in as many cases as possible, to gain their acquiescence that their organisation would participate in the survey, or at least assist in getting the questionnaire to someone in the organisation who could take a view on participation.

For the balance, mining industry contacts were used to gain a referral. In the listing shown as Appendix 6.2 the contact individuals and the method of contact is shown. Not all the contacts were identified up front and the list grew as the project progressed, particularly as it became clear that there would be difficulty in actually getting returns from everyone who had been approached.

Once the target individuals agreed to participate they were sent a questionnaire document. The majority of these were sent by email under a covering letter from the Principal Researcher. In the minimal cases where this was not possible the document was sent by fax. Unfortunately at this stage there was no motivating letter bearing the Minister's signature available, but perhaps this would only have been important in the cases of persons who did not know the Researcher personally.

It is important to note that at this stage the most common response was agreement to consider assistance

"Yes sure, I would like to assist you, send me the questionnaire and I will see."

For the questionnaires that had gone out a log was kept showing the date of despatch for each.

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This log was reviewed from time to time. When it became apparent that a number of questionnaires were outstanding for return a polite enquiry was put out to a group of contacts by email.

[It could be said that one should have used the telephone but it is worth noting that with the lean organisations of today and the meetings load, most executives of companies are not available for phone calls. Messages left are often not returned and requests for return calls either not met, or in turn, are returned at a time when the receiver is not available.]

The majority of the target individuals never responded to the follow up contact, and in many instances this had to be repeated three or more times.

The usual problem was that the person first contacted was not the one who was competent to supply some of the technical information called for, and had passed it on to someone better placed to supply some of the information. This was more the case with senior executives of the larger organisations like mines, process plants and major suppliers. Another problem with less senior contacts was that it was necessary for them to obtain permission from a senior manager to complete the questionnaire and send it to a Researcher outside the organisation. The platinum companies have been traditionally reticent to disclose any sort of information about their operations.

On receipt of a completed questionnaire, the person sending it was contacted first in acknowledgement but also to notify him of a follow up session.

In the follow up process the contents of the questionnaire were reviewed to ensure the Researcher understood the respondees' comments in the submission. Once this was the case, copies of the document were printed, one copy filed and a copy sent to the Principal Researcher.

2.3 Interviewees: Selection and List by Role in the Sector

2.3.1 Research Plan Targets

The intended target groups and approximate number of interviewees was as follows:

Target Groups	No of Interviews	Locality
Mining companies' senior management / consultants	2	Johannesburg
Mine management members	15	Various mines in the BIC
Metallurgical process managers	2	Rustenburg/Reef
Mining supplier companies	6	Reef
Metallurgical materials suppliers	1	Reef
IT Vendors of software for mines	5	Johannesburg
PGM Buyers	1	Reef
DME & Industry bodies	3	Pretoria / Rustenburg/ Johannesburg
Research Organisations	4	Johannesburg
Finance Providers	2	Johannesburg
Provincial/Regional/Local authorities	4	Pietersburg
Interested and affected community representatives	10	Pietersburg
Total	55	

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2.3.2 Summary Of Responses

The table shows the actual outcome in terms of the returns received of the Survey document, relative to the contacts made, and also to the response level targeted for each set of stakeholders in the Research Plan.

ICT PROJECT RESEARCH AREAS LISTING			
TARGET ORGANISATION	CONTACT MADE	TARGET RESPONSE	SURVEYS RETURNED
ALL	86	55	62
COMPANIES MANAGEMENT	8	2	6
MINES MANAGEMENT	18	15	14
PROCESS MANAGEMENT	4	2	3
MET PROCESS SUPPLIERS	3	1	1
PGM BUYERS	0	1	0
MINING SUPPLIERS	10	6	9
MINING CONTRACTORS/ SERVICES	13	0	11
ICT SERVICES	3	5	3
INDUSTRY REGULATORS & CONTROLLING BODIES	5	3	2
RESEARCH BODIES & CONSULTANTS	4	4	3
INVESTMENT & FINANCE BODIES	2	2	1
PROVINCIAL/REGIONAL/LOCAL AUTHORITIES	2	4	2
INTERESTED & AFFECTED PARTIES/ SMALL ENTERPRISES	11	10	7
JV PARTNERS	3	0	0

2.4 Interview Process

The essence of the study was the capture of perceptions and attitudes of key role players in the sector. The survey instrument was used to record open-ended comments in addition to the information called for.

Because the instrument was made available to interviewees in advance it was expected that they would assemble input, tap the opinions of colleagues etc., before an interview.

Because of the sector geography and the availability of the respondees, it turned out, as predicted by the Principal Researcher that individual interviews had to be supplemented by small group interviews, telephonic interviews, or requests to complete and return questionnaires by email or fax.

The Platinum Mining sector covers an extremely large area of the North West, Limpopo and Mpumulanga provinces. As such the range of respondees was very spread.

For the occasions where a group of interviewees had all prepared questionnaires from a particular area of the Bushveld Complex it was possible and warranted to travel to a central point for personal interviews. Where possible, although a bit difficult, this was conducted with two or more people simultaneously.

However with the irregular delivery of questionnaires this seldom happened and it is not practical to make a several hours journey every other day for a single interview.

Furthermore many managers were very reluctant to allocate any further time than they had already given in the form of the initial discussion in which they agreed to participate, and had then made arrangements to complete the questionnaire for their organisation. They felt they had contributed enough by that stage but would agree to a brief telephone discussion, assuming you could actually catch them at a time they were in the office and prepared to take calls.

“Interviews” therefore took three forms. These were: face-to-face, telephone and email/fax verification. In certain instances there was only a tick-off response to the sections, with no comments and also some areas not completed because “I have no idea”. As such where there was no room for misunderstanding and various parts of the different sections correlated, an interview was considered unnecessary. Needless to say such a shallow contribution was not accorded a great deal of weight in the subsequent evaluation.

3. Results

3.1 Nature of Sector: boundaries and subsector map; large company/small company picture; international relationships

3.1.1 Geographic

The study focused on PGM mining in areas already demarcated as having known or highly probable PGM resources. This meant that the geographic areas involved were those in the Bushveld Complex known as the:

- Western Limb
- Eastern Limb
- Northern Extension.

Where there are mining rights having resources of Merensky, UG2 and Platreef.

3.1.2 PGM Mining Value Chain And Stakeholder Network

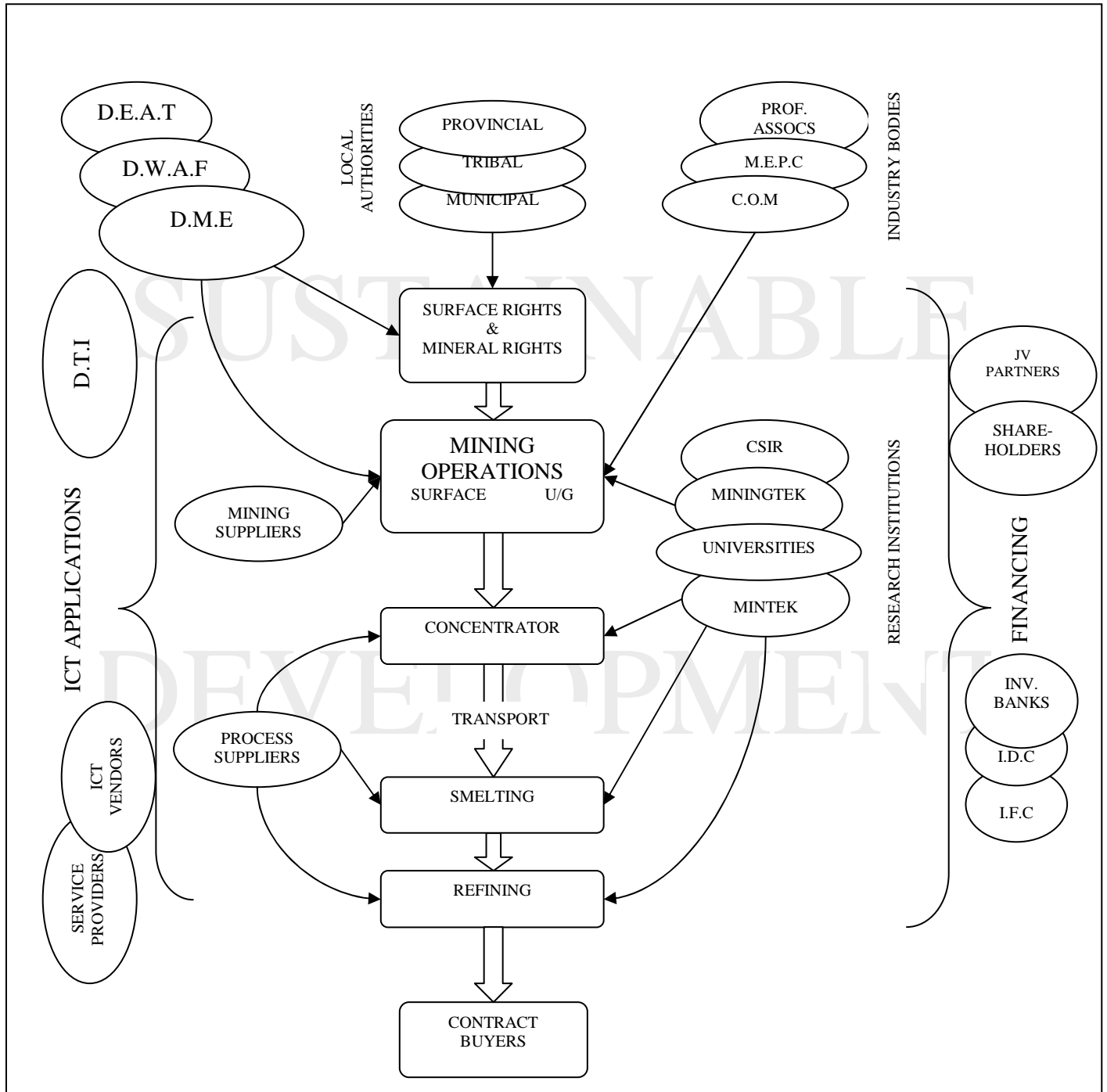
Value Chain

The starting point is with the already defined resources whether currently being mined, or defined as having potential. The downstream limit is the point of despatch of refined metal from refinery to the contract buyers.

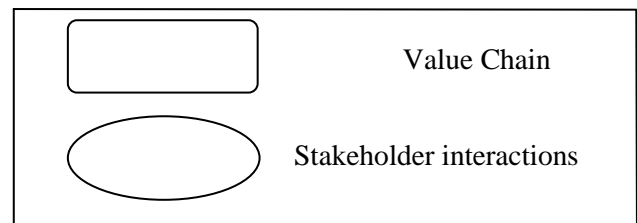
Stakeholder Network

The network below shows the broad range of stakeholders involved in the sector and provided the guidelines when drawing up the list of the groups to be considered when drawing up the list of interviewees.

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KEY



3.1.3 Spread of Companies & organisations

There is a dramatic spectrum of size when reviewing the organisations in the sector. This is most markedly observed in the companies currently involved in the production of PGMs and contrasted against the locally resident parties who are very interested in becoming part of the overall group of producers.

