SAITIS BASELINE STUDIES

Executive Summary:

A Survey of the IT Industry and Related Jobs and Skills in South Africa

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THE PROJECT TEAM

International Development Research Centre (IDRC): The IDRC is a public corporation created by the Parliament of Canada to help researchers and communities in the developing world find solutions to their social, economic and environmental problems. The Acacia initiative of the IDRC is an international effort to empower sub-Saharan African communities with the ability to apply ICTs to their own social and economic development. The initiative is designed as an integrated programme of demonstration projects and research and development to address issues of applications, technology, infrastructure and policy. The IDRC was commissioned by the Department of Arts, Culture, Science and Technology to produce the international scan of the IT sector for the South African Foresight study. The Acacia programme is also involved in a collaborative effort with other donor agencies to develop ICT-Scans for several African countries, in an attempt to understand more fully the various activities that are underway at country level in Africa.

Miller, Esselaar and Associates (MEA): MEA is a Management Consultancy specialising in the effective use of the Internet and Electronic Commerce in business and, on a policy level, within civil society in Developing Countries. Apart from the SAITIS project, MEA has participated in the Foresight Process commissioned by the Department of Arts, Culture, Science and Technology, and is a regular contributor to seminars and workshops on related topics. In conjunction with the School of Public and Development Management at the University of the Witwatersrand, they offer courses on Electronic Commerce aimed particularly at the Public Sector.

Information Resources Group (Pty) Ltd (IRG): IRG is a specialist Human Resource research and information technology company. IRG has three interrelated business focus areas: Research, Information Systems and Strategic Consulting. The company has a client base of more than 200 leading corporations in South Africa, and has done extensive research and consulting work for the South African Government. In addition, IRG has international research partnerships through the Saratoga World-Wide benchmarking programme; and joint research projects with leading universities and experts in Europe, North America and South Africa.

Forge Ahead BMI-T: Forge Ahead BMI-T is the first black majority controlled market research Company in South Africa, with an in-depth focus on the Information and Communications Technology (IT) sector. Forge Ahead-BMI-T is a joint venture between Thokoza (51%) and BMI-TechKnowledge (49%) respectively. Apart from its research and consulting activities, Forge Ahead BMI-T arranges conferences on behalf of clients, manages events and provides strategic information to business and stakeholders.

BMI-TechKnowledge (BMI-T) is South Africa's premier technology-focused market research consultancy company with a ten-year track record in the South African information technology and telecommunications markets. BMI-T represents International Data Corporation (IDC) in Southern Africa. IDC is the foremost global IT research consultancy, boasting resources of over 400 analysts with offices in 40 countries. IDC has delivered reliable and insightful market data and strategic guidance to IT vendors since 1964, and currently serves more that 3800 corporate clients. IDC is a division of the R7,3 billion (US$1,2 billion) International Data Group.

ACKNOWLEDGEMENTS

We wish to thank all those individuals and organisations that gave of their time to contribute towards this project. The insights, suggestions and challenges that were raised during individual interviews, telephonic discussions, and workshops have enriched the outcomes of these baseline studies.

We hope that the findings presented in this report will provide useful input into the South African IT Industry Strategy Project. We believe that these studies will provide a springboard for future direction which will result in a stronger and vibrant IT industry sector, capable of creating a broader base of wealth and economic growth for South Africa.

A particular word of thanks to Dr Jonathan Miller and Dr Bob Day who provided insights on the Foresight project. Jonathan Miller also made valuable inputs into the final report, and provided the project team with access to his networks and expertise in the industry.