The producers in the sector are comprised of the four traditional large mining companies, each having many thousands of employees, as well as several medium sized mining companies relatively new to the area. These companies are involved in the production value chain from mineral rights to sale of refined metal. These companies are supported by large to medium size suppliers, contractors and service providers.

Other organisations that are stakeholders in the sector are often large organisations in themselves but have a rather lesser presence in the Platinum Mining sector in particular, in people terms. These then that fall into the low people presence categories are mining systems suppliers, Industry and Regulatory bodies and Research institutions.

The group that is growing significantly in numbers but does not have any strength as yet in the mining business is that comprising regional and local authorities, as well as the local interested and affected parties throughout the three provinces where platinum mining rights are located. A number of individuals and small company owners have established embryonic mining companies with the specific intention of gaining a share in the wealth arising from the potential development in the sector.

An overall analysis of the sector was done based on the generic part of the questionnaire. It was realised that the different groups above might have different trends, concealed by the averaging of results in the overall analysis.

For analysis of the sector-specific part of the questionnaire, the sector was therefore divided up into the categories: Companies management, Mines management, Process plants management, Suppliers (of various goods and services) Contractors, Industry and Regulatory Bodies, Consultants and Research Institutes, Interested and Affected Parties, and Joint venture/empowerment partners.

3.1.4 International Relationships

The major platinum producing companies in this country are world leaders in PGE metal production. They command a respected position in the international arena because of the importance of PGMs to the developed world. They are quoted on the Johannesburg Securities Exchange as their primary listing.

The newer entrants to the platinum production scene are companies listed on foreign stock exchanges (e.g. Toronto) and these companies have significant requirements in terms of provision of information to shareholders.

Precious metal production is sold in terms of contracts with foreign companies of whom the best known is Johnson Matthey.

A number of the companies that provide engineering design services have connections with parent or affiliated companies in other countries. These companies are truly international in that they are in constant communication between the various offices (some in several countries) for many reasons. The most important however relates to engineering designs and drawings for process plant, and mining layouts for the platinum mines. This requires immense flows of

information and data transfer that are totally dependant on the (limited) transmission capability of the international data networks.

3.2 Characteristics of ICT Use

The generic part of the survey solicited the type of information common to all sectors. A Likert-type survey called for a response from a spectrum of options graded from 0 - 5 or in two cases 1-3.

ICT Usage - "0" to "5"

"1" indicated "no use at all"

"5" referred to "fully utilised"

"0" was used for "not needed / don't know".

ICT Spending Patterns - "0" to "5"

"1" indicated "much less than the norm"

"5" to "much more than the norm"

"0" was used for "not needed / don't know".

Sources of ICT Information and Training - "1" to "3"

"1" indicated "sources least used/ not at all".

"3" "sources most used".

ICT Adoption: Drivers and Barriers - "1" to "5",

"1" indicating "strong negative influence / a barrier"

"3" no particular influence

"5" "strong positive influence - a driver".

Diffusion of ICT into Your Organisation - "1" to "5"

"1" refers to the "innovators/first few percent to adopt ICT"

"2" to the "early majority/next 10-15% to adopt ICT" and so on up to

"5" referring to the "laggards", the "last few percent to adopt an ICT innovation".

In addition certain open questions were put, but some of these only elicited a response where the person felt strongly on a point.

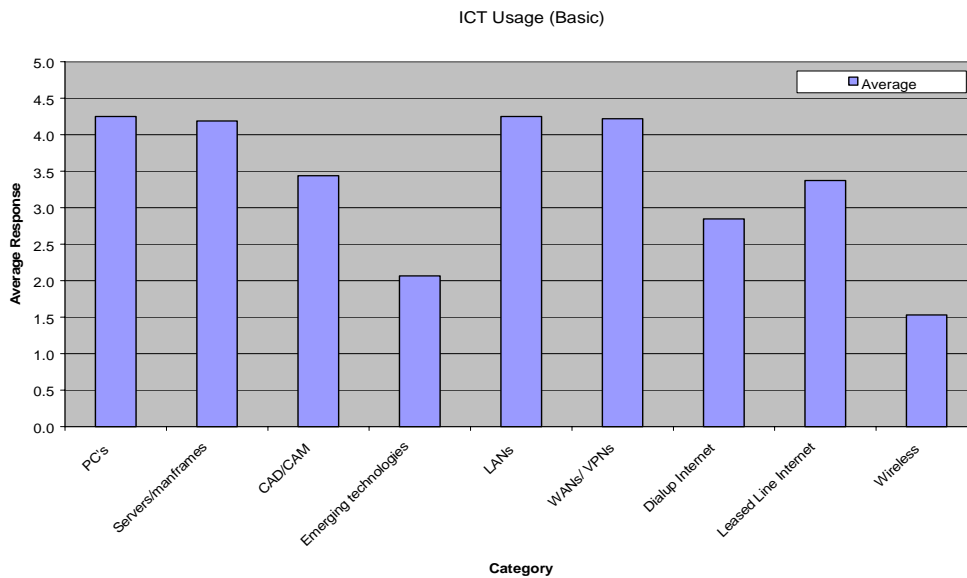
3.2.1 Basic Technologies

Graph 3.2.a represents the extent of usage of the various basic technologies.

All technologies are well utilised except emerging technologies and wireless data transmission.

Emerging technologies, such as geospatial technology and robotics are not yet well utilised in the sector. At the time of the survey, most of South Africa's platinum mines are underground operations. Sensing devices and geospatial technologies are used to some extent in surface mining but underground application is still under development. This is the expected pattern in mining where technology is developed for surface use then has to be adapted and often redesigned, in order to be used in the confines of the underground environment.

Satellite positioning technology, for example, is used extensively in surface mining. Underground, the system has to be redesigned totally as the carrier waves cannot penetrate solid rock. As the platinum mines are predominantly underground, the survey shows very little usage of such technology.



Graph 3.2.a Usage of Basic Technologies

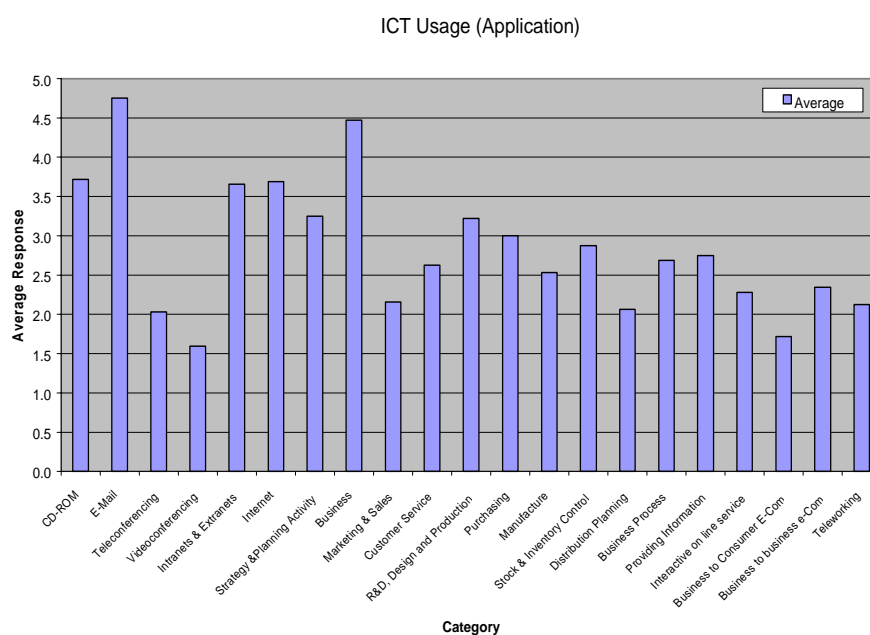
Another emerging technology which is not well utilised in mining is robotics. It has long been recognised that the hazardous environment of underground mining would be a suitable place to use robotics. However, the technology has not yet been developed to the point where it is a commercially attractive option. Recently, successful tests have been made with remote controlled and semi-automated machinery, which will find increasing use in the near future.

Wireless data transmission is not widely used because of the slow speed of transmission, and the patchy network coverage in remote mining areas. It is envisaged that with new network technology, transmission speeds will improve and the use of wireless networks for data transfer will increase.

“Bluetooth and other wireless technologies for wireless data capture”
Programme manager: Research institution
(on new developments to be adopted)

3.2.2 Applications

The following trends can be observed from Graph 3.2.b below:



Graph 3.2.b Usage of Sector Applications

ICT's for information acquisition and communications (bars 1-6) are well utilised, except for teleconferencing and videoconferencing. E-mail is well utilised across the sector except for some of the new entrants.

Teleconferencing and videoconferencing are generally not used on the mines. Their use is mainly in the corporate offices of the large mining companies that have international links. Such links may be international offices, directors, shareholders, or contracts.

ICT's for streamlining business operations (bars 7-16) are all reasonably well used except distribution and marketing. Mines dispose of their mineral products in terms of long-term contracts. There is thus little or no place for marketing and distribution effort via ICT channels. The boundary of this study terminated at the delivery of metal to contract buyers. Business-to-customer activity on any scale would only be appropriate in the area of manufactured downstream products (such as jewellery).

The use of ICT for business support activities (finance, accounting etc) is high, as is to be expected in modern companies.

ICTs for transforming business processes (bars 17-21) are not widely utilised so far. The major companies provide information on websites, which are generally not interactive.

Business to business E-commerce is limited to transactions at the corporate offices of large companies. Mines and their major plant and equipment suppliers currently obtain their equipment and consumable materials by means of procurement contracts set up on a tender basis at mine or corporate level from time to time. These are medium term in nature and usually renewable annually or by formula.

There is thus not the same scope for business-to-business E-commerce as for consumers outside the sector who wish to scan and obtain a large number and scope of materials at irregular intervals.

There is the current move to set up large contract purchasing on a business-to-business basis via the announced international Quadrem procurement system that will operate as a service to participating mines on a worldwide scale. This has been set up by the 14 largest mining companies in the world as a standard procurement portal.

This is likely to grow rapidly in the near future and will step up the demand for ICT use on mining operations. Comments from respondents show the importance of this area of ICT application by highlighting 'streamlining and transforming business processes' as areas needing emphasis. Projections show that the priority of this area will get higher still in the next two years.

In respect of *technologies requiring emphasis* there is a variety of opinion dependant on the source. Head offices and large mining companies see the need for those supporting strategy, streamlining of business processes and integration of systems. B2B and other electronic business interactions are seen as the logical and desirable development in future, particularly by suppliers.

Suppliers of design services and technical systems see a need for data integration and integrated Internet communications. The need for greater effectiveness and lower cost of telecommunications for firms transferring huge files (e.g. geological, design) is a recurring theme from all contributors. This will open the way for increased use of tele-working, -conferencing etc.

No technology gaps are seen, indicating a relatively high degree of understanding of the power of the available systems.

3.2.3 ICT Spending Patterns

The growth of the ICT budget within the various organisations is believed to approximate the organisation norm. For the large mining organisations this is a reflection of the prevalence of central guidance and control. In the very small organisations there is only one budget to cover this expenditure.

Organisations' ICT expenditure compared to the national economy is thought to match the norm. The Platinum sector considers itself to be on par with other sectors of the South African economy, which is a fair judgement provided one considers all the various sectors. Expenditure is of course low compared to sectors where ICTs have become part of their core business e.g. banking.

In the mining business ICTs are seen as a necessary cost that must be controlled, like all administration type costs. In general ICT expenditure is unlikely to exceed 1% of revenue.

"Mining people do not have ICT on their radar screens"
- MD of a mining systems supplier

Comparison of expenditure against a global norm is felt to be below par, but this could perhaps be because of incorrect comparison with First World countries only, presuming them to be the norm.

It could also be that the South African Platinum sector is so dominant in the world that it does not find it necessary to use ICT to maintain this dominance, hence the low ICT budget. This can

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be corroborated by the fact that external factors, such as global competition, are seen as having little influence on ICT, being neither drivers nor barriers. (See 3.2.5).

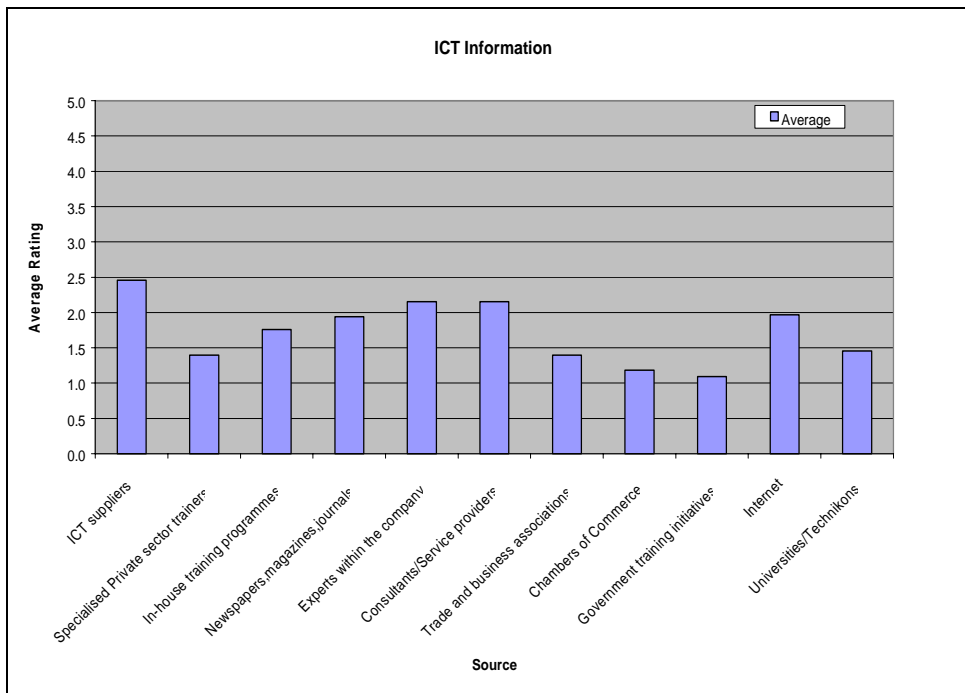
It is worth noting that responses to this section were based on the respondent's perception and not necessarily on facts and figures.

3.2.4 Sources of ICT Information and Training

The graphs below indicate that the sources of information and of training are similar. It can be seen that the usages of these sources are not high and are only drawn on when required. This reflects the perceived role of ICTs in organisations in the mining business.

Areas that are significantly low are trade and business associations, chambers of commerce, and government training initiatives. Business associations are an important resource, which could be better utilised as a source of ICT information.

“We need access for our members to ‘Geoscience’ information about mineral properties that the owners may make available”
- Chairperson : South African Women In Mining Association (SAWIMA)



Graph 3.2.c Sources of ICT information

The highest ranked source of ICT information is the mining systems suppliers. These suppliers generally provide a ‘complete product’, including training. This is an essential element of their business, without which the customer would fail to use the product and declare it unsuitable.

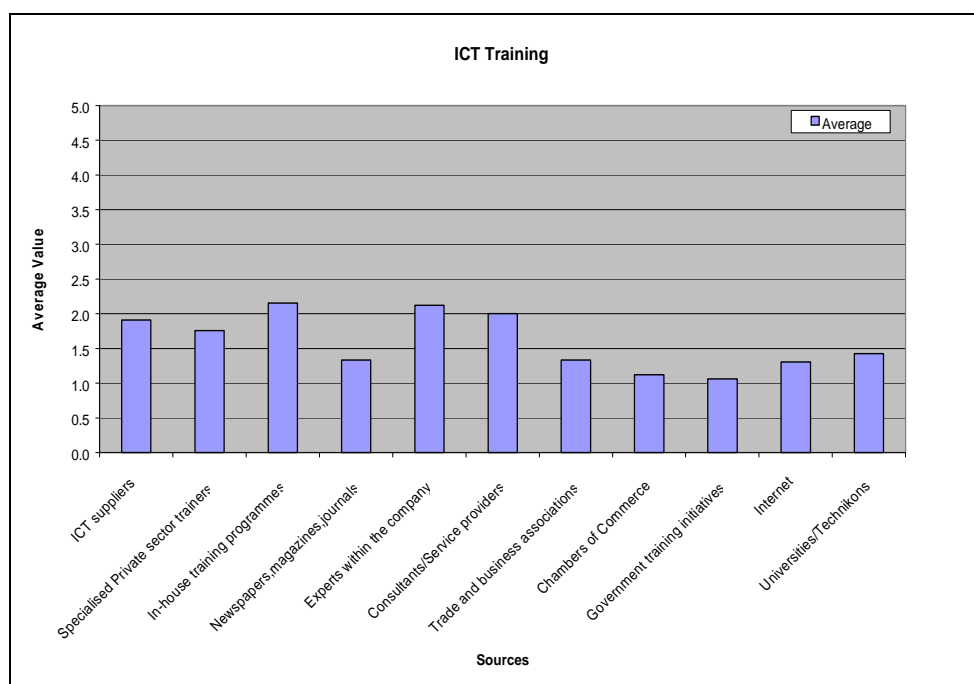
The Internet and printed media are used but not as often as one might expect. The ICT products used in the sector are either highly specialised mining systems software, which have adequate

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backup service, or 'household' products like MS Office, which are well used and well known across all sectors. In either case, there is little to be gained from the Internet and printed media.

Amongst the respondents there is a universal understanding about the importance of security of organisational data and also of personal records. However there is no great concern that this security is under threat.

The large companies have a centralised IT function whose job is to ensure this security via the appropriate technical applications. These persons have the in-depth understanding of the measures involved. In most of the responses the individual presumed that the measures in place are adequate e.g. password protection, virus checking, firewalls etc.



Graph 3.2.d Sources of ICT training

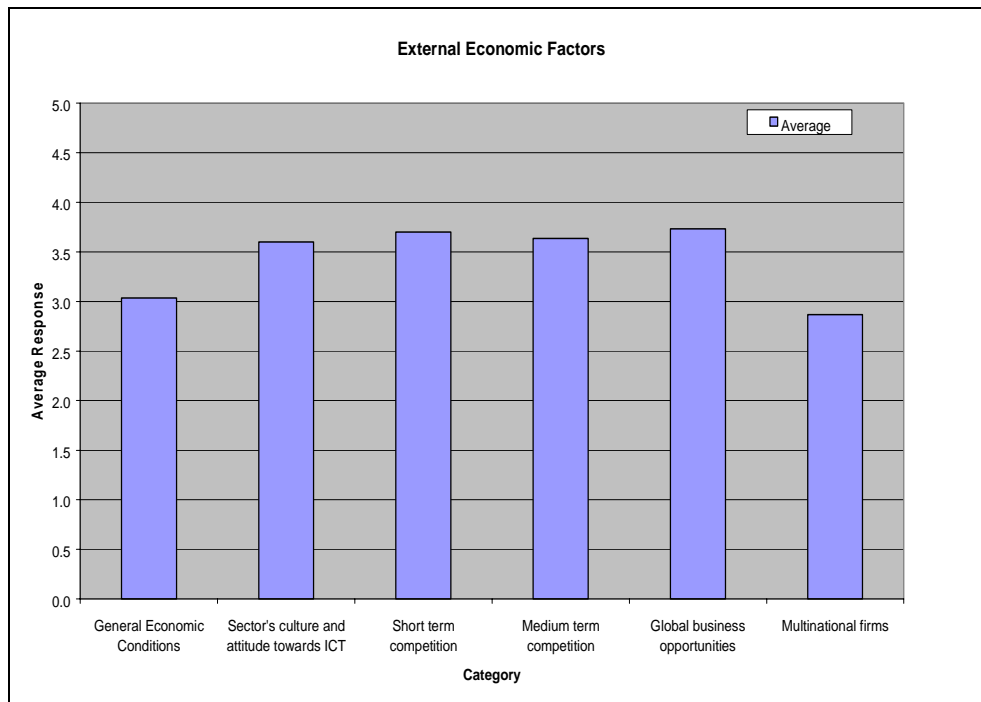
Suppliers of engineering plant and mining systems use sophisticated software that can only be trained in-house.

The sector is unanimously unaware of any government initiatives to support the use of ICT. Perhaps government could use business associations and local education infrastructure as vehicles for ICT promotion and development programmes. It is highly likely that ICT hardware and software manufacturers could be persuaded that it is in their interest to promote the increased training on and usage of their particular products. Brand loyalty is very difficult to shake from individuals once entrenched.

3.2.5 ICT Adoption: Drivers and Barriers

Graph 3.2.e shows the following:

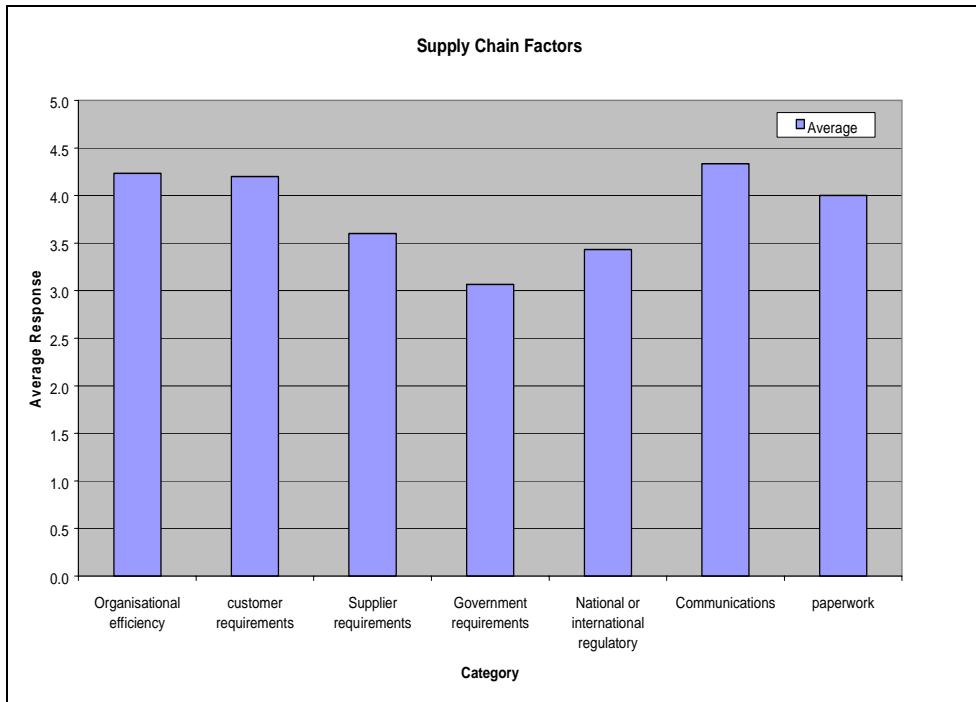
External factors in general have no particular influence. The South African platinum sector commands a dominant position, and is not driven by competition or global opportunities.