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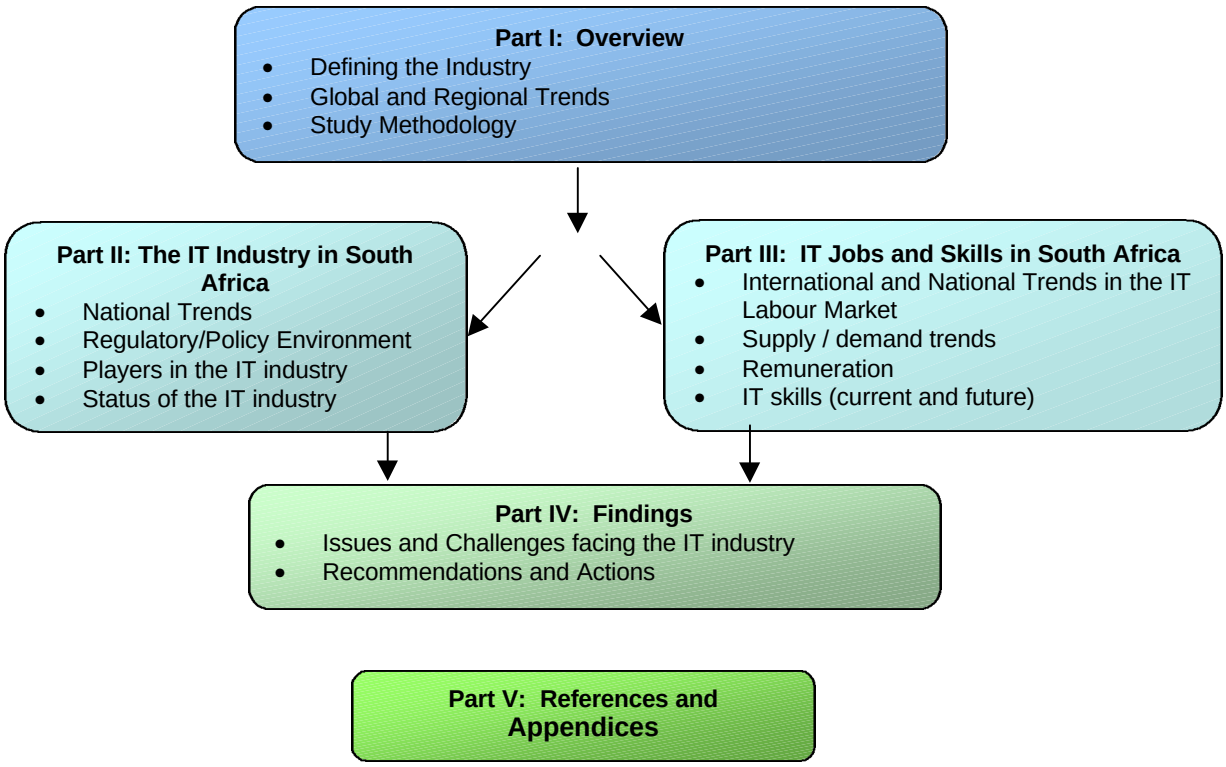
BACKGROUND

The SAITIS Baseline Studies provide an overview of the status of the Information and Communications industry in South Africa. The SAITIS Baseline Studies are the first output from the South African Industry Strategy Project (SAITIS), a three-year project launched by the Canadian International Development Agency (CIDA) and the Department of Trade and Industry (DTI), and executed by PricewaterhouseCoopers Canada. The project was conducted by four South African based organisations under the project management of the Canadian International Development Research Centre (IDRC).

The study consists of two major focus areas, the *Status of the IT industry in South Africa,* and the *Status of IT-related Jobs and Skills.* The full 223-page report, which will be available on the SAITIS Website (www.saitis.co.za), is structured in five parts:



METHODOLOGY

The report is based on research obtained from available secondary sources, about forty individual interviews, and four discussion groups (10 – 15 participants) held in Johannesburg and Cape Town. The study also made use of, as yet unpublished, material that was developed during the eighteen-month Foresight process under the auspices of the Department of Arts, Culture, Science and Technology.

Because of the very limited data available on IT-related jobs and skills, a national questionnaire survey was designed and conducted to obtain inputs from both IT vendors and users. The survey approached about 2 500 organisations (through mailshots and telephonic follow-up), and eventually obtained responses from 456 organisations. The survey covered a total of 500 240 employees nationally, which amounts to 5,8% of total employment in South Africa, according to 1996 Census figures. Respondents are located in eight out of the nine provinces. Gauteng, followed by the Western Cape, had the highest shares of employees in the sample.

DEFINING THE IT INDUSTRY

The definition of the IT industry used in this study is that of the Organisation for Economic Co-operation and Development (OECD). This definition includes the telecommunications industry (both manufacturers of telecommunications equipment plus the network operators Telkom, MTN and Vodacom) but not the provision of content that, for instance, excludes Web-based information providers. Industries are classified based on the Standard Industrial Classification System (SIC) used by the United States, and IT usage is mapped onto this classification.

The Jobs and Skills analysis is based on the categorisations developed by the Information Technology National Qualifications Framework (ITNQF) and corresponds closely with classifications used in other countries such as New Zealand and Canada.