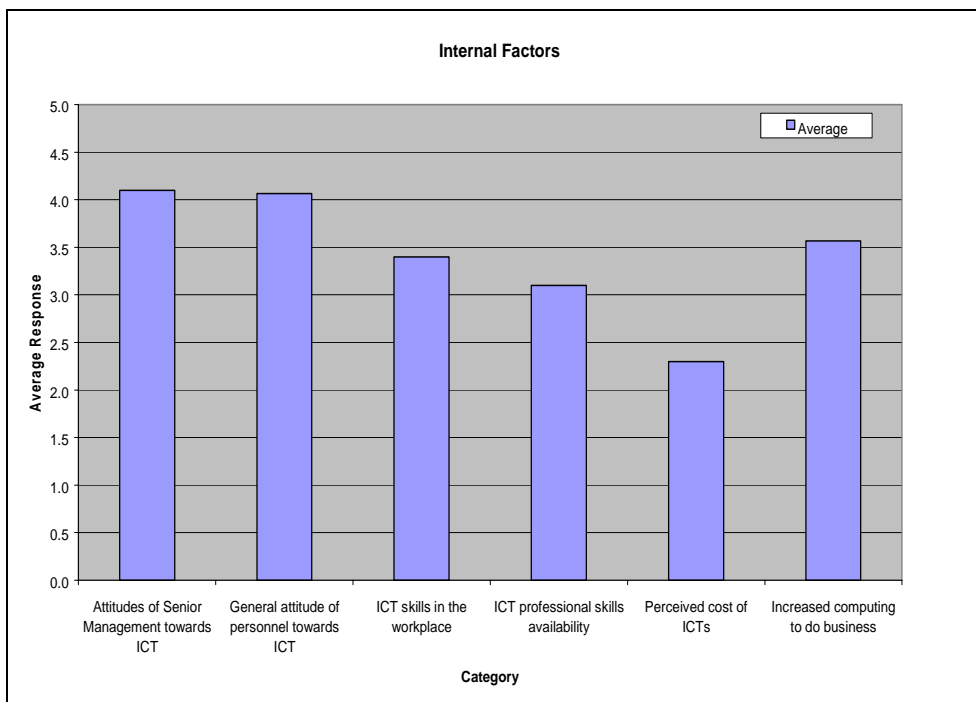
Graph 3.2.e ICT Drivers and barriers (External factors)

Supply chain factors (graph 3.2.f) all have positive influence, except for government, which has no particular influence. The mining sector is efficiency driven. Mineral producers have no direct control over commodity prices, so that the only control they have on profit margins is increased efficiency. It therefore follows that the need for organisational efficiency is a driver for ICT adoption. First class communications and reduced paperwork help to enhance that efficiency and are also positive drivers.

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Graph 3.2.f ICT drivers and barriers (Supply chain)



Graph 3.2.g ICT drivers and barriers (Internal factors)

Of the internal factors (graph 3.2.g) skills considerations have no particular influence on ICT adoption. The feeling is that if the ICT is needed, the skills will be found or developed.

The internal drivers of ICT are the positive attitudes of both management and personnel, without which any attempts at adoption would fail.

The perceived cost of ICT is the only factor that is a barrier to ICT adoption. This is backed up by various comments to the effect that the cost of ICTs, especially the telecommunications component, is too high.

In regard to the types of projects that should be initiated to *stimulate the use of ICTs* in the industry and sector there was a very limited response. Contributions were generally limited to technical systems. These are not an area that anyone outside the sector should get involved with.

3.2.6 Diffusion of ICT

Responses to this section are based on the respondent's perceptions rather than known facts.

In general, respondents view their organisation as being slightly behind the rest of the mining sector in South Africa. This is probably not the case, but rather a perception based on conservatism.

They believe South Africa's platinum sector to be comparable with the platinum (or more likely mining) sector globally, which is amongst the early majority.

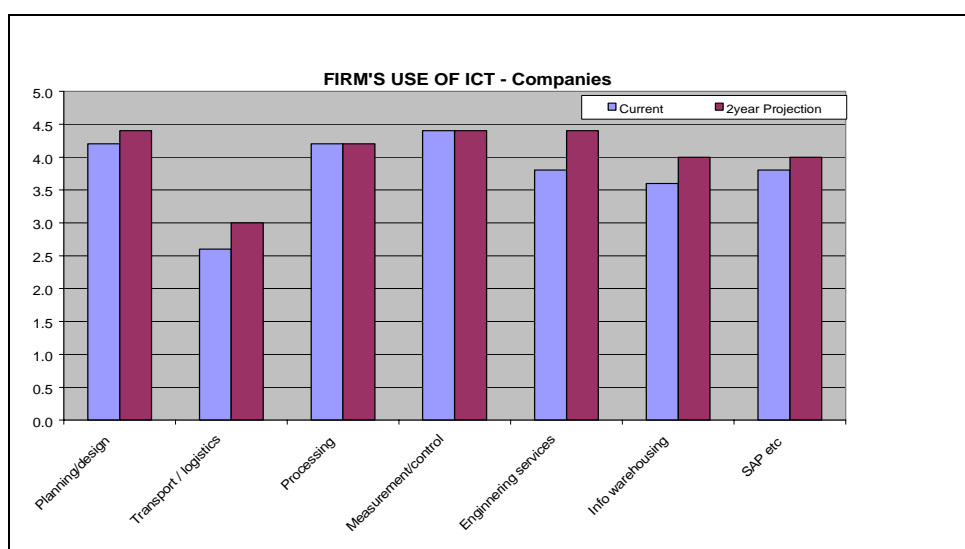
3.3 Sector-Specific Section of the Questionnaire

3.3.1 Firm's use of ICT

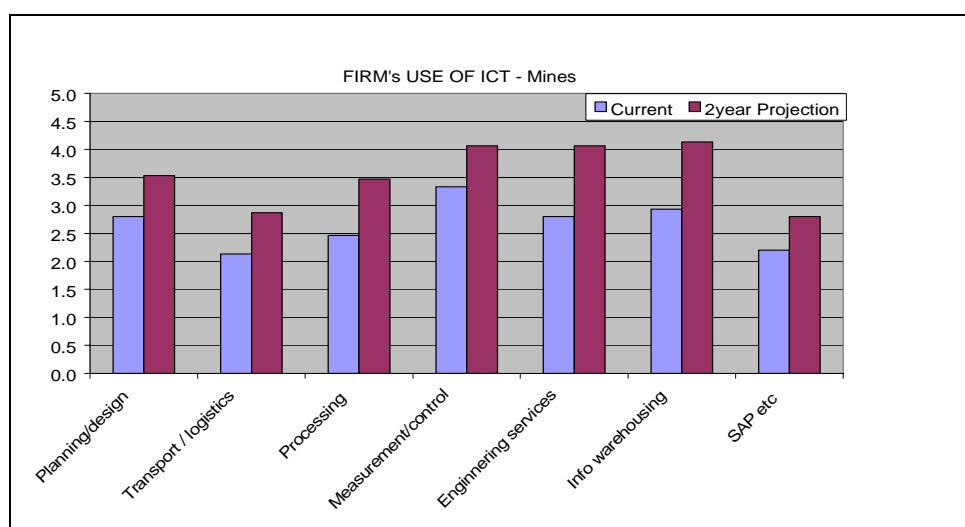
The use of ICTs is forecast to rise overall in all areas in the next two years. However, the emphasis is different in the various groups studied.

Mines have a well-established usage of ICT for mine planning and design, measurement and control, and information warehousing. The emphasis seems to be moving towards measurement and control, engineering services and information warehousing.

There is a higher use of systems integration in the *mining companies at corporate level* than there is on the mines themselves, as can be seen by comparing graphs 3.3.a and 3.3.b below. The use of ICT for transport and logistics is low both at corporate and mine level, though like all other uses, an increase in usage is expected in the next two years.



Graph 3.3.a Mining Companies' use of ICT



Graph 3.3.b Mines' use of ICT

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Process and metallurgical plants show a very low use of ICT for transport and logistics. This is expected as transport and logistics does not form part of their core business. They have a well-established usage for processing and measurement and control, which is in line with their core business.

Some *contractors* have expressed concerns over the relatively low usage of ICT for measurement and control. This is an important aspect for contractors as they are paid per measured output.

Suppliers of equipment and services in the sector are very proactive and provided a good response to the survey. Their usage of ICT is high in metallurgical plant processing, but the trend is set to change in the next two years, with information warehousing and systems integration gaining in importance.

Research and consulting entities in the sector have no usage of ICT for engineering services, which is to be expected. High usage of ICT is for measurement and control, and information warehousing, followed to a lesser extent by plant processing and systems integration.

Mining systems suppliers in the sector are well established in the field of planning and design, where the high tempo of usage is expected to continue. Significant increases are expected in the areas of measurement and control, information warehousing and systems integration.

Industry and regulatory bodies generally have a low usage of ICT, save for information warehousing and systems integration. This was expected, as they are not directly involved in any of the core sector activities analysed.

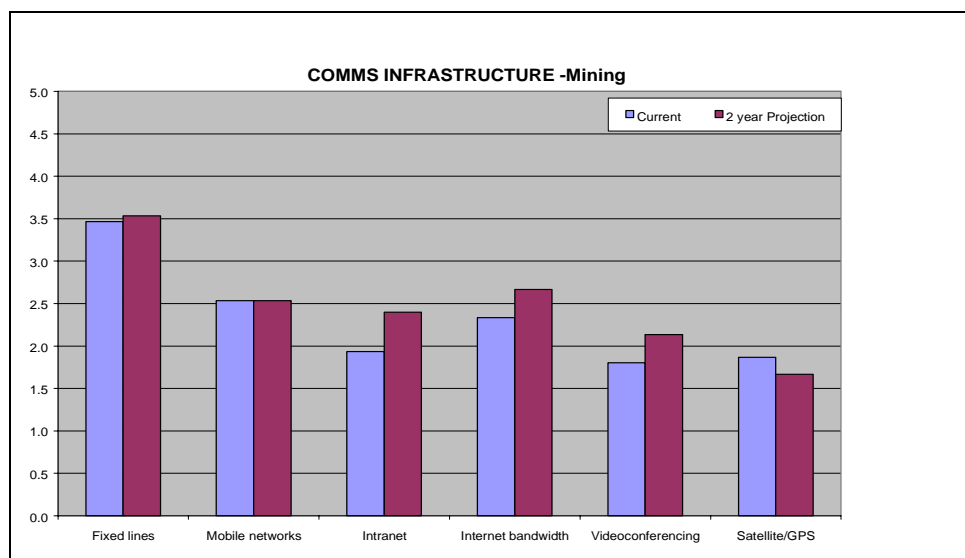
Interested and Affected parties have very little usage of ICT. There is guarded optimism, with usage expected to increase somewhat in the next two years. It was noted in interviews however that this group of individuals had a very limited perception of what ICTs are or what they do.

“My wife runs the computer as I don’t really understand it. But I am going to put in a big expansion into this computerisation soon – I am thinking of buying a laptop.”

Businessman in Limpopo Province with an emerging mining company

3.3.2 Adequacy of Communications Infrastructure

There is a general consensus that services provided by Telkom need improvement (see graph 3.3.c). Concerns were expressed over the cost of telephone services, the speed of data transfer and the unreliability of connection. Theft of telephone cables is widespread, which possibly accounts for a significant proportion of the problems.



Graph 3.3.c Adequacy of communications infrastructure

On the whole, however the fixed line network is judged to be more or less adequate, with the need to upgrade in some areas. Internet bandwidth is generally not adequate.

Communications infrastructure is generally of an acceptable level in the *corporate offices* as they are mostly located in major centres. Not much change in capacity is expected in the next two years.

On the *mines*, infrastructure for intranets is poorly developed. Mobile networks are mostly adequate in the established areas although they are expected to become inadequate in the near future, as mining operations expand into new and more remote areas. This is particularly so in the Eastern Limb mining area where much development is planned

“I have to drive to a particular spot up that hill to get any cell reception”
Quote from the Eastern Limb area of the Bushveld Complex

Processing and metallurgical plants judge the telecommunications infrastructure as being generally adequate, though needing upgrade. Infrastructure for videoconferencing and satellite communications is inadequate, though the situation with videoconferencing is expected to improve over the next two years.

Contractors find the infrastructure generally adequate, but like everyone else, needing upgrade. Of particular concern to them is infrastructure for videoconferencing and satellite communications as they operate internationally. These, together with intranet infrastructure, are forecast to improve over the next two years.

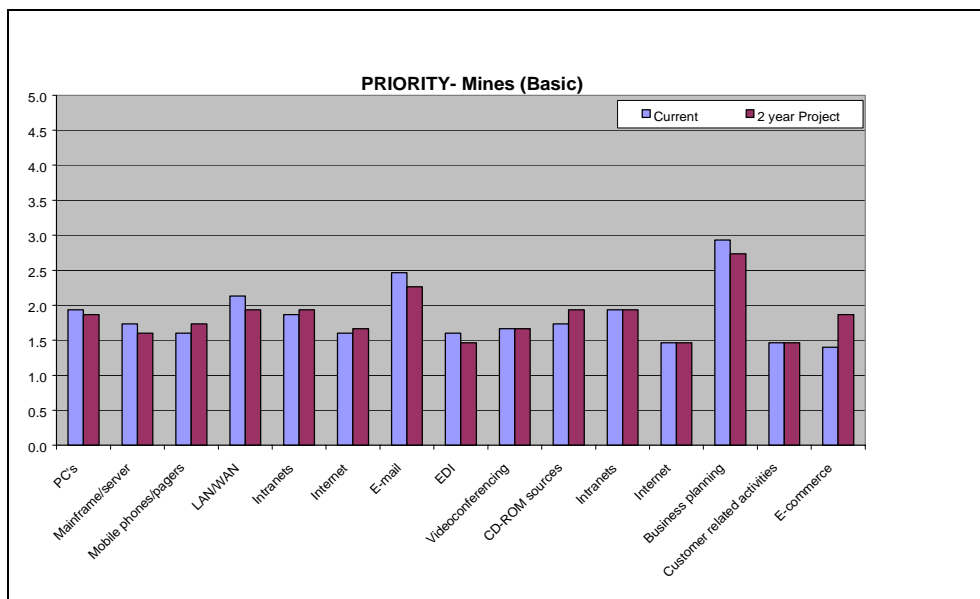
Suppliers have inadequate intranet and satellite infrastructure, which they expect to improve over the next two years. All other infrastructure is in need of upgrade.

Industry bodies and *mining systems suppliers* find the infrastructure inadequate, with both fixed and mobile networks needing upgrade.

New entrants in the form of *Interested and affected parties* responded positively to various degrees but interviews revealed that other than telephone lines and mobile networks they have almost no infrastructure at all. The questions were thus either misunderstood or answered gratuitously.

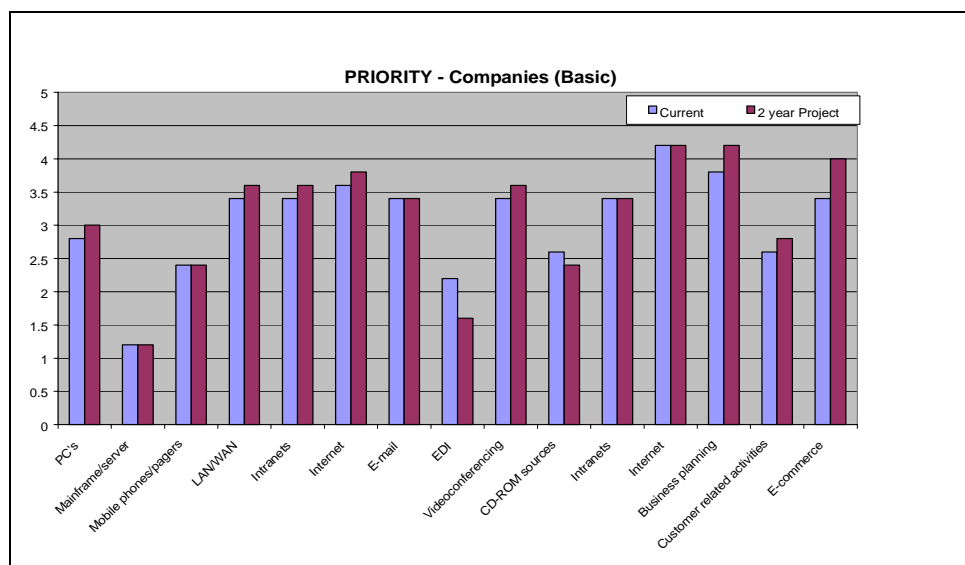
3.3.3 Priority Areas: Basic technologies

On the *mines* e-mail and business planning are regarded as priority areas, while all other ICTs are regarded as important. Business planning will have an even higher priority in the next two years. This is supported by the comments made in the generic part of the questionnaire to the effect that ‘streamlining business processes’ and ‘transforming business processes’ were areas needing major attention. The priority of most other basic technologies will remain unchanged over the next two years.



Graph 3.3.d Mines' priorities for basic technologies

Mining companies are generally in accordance with the mines, but elevate communications and business planning to a higher level of priority. Corporate offices place a higher priority on e-commerce than the mines do. Mainframes are given almost no priority at all, probably due to universal application of PC and laptop-based computing.



Graph 3.3.e Companies' priorities for basic technologies

Process and metallurgical plants generally have a similar view to the mining companies. One important difference is that business planning is not considered a priority now but will be so in the next two years.

Suppliers currently place high priority on email but this will decrease in the next two years. The Internet and e-commerce will emerge as the highest priority areas in the next two years. The trend suggests a move towards electronic media for marketing and commercial transactions, which is corroborated by comments made by some suppliers.

Contractors currently place high priority on email and Internet. These are expected to remain a relative priority area but will be surpassed in importance by mobile phones and PC's. Customer related services are also expected to increase in importance over the next two years.

Research bodies and consultants place a low priority on most ICTs with the exception of ICT use for business planning, customer related activities, and e-commerce.

Mining systems suppliers of ICT also place low priority on most basic ICTs, their exceptions being e-commerce, Internet and intranets. These are expected to increase further in importance over the next two years.

Industry and regulatory bodies, on the other hand, place low priority on e-commerce and videoconferencing. Their priority is in PC and personal mobile communications. The use of CD-ROM sources and the Internet is expected to gain in importance.

There was little response from *new entrants*.

3.3.4 Priority Areas: Sector Applications

Comments from this section revealed an interest across the board in adopting communications and automation technologies that are being developed for the mining industry. Systems integration is also seen as an area for future adoption, but it appears the software being used by the mainstream mining organisations has so far not produced favourable results.

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Mines currently place a low priority on transport and logistics, but expect this area of ICT application to gain in importance over the next two years. Current priorities are measurement and control and engineering services. There are mixed view on systems integration, with some expecting that area of ICT application to gain in importance and others frustrated with the difficulties of integration.

The *mining companies* rate planning and design together with processing, and measurement and control, as priority areas, though other areas are still considered important.

Process and metallurgical plants rate all ICT areas as important except for planning/design and transport/logistics. This is to be expected judging by the nature of their core business.

Contractors are among those who place high priority on systems integration. Other areas of relative importance are engineering services and mine planning and design. Transport and logistics is currently a relatively low priority area but is expected to gain in importance over the next two years.

Suppliers rate information warehousing, systems integration as high priority areas.

Mining systems suppliers place low priority on all sector applications except mine planning and design, which is their field of specialisation. Mine planning and design is given the utmost priority, and will continue to be the main focus in the next two years. However, information warehousing will gain in importance over the next two years.

“The use of ICT in mining in South Africa is in general more advanced than in Canada”

MD : Mining systems supplier
(expression of opinion)

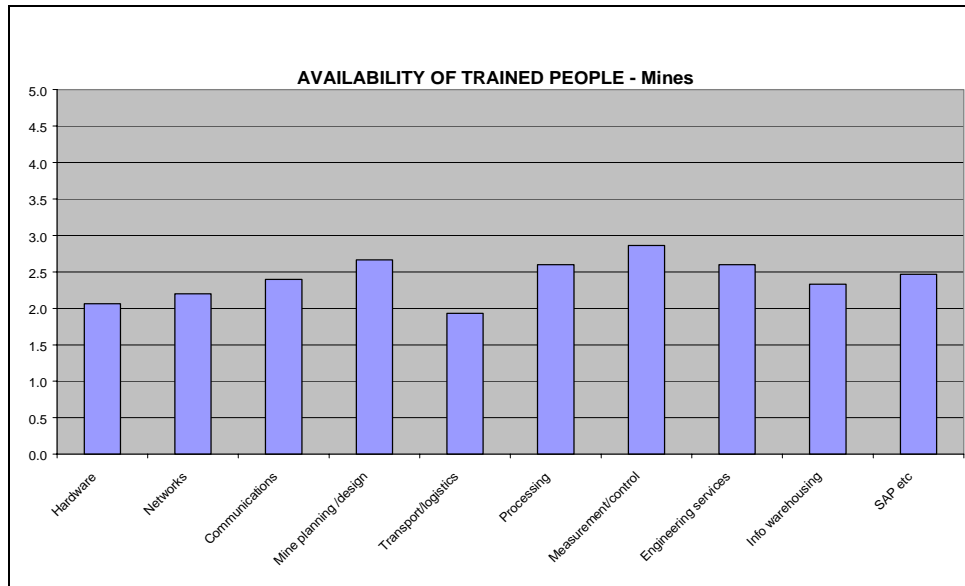
Industry and regulatory bodies place very low priority on sector applications, with the exception of information warehousing and systems integration. This is as expected, for all other sector applications are not relevant to their functioning.