GLOBAL TRENDS IMPACTING ON THE IT INDUSTRY

The process of globalisation is the determining feature of political, social and economic discourse at the end of the twentieth century. It creates a number of tensions within and between societies, and represents a challenge to developing nations in particular to use the process to benefit their own societies. The social compact between government workers and employers emanating out of the Industrial Revolution is being challenged by a shift to new information technology (IT)-mediated modes of production of goods and services.

Changes in Techno-Economic Paradigm

'Fordist' Old	'IT' New
Energy intensive	Information-intensive
Standardised	Customised
Dedicated plant and equipment	Flexible production systems
Single firm	Networks
Hierarchical Management structures	Flat horizontal management structures
Centralisation	Distributed intelligence
Specialised skills	Multi-skilling
Government control and planning	Government information, regulation, coordination and 'Vision'
Minimal training requirements	Continuous training and re-training
Rather stable product mix	Rapid changes in product mix

Source : UNCSTD Report, 1997: 2-4

The potentially revolutionary social and economic impacts of IT are visible in changes to the organisation of work, the disappearance of jobs and the creation of new forms of employment. The impact of IT on the workplace and on organisations has been and will continue to be tremendous. This includes the flattening of organisational structures and the increased vertical integration in the different sectors of economic activity. The impact on employment has been an issue of concern for policy makers. This concern was reinforced by the pessimistic projections suggesting that IT will have negative impact on overall employment. However, there are also empirical observations suggesting that some negative effects of IT are offset by the redistribution of human resources and that the general economic effects are positive, at least in the developed nations.

Geographic distance and time are no longer limiting factors in production. Companies can therefore choose where to site operations based on local labour skills and costs, and local taxation and incentive arrangements. By positioning activities in different time zones, they can work on a twenty-four hour basis - increasing output rates and reducing product development times.

Flows of information make it easier for business entities to exist independently and focus on core activities. Work is increasingly being outsourced and/or done by collaborative consortia and 'virtual business entities'. The effect of this, and other related changes in management philosophy, is that life-long, stable employment is no longer the norm for much of the industrialised countries' work force.

Financial markets are increasingly transcending national boundaries, reflecting the disempowering of other economic actors, particularly those operating within physical confines, such as regulators and planners. At the same time, there is a spread of liberalisation driven by realities of the marketplace. Neighbouring countries - which are natural trading partners - will be drawn together as they liberalise. This opens up new market opportunities and also allows the strengthening of coalitions for joint bargaining in third markets.

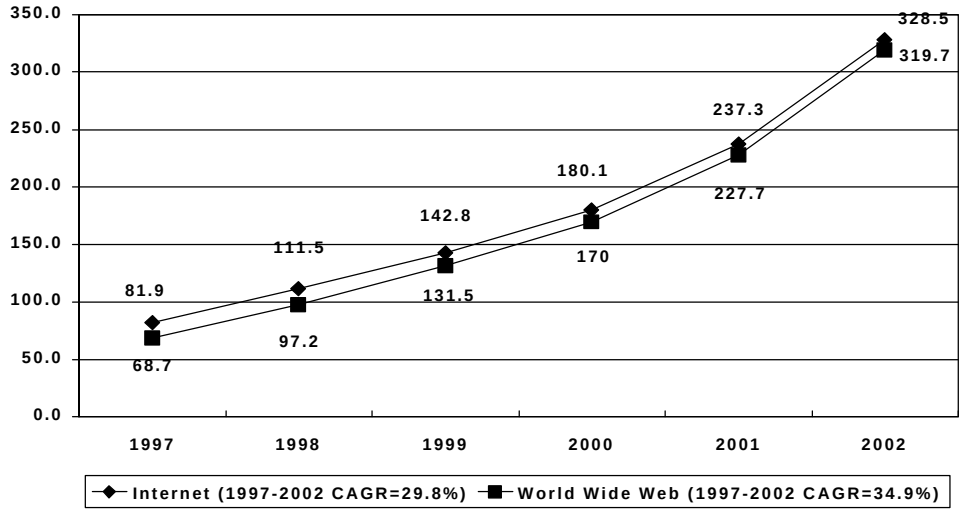
The past decade has been dominated by the global trend towards trade liberalisation of telecommunications. This concerns in particular the European Union, Canada, Japan and 68 countries including 35 economically less developed countries which signed the WTO Basic Telecommunications Agreement to open up the world's market to competition.