The response from *research* institutions and consultants on this part was not sufficient to make any meaningful conclusions.

New entrants place low priority on ICTs all round.

3.3.5 Availability of trained people

The *mines* are experiencing a general shortage of ICT skills (see graph 3.3.f). The Platinum Mining sector is growing and at the same time new ICTs are continually being introduced. That, coupled with the general high demand for people with ICT skills in all sectors, creates a shortage for the mines. Mines are generally in outlying areas, which are regarded as less lucrative working places than major urban areas. There is therefore a preferential concentration of ICT skill in major urban areas.



Graph 3.3.f Availability of trained people.

This is corroborated by the fact that the shortage of ICT skills in *mining company corporate offices* is less critical. Corporate offices have more or less sufficient ICT skills all round. The corporate culture of the sector is such that people who acquire skills in any particular discipline often find themselves promoted to head office, and this drains trained people from the mines to the corporate office.

Process plants have a mild shortage of trained people for ICT. Concern has been expressed over the shortage of process control graduates with a metallurgical background. There are very few people trained in the use of ICT for transport and logistics, because it is not an integral part of the operation of a processing plant.

Suppliers have a general shortage, but less so in hardware, networks and communications. ICT skills for planning / design and transport / logistics are not needed as these do not constitute core business.

"...poaching of staff between suppliers and clients"
MD of a Mining systems development company
(on staffing concerns)

Contractors are experiencing a serious shortage in ICT skills for processing. This reinforces the above-mentioned concerns over the shortage of process control experts. The only field where there are reasonably sufficient ICT skills for the contractors is in communications. It must be said that contractors in the sector aim to employ top notch people in any field, so that their shortage is not just about unavailability but unavailability of the required level of expertise.

Research institutions and consultants have an acute shortage all round except for information warehousing. As is the case for contractors, organisations in this segment look for a high level of expertise, which is invariably scarce.

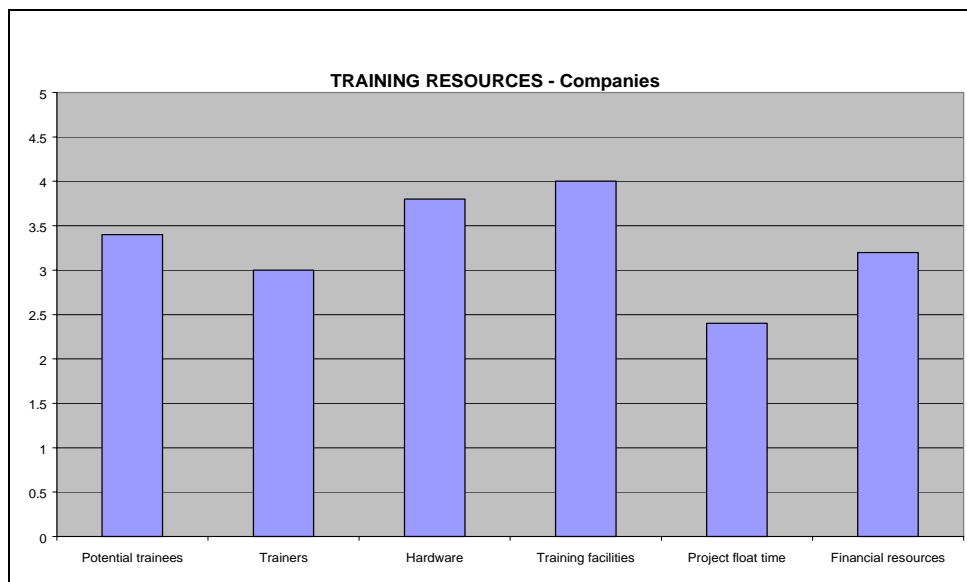
Industry and regulatory bodies generally do not need the sector ICT skills listed. In those areas where ICT skills are needed, in hardware, networks and communications, these bodies are experiencing a shortage. *New entrants* have a shortage all round.

3.3.6 Availability of Training resources

Resources, by their very definition are always scarce. It therefore follows that there is a general shortage of training resources across the whole sector. However, some shortages are within manageable and economically sensible ranges while others may affect the normal conducting of business. It is this latter type of shortage that is considered here.

The *mines* have a reasonable supply of potential trainees, hardware and the financial resources required. Trainers and training facilities are on the low side. The real constraint, as is shown in graph 3.3.g, might be projects float time. The platinum sector, riding on the back of firm demand and high commodity prices is experiencing a significant rate of expansion. In an attempt to make full use of this economic wave, there isn't sufficient time to build training programmes.

The same argument goes for the *mining companies* involved, except that, unlike the mines, they have less problems of access to training facilities.



Graph 3.3.g Availability of training resources

Processing and metallurgical plants follow the general trend also, with the most shortage being that of project float time (i.e. time to train).

Contractors have a shortage of potential trainees and float time, but are more comfortable with training facilities. Most contractors do not do much training anyhow, preferring to hire trained and experienced people.

Suppliers follow the trend except their shortage of float time is not as critical.

Research institutions have a reasonable supply of potential trainees and a critical shortage of financial resources. The shortage of financial resources naturally worsens the shortage of trainers, hardware and training facilities. Comments from this segment have called for government help while others are calling for "aid from somewhere".

Industry and regulatory bodies are reasonably comfortable all round except for potential trainees.

Mining systems suppliers have a critical shortage all round, with the worst being that for trainers. Mining systems suppliers often market very specialised packages, and people who are expert enough to train others in the use of these are scarce.

3.3.7 Sophistication level of Joint Venture or Empowerment Partners

There was a high percentage of non-response to this section. For some organisations it was not applicable, as they do not have any joint venture partners. Others were not in a position to make a reasonable assessment of the joint venture partner's level of ICT sophistication.

It appears that there are two categories of joint venture partnership. The first is where both organisations are considered to be equals. Here their level of sophistication will be similar, though one might have particular strengths.

The second is where one partner is considered to be junior to the other. In this case, it is likely that the junior partner will be less sophisticated than the other. Empowerment partners tend to be new companies that fall into this category, but not exclusively so.

For the joint venture deal to have come to fruition there must be other positive factors that encourage the two to cooperate, even though one partner is less sophisticated in ICT than the other. If ever ICT were a barrier it would not come out in this survey as it involved functioning joint venture partnerships.

Of interest is a comment made to the effect that some companies expect joint venture companies to be less sophisticated. The stronger party will in the course of time, cause the other to develop in order that they can use the same ICTs and function at the same level.

4. Analysis and Interpretation

One of the tools for achieving the growth envisaged in the Platinum mining sector is the diffusion of ICT. The diffusion and usage of ICT will help the sector to maintain its global dominance and to conduct business with First World players.

4.1 Nature of ICT Applications: Benefits

One of the major areas for ICT applications in the sector is for technical uses such as mine planning and design. The use of such ICTs results in optimal mine plans and more effective exploitation of the mineral resource. This has direct economic benefits to the sector and to the national economy.

Mineral resources are a natural national endowment that must be exploited for the general good of the nation. By utilising mine planning and design ICTs, the sector is able to ensure that optimum benefit is obtained from national resources.

Benefits are also derived from the use of ICT for business support activities. Most companies in this sector are large and sophisticated in this area of application. Systems for accounting, personnel management, payroll etc are used to lubricate the functioning of organisations, which results in time and cost savings.

Process and metallurgical plants derive efficiency benefits from the use of ICTs in process control. PLC systems are utilised to ensure smooth process flow and improve recovery. Ultimately, this translates into a revenue benefit.

4.2 Extent of ICT diffusion

The major proportion of the companies, mines and other prominent stakeholders in the sector are well developed, sophisticated users. They recognise and use the power of the technologies in the technical areas, and acknowledge the benefits of the ICTs in the business applications.

While major players are sophisticated ICT users, new entrants have hardly any usage of ICT at all. This poses a challenge that needs to be addressed by sector role players, government and developmental institutions.

In the large companies they employ ICT specialists; the smaller sized technical suppliers are users of highly technical equipment and software and require being highly skilled users of ICTs themselves.

The ICT needs of the sector are supported by specialised systems suppliers, who themselves are also sophisticated at world class levels.

For major advanced players in the sector, technical applications are no longer the top priority. Focus is now more on organisational processes. For example, in response to a question on areas needing emphasis, a common answer would be:

“...streamlining business processes (e.g. strategy and planning on a manager’s desktop)...”

4.3 Status within International Context

It has already been alluded to that the platinum sector in South Africa is a world leader in its field. Its international status as the prime producer of PGMs is well established.

However, in ICT diffusion it will be necessary for the major companies to make a special effort to upgrade their partners in joint ventures and the new entrants into the field. The sector is also operating in a distinct South African environment, with issues and challenges unique to South Africa.

In the final analysis the sector will continue to maintain its respected international position.

An area of concern expressed at senior level is that in the volatile and often secretive position of foreign metal sales, business intelligence using ICTs will require increasing emphasis.

4.4 Current and Expected Trends in Applications and Diffusion

The study has revealed some current and future trends in ICT diffusion and usage. Analyses of those trends which are significant to the growth and well being of the sector are listed below.

- The use of mobile networks for data transfer is minimal. This can be explained by the slow speed of data transfer over existing networks. Faster networks are on the horizon, which might result in more utilisation of wireless data transfer in the future.
- In the mining environment, use of ICTs for mechanisation and automation will grow.

“...ICT interfaces in mechanisation and automation can take efficiencies of open pit mining into the underground mining environment”

MD of a mining systems development company

- The use of expert systems for process control will grow in the metallurgical process plants.
- Major commercial transactions are carried out in companies’ corporate offices. These therefore put a higher priority on e-commerce than the mines and process plants do. The forecast development towards streamlining and transforming business processes is likely to be seen at company corporate level first before it diffuses to the operations.
- There are mixed views on total systems integration, with some expecting that application to gain in importance, with others being increasingly disillusioned about integration to that degree. The latter are those who have been early adopters who are not getting satisfactory results so far.
- The use of CD-ROM sources and the Internet in Regulatory and Industry bodies is expected to gain in importance in the next two years, probably as these organisations attempt to make information more widely available to the public.

4.5 Postscript on Items noted about the Responses

- There were a number of quality responses from certain individuals who made an effort to put across a considered, comprehensive view. These were mostly senior managers who also managed a speedy turnaround. Needless to say these responses were given appropriate weight.
- Supplier companies were generally very keen to participate as they realise their prosperity is tied to the success of their mining partners.
- Some responses were considerably delayed by internal company procedures relating to authorisation of returns.
- A large percentage of responses were clearly delayed by the seemingly huge task of making out a 10+ page questionnaire. The task was postponed because a busy manager did not see

he could spend the immediate time available on a non-priority matter. When eventually done it often reflected that it was done reluctantly with minimal real consideration.

- The group of unsophisticated aspirant new entrants to the sector from the provincial areas never even attempted to fill in the questionnaire and probably did not wish to display ignorance of the content. Eventually the researchers travelled to them. These questionnaires were completed jointly with the prompting and assistance of a researcher.
- There were some disappointments. The Department of Minerals & Energy Regional Offices did not reply to or acknowledge receipt of their two questionnaires. As such the group response for Industry Bodies and Regulators actually represents the former only.
- The contacts with the powerful empowerment companies that are in joint ventures with the major platinum companies also did not elicit any response.

5. Conclusions and Recommendations

The following points are made in the expectation that the sector will develop in accordance with the desire of many stakeholders. These are broadly as follows.

- The sector will grow strongly as a result of the major expansion projects that are taking advantage of the favourable supply/demand imbalance forecast for the next five years.
- The major companies are going ahead with programmes to increase the number of joint venture and empowerment partnerships.
- In accordance with the intentions of the new Mineral Rights Bill there will be increased involvement of local businesses and communities in the areas where there are new mining operations being developed in the sector.

5.1 What can the Sector do to better exploit ICT?

5.1.1. Company Approach to use of ICTs

The major proportion of the companies, mines and other prominent stakeholders in the sector are well developed, sophisticated users. They recognise and use the power of the technologies in the technical areas, and acknowledge the benefits of the ICTs in the business applications.

In the large companies they have ICT specialists employed; the smaller sized technical suppliers are users of highly technical equipment and software and require being highly skilled users of ICTs themselves.

To remain competitive and effective these companies only require to maintain an awareness of all appropriate developments in the ICT field and ensure they keep at the cutting edge.

“Due to the fact that data is not integrated, data input is being repeated and inconsistent. Another major inhibitor is the lack of a change management system”

Engineering technologies team leader:
Major process plant supply company

Mining companies are by nature conservative in approach, and their managers should consider becoming Early Adopters of these technologies, rather than the prevalent self-image of being among the Early Majority. Many may actually well be of the Late Majority classification. As such they have considerable scope to advance quickly, and enjoy the benefits thereof.

It is a fact that some mining companies do not view use of ICTs in the business processes function as being more than a modern necessity. It is time they viewed them as the required pervasive elixir that will enable energy and growth in the future.

5.1.2 In-House Training

The operations, the suppliers of process plant and technical ICTs, and all players in the sector whose functions are highly dependent on trained staff are likely to run into staffing problems as developments gather momentum. With insufficient trained personnel, job-hopping, poaching of staff and inflation of earnings packages is inevitable.

Training in the areas above is of necessity done on-the-job.

The parties in these areas firstly need to assess what their future staff requirements are going to be. They must then ensure that with the appropriate lead-time, they take on people of potential and commence training to ensure that when the expansion of project work is under way that the potential shortage of technically skilled people is averted.

Clearly there are some players (particularly contractors) who do not have an historical training ethic, but all parties should be encouraged to commence some training and if possible in contract awards, have disincentives to poach trained staff (at least from the operations).

Similarly operations should not think of recruiting staff from the companies who are installing technical systems. These companies, again if possible contractually, should be training operations personnel in the use of these systems.

This should of course apply to all systems but is of particular importance in the specialised world of ICTs.

5.1.3 Assistance to JV/empowerment partners

The large mining companies that are instituting or looking at partnership arrangements should investigate the ICT capabilities of their potential partners.

Their attitude is already a positive one. There is a belief and a confidence that they will be able to carry along any partner with their own momentum.

It may well be, however, that the partner is unaware of how their (smaller) organisation would need to change and invest in ICTs in order that there will be a functional compatibility of the partnership in the ICT sense. The major partner will need to know in what areas and to what degree it intends to interact with the other partner in the course of conducting business, and ensure the partner possesses the appropriate ICTs and the ability to use them.

Shortcomings will need to be identified and eliminated before they place any strain on the functioning of the partnership. This may entail awareness sharing, and possibly in-house training for which capacity exists.

5.2 What can the ICT Industry do for this Sector?

5.2.1 Financial assistance to new entrants and potential users

Most, if not all, of the emergent local companies wishing to become part of this sector do not have the finance to embark into the world of ICTs except at the most basic level of business operation (i.e. landline and mobile phones, and possibly a desktop computer). Further, without sound advice they would probably make wrong decisions when moving into the world of ICT. This would then waste the limited funds that they do have.

It would be in the interests of ICT vendors to look into ways of financing new entrants such that they entered the world of ICTs with confidence and in an affordable way. These firms should well know that once a small company's management has embarked on the road of ICT usage they will never turn back and will become significant users if their organisation prospers.

5.2.2 Formal Training for New Entrants

ICT Vendor companies have a unique opportunity in the training area. Their products whether hardware or software do not in fact cost them anything. They have a book or opportunity cost but they do not have a cash impact. If they undertake training of their particular products, they should also know that the trainees become familiar and thereafter loyal to the products on which they learn.

It will indeed cost the vendors in trainer time, but this and any other cost should be claimed as a recoupment from the national training levy. With skilled trainers a "train up the trainers" programme can be set up to proliferate a training network quickly.

They should consider instituting no-cost or low-cost training programmes to targeted groups of trainees in the sector. This could be done as a stand-alone effort or on a collaborative basis with the DTI, provincial and local government using venues at local Universities and colleges close to the sector's mining areas.

5.2.3 Reducing the Cost of ICT Usage

The fixed cost portion of ICTs (licenses & maintenance) should be driven down. This will induce more entrants into the use of these technologies.

5.2.4 Streamlining of Business Processes

There were many contributions of the established companies that emphasised the importance of pushing this area. The ICT suppliers should ensure that they are in a position to meet this requirement.

5.2.5 Systems integration

Responses indicate a need for systems integration. However, those who have tried current systems are not getting satisfactory results. ICT suppliers need to develop these products to better meet the needs of the sector.

5.3 What can government do?

5.3.1 Supply of ICT information and training

Some of the more striking differences that can be observed in the charts are of the sources of information and training. What is also striking is that almost all the sources only qualify for the rating of “Sometimes used” with no ratings of “Always/mostly used”. Absolute bottom of all the ratings is “Government training initiatives”. If these initiatives exist then they are hardly known about by the persons in this sector.

*“Provide training to enable emerging business to be equipped with today’s changing information and communications technology.
DTI should fund access to training seminars and conferences.
Generate awareness of the benefits if ICTs for emerging business”
Director of an emerging mining company*

Even with the developed participants in the mining operations the prime sources of both information on ICTs and training in their use are the hardware/software vendors.

Clearly the large companies are able to initiate their own programmes and no doubt will, in order to meet the need. It is for the smaller new entrants in the field and the interested parties in the local communities, in the areas where PGM mineral rights exist, that considerable input is necessary if the successful participation of this group is to be facilitated.

With the exception of use of cell phones, (often as much a necessity as a convenience), their perception of a high level of ICT use is to have a fax machine and a word processing PC. A small number of the high fliers have email and access to the Internet. Their companies (small and some only in name) do not have their simple business processes driven with ICTs.

Government in the form of the Department of Trade & Industry can play a role by instituting programmes in three areas:

Creating awareness of the importance of use of ICTs in business and the technical aspects of mining.

Providing information on available ICTs and their uses in business in general and mining in particular.

Skills development for the people of the areas where mining operations are being conducted or are planned. (The ISETT SETA recently advertised training courses for Skills Development Facilitators, but these are in Johannesburg, Cape Town and Durban.) Trainee facilitators can be drawn from Universities and colleges, and local authorities in the areas where the sector functions.

*“Suggested projects:
-Information and guidance for small scale miners
-E-enablement of the DME
-Distance learning”
Programme manager : Research Institution*

5.3.2 Upgrading of Communications Infrastructure

This is an area of great importance to the sector. Responses to the questionnaire and general comments made during interviews show a widespread dissatisfaction with the telecommunications infrastructure.

The fixed line telephone network needs to be upgraded in most areas, with the Eastern Limb being an area needing urgent attention. A lot of the expansion in the sector will take place there, and action needs to be taken now to ensure that the fixed line network is upgraded in time to service the increased demand.

In upgrading the network, not only voice transmission but also data transfer (Internet bandwidth) needs to be considered. Internet bandwidth in some areas needs to improve for organisations in the sector to operate on the same level as their first world colleagues.

Expenditure in this area is justified by the projected growth in the Platinum sector. It is estimated that Platinum supply from South Africa will grow from 4.08 million oz. in 2001 to 6.77 million oz by 2010. Most of the additional production will come from the Eastern Limb mining area, where the telecommunications infrastructure is most in need of an upgrade.

It appears that one of the contributing factors to the state of the telecommunications infrastructure is the theft of telephone cables. Failing all efforts to put an end to this practice, government must consider other media of transmission such as optical fibre cable.

A solution for the telecommunications network problems is to open up the industry to competition. With sufficient commercial competition, operators will direct all efforts to solve problems, and users will enjoy improved service.

5.3.3 Concluding remarks

South Africa's PGM mining sector is well geared for growth and is set to maintain its global dominance.

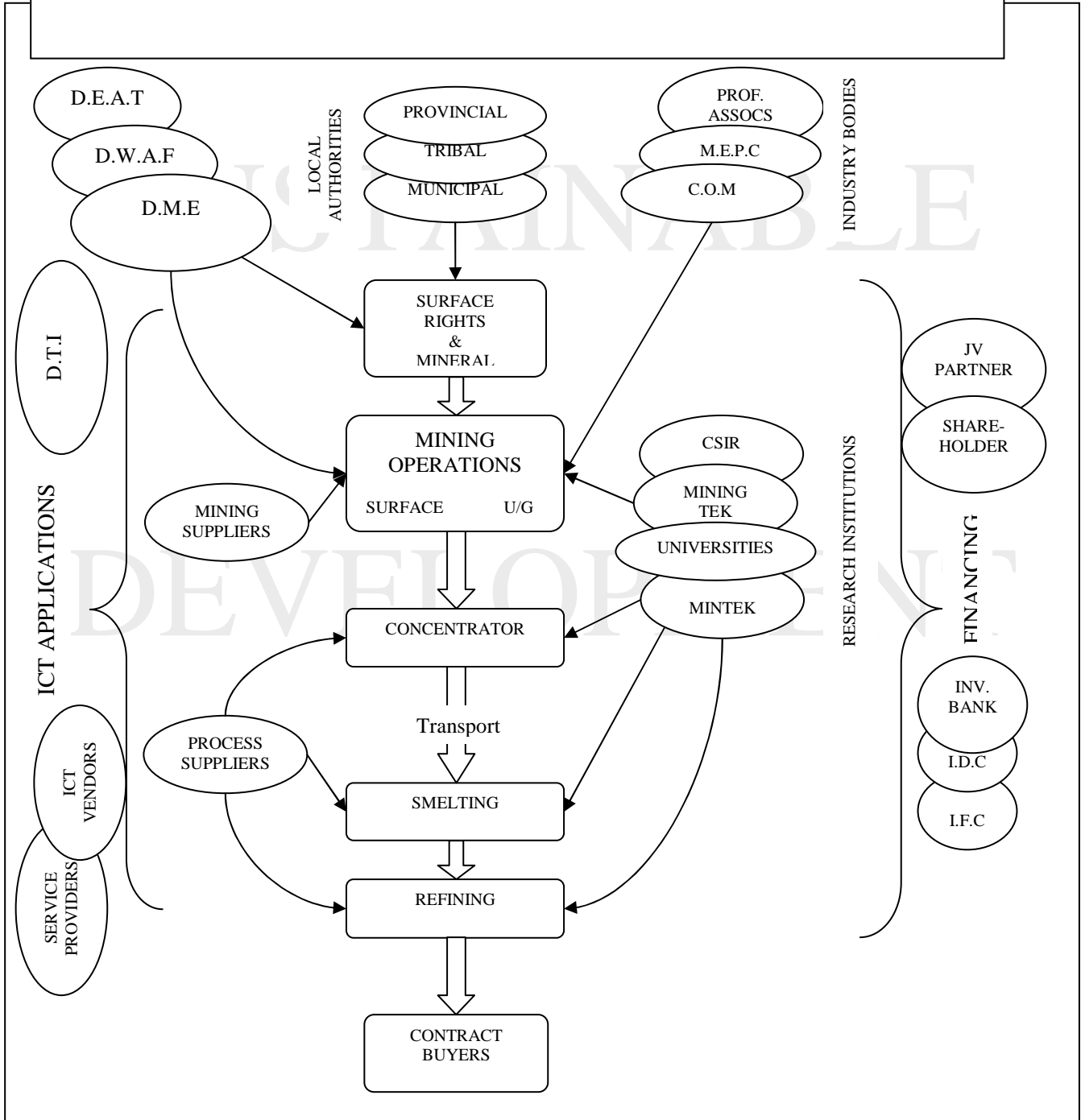
The achievement of growth in the PGM mining industry will produce extraordinary leverage in enhancing economic growth in the regional communities, and the provincial and national economies. This will occur through the knock-on effect that always follows developments in any mining sector.

This growth has already been guaranteed in that major expansion is already under way in the form of expansion projects on existing operations as well as development of new mines.

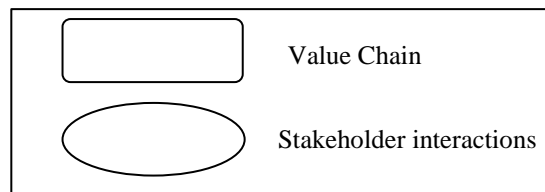
What remains to be seen is the extent to which this growth can be enhanced by the timeous developments in the world of ICTs.

Appendix 1 – Platinum Mining Sector-specific Questionnaire

Indicate on the diagram the boundaries of your involvement in the Value Network



KEY



**DEPARTMENT OF TRADE AND INDUSTRY POLICY SUPPORT PROGRAMME
PROGRAMME MANAGEMENT UNIT**

A: Indicate the extent of your firm's current and intended use of ICT in performing the following tasks:

0=don't know	1=no use at all	2	3	4	5=fully utilised
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SECTOR APPLICATIONS – Pt MINING

Application	Examples	Current	2 year projection
Mine planning/design	CADSmine, Datamine, Gemcom	0 1 2 3 4 5	0 1 2 3 4 5
Transport / logistics	Truck dispatch, rail bound traffic control	0 1 2 3 4 5	0 1 2 3 4 5
Processing	PLC systems	0 1 2 3 4 5	0 1 2 3 4 5
Measurement / control	Ore accounting, on-line devices, weightometers	0 1 2 3 4 5	0 1 2 3 4 5
Engineering services	Maintenance, ventilation control, pumping	0 1 2 3 4 5	0 1 2 3 4 5
Info. warehousing	Database management systems	0 1 2 3 4 5	0 1 2 3 4 5
Management systems integration	SAP	0 1 2 3 4 5	0 1 2 3 4 5
		0 1 2 3 4 5	0 1 2 3 4 5

Comments:

B: Rate the telecommunications infrastructure in the project area in terms of adequacy for the ICTs you plan to use.

1=non existent, 2=needs replacement, 3=needs upgrade, 4=adequate, 5=more than adequate

		Now	2 year projection
Telephone	Fixed lines	1 2 3 4 5	1 2 3 4 5
	Mobile networks	1 2 3 4 5	1 2 3 4 5
Intranet		1 2 3 4 5	1 2 3 4 5
Internet	Bandwidth	1 2 3 4 5	1 2 3 4 5
Videoconferencing		1 2 3 4 5	1 2 3 4 5
Satellite	GPS	1 2 3 4 5	1 2 3 4 5

Are there any areas of concern as far as telecommunications infrastructure is concerned? If so, what needs to be done, and by whom, to enable your company to utilise intended ICTs efficiently?

**DEPARTMENT OF TRADE AND INDUSTRY POLICY SUPPORT PROGRAMME
PROGRAMME MANAGEMENT UNIT**

C: Which ICTs should get the priority of diffusion in terms of their importance to the speedy implementation of the development projects planned?

1=non priority item, 2=little priority, 3=important, 4=high priority, 5=urgent

BASIC TECHNOLOGIES

Technology		Current	2 year projection
ICT Hardware	PC based	1 2 3 4 5	1 2 3 4 5
	Mainframe	1 2 3 4 5	1 2 3 4 5
	Mobile phones/pagers	1 2 3 4 5	1 2 3 4 5
ICT Networks	LAN and WAN	1 2 3 4 5	1 2 3 4 5
	Intranets and Extranets	1 2 3 4 5	1 2 3 4 5
	Internet	1 2 3 4 5	1 2 3 4 5
Communications	E-mail	1 2 3 4 5	1 2 3 4 5
	EDI	1 2 3 4 5	1 2 3 4 5
	Videoconferencing	1 2 3 4 5	1 2 3 4 5
Applications			
Info acquisition and management using:	CD-ROM sources	1 2 3 4 5	1 2 3 4 5
	Intranets and extranets	1 2 3 4 5	1 2 3 4 5
	Internet	1 2 3 4 5	1 2 3 4 5
Streamlining business processes	Business planning and support activities (Finance, accounting, data storage, payroll)	1 2 3 4 5	1 2 3 4 5
	Customer related activities e.g. database records of customers.	1 2 3 4 5	1 2 3 4 5
	E-commerce (websites, electronic transactions)	1 2 3 4 5	1 2 3 4 5

SECTOR APPLICATIONS – Pt MINING

Application	Examples	Current	2 year projection
Mine planning/design	CADSmine, Datamine, Gemcom	1 2 3 4 5	1 2 3 4 5
Transport/logistics	Truck dispatch, rail bound traffic control	1 2 3 4 5	1 2 3 4 5
Processing	PLC systems	1 2 3 4 5	1 2 3 4 5
Measurement / control	Ore accounting, on-line devices, weightometers	1 2 3 4 5	1 2 3 4 5
Engineering services	Maintenance, ventilation control, pumping	1 2 3 4 5	1 2 3 4 5
Info. warehousing	Database management systems	1 2 3 4 5	1 2 3 4 5
Management systems integration	SAP	1 2 3 4 5	1 2 3 4 5

What new developments do you see yourself adopting?

**DEPARTMENT OF TRADE AND INDUSTRY POLICY SUPPORT PROGRAMME
PROGRAMME MANAGEMENT UNIT**

D: *Are there sufficient people trained in the use of the ICTs that are required for all the development planned in your organisation?*

1=none at all, 2=very few, 3=insufficient, 4= reasonably sufficient, 5= very sufficient

Hardware		1	2	3	4	5
Networks		1	2	3	4	5
Communications		1	2	3	4	5

Mine planning/design		1	2	3	4	5
Transport/logistics		1	2	3	4	5
Processing		1	2	3	4	5
Measurement / control		1	2	3	4	5
Engineering services		1	2	3	4	5
Info. warehousing		1	2	3	4	5
Management systems integration		1	2	3	4	5

Are there any areas of concern with regards to your staffing? If so, what needs to be done and by whom, to enable your organisation to utilise ICTs efficiently?

E: *Are there available sufficient resources, that training of personnel in the use of the envisaged ICTs will not retard any of the planned developments in your organisation?*

1=none at all, 2=very few, 3=insufficient, 4=reasonably sufficient, 5=very sufficient

RESOURCE

Potential trainees		1	2	3	4	5
Trainers		1	2	3	4	5
Hardware		1	2	3	4	5
Training facilities		1	2	3	4	5
Project float time		1	2	3	4	5
Financial resources		1	2	3	4	5

What needs to be done and by whom?

**DEPARTMENT OF TRADE AND INDUSTRY POLICY SUPPORT PROGRAMME
PROGRAMME MANAGEMENT UNIT**

F: How would you rate the degree of ICT sophistication of JV or empowerment partners?

0=don't know	1=unsophisticated	2	3	4	5=very knowledgeable
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BASIC TECHNOLOGIES

Technology		Current	2 year projection
ICT Hardware	PC based	0 1 2 3 4 5	0 1 2 3 4 5
	Mainframe	0 1 2 3 4 5	0 1 2 3 4 5
	Mobile phones/pagers	0 1 2 3 4 5	0 1 2 3 4 5
ICT Networks	LAN and WAN	0 1 2 3 4 5	0 1 2 3 4 5
	Intranets and Extranets	0 1 2 3 4 5	0 1 2 3 4 5
	Internet	0 1 2 3 4 5	0 1 2 3 4 5
Communications	E-mail	0 1 2 3 4 5	0 1 2 3 4 5
	EDI	0 1 2 3 4 5	0 1 2 3 4 5
	Videoconferencing	0 1 2 3 4 5	0 1 2 3 4 5
Applications			
Info acquisition and management using:	CD-ROM sources	0 1 2 3 4 5	0 1 2 3 4 5
	Intranets and extranets	0 1 2 3 4 5	0 1 2 3 4 5
	Internet	0 1 2 3 4 5	0 1 2 3 4 5
Streamlining business processes	Business planning and support activities (Finance, accounting, data storage, payroll)	0 1 2 3 4 5	0 1 2 3 4 5
	Customer related activities e.g. database records of customers.	0 1 2 3 4 5	0 1 2 3 4 5
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SECTOR APPLICATIONS – Pt MINING

Application	Examples	Current	2 year projection
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Engineering services	Maintenance, ventilation control, pumping	0 1 2 3 4 5	0 1 2 3 4 5
Info. warehousing	Database management systems	0 1 2 3 4 5	0 1 2 3 4 5
Management systems integration	SAP	0 1 2 3 4 5	0 1 2 3 4 5

If there is any disparity, what measures can be taken and by whom to ensure that this doesn't become a barrier?