The situation in the developing world is far from optimal. Capital mobility has not produced a massive shift of investment and employment from the advanced to the developing world, which still relies heavily on the export of primary products for over 70% of export earnings. Developing countries' exports continue to face formidable barriers in the markets of developed countries

INTERNET AND E-COMMERCE

The Internet has, and continues, to revolutionise the way in which we communicate, and increasingly how we are entertained and do business. The total number of Internet users is now estimated at between at between 140 and 160 million (BMI-TechKnowledge, 1999). Originally the domain of engineers, researchers, and scientists in government, education and private industry, the Internet is increasingly becoming the province of individual home users and commercial users. More than half (60%) of total Internet users in 1998 were 'home' users. Business users (35%), and education and government (5%) make up the rest.

Figure 1: Worldwide Growth in Users of the Internet and World Wide Web (WWW), 1997-2002



Source: BMI-TechKnowledge and International Data Corp, 1998

According to the International Development Corporation, the number of home users of the Internet and World Wide Web (WWW) will grow at a little more than 36% a year from 1997-2002. Small businesses

will also exhibit strong growth in user numbers with Internet users increasing 34% each year until 2002, and WWW users increasing 48% for the same period. Smaller businesses that now use the Internet for only e-mail and non-graphical forms of communication will begin to implement browser-oriented communications solutions.

THE AFRICAN CONTEXT

Internet

Africa is currently undergoing a rapid transformation and is outpacing the global average for growth in number of Internet host systems, albeit from a low base. South Africa in particular is developing rapidly, with about 370 000 dial-up accounts at the end of 1998. South Africa also has more than 70 POPs (points of presence) in both metropolitan and rural towns, unlike most of Africa. In southern Africa, Angola and Botswana are also developing Internet quite rapidly, while in the north, Egypt and Morocco are leading, with Tunisia following. Eastern Africa's leaders include Kenya and Uganda, while in West Africa, Senegal, Ghana and Benin are leading. Cameroon is ahead of the rest of central Africa, followed by Gabon and then Nigeria.

Internet development in Africa is constrained by poor telephone infrastructure, low international bandwidth and high dial-up tariffs levied on Internet users. This has limited Internet access to mainly the elite who have a good education. Access to the Internet is mostly in major cities, sidelining the 70 percent of Africans who are rural dwellers.

Telecommunications

Africa has recently been moving towards regional integration in the area of telecommunications. There are a number of regional projects which have a bearing on the IT industry. Two of the most important ones are the Southern African Regional Telecommunications Restructuring Project (RTR) of the South African Development Community (SADC) and the COMTEL project of the Common Market for Eastern and Southern Africa (COMESA). The objective of the RTR programme is to ensure that SADC member states realise the economic and social benefits of a modern information infrastructure and have the resources, both technical and financial, to develop it. COMTEL was an initiative established in early 1998 to promote the establishment of a regional telecommunications network. COMESA comprises 21 member states and represents 385 million people. The aim of COMTEL is to facilitate increased trade relations within the region of eastern and southern Africa. The network will be managed as a private limited liability company with an investment cost of approximately US$300 Million.

According to a recent report issued by the US Department of Commerce, the value of US telecommunications equipment exports to sub-Saharan Africa for 1998 was R1 251 million (US$206 million), an increase of 39%. South Africa is the largest market in the region and imports have more than doubled from R389 million (US$64 million) in 1997 to R808 million (US$133 million) in 1998. During 1997, six SADC countries ranked in the region’s top 10 equipment importers, representing approximately R577 million (US$95 million) in exports.

Foreign Direct Investment

The African continent as a whole received R50,4 billion (US$8,3 billion) in Foreign Direct Investment (FDI) out of a total of R1 008 billion (US$166 billion) for developing countries as a whole. South Africa was the largest African recipient of FDI in 1997, but fell to 7th position in 1998. According to the UN Conference on Trade and Development (UNCTAD) world investment report, on which these figures are based, the reasons were due to a decrease in privatisation-related investment and reduced investment by Asian companies. The five African countries rated most attractive to foreign investment were South Africa, Nigeria, Botswana, Ivory Coast and Tunisia.

THE NATIONAL CONTEXT

Socio-economic and socio-political environment

South Africa, in common with most of Africa, is a developing country with wide inequities between different groups. In order to understand the IT industry in South Africa, it is necessary to see the industry against the general demographic data of the country:

- South Africa's current population size, based on the 1996 Census, is estimated at 40,58 million. This is based on 9 059 571 households in South Africa, but excludes hostels and other such institutions.

- 58% of the population have access to electricity, and 45% have running water in their homes.

- South Africa is a very youthful nation. It is also one in which the literacy rate is only 61,4%.

- Although South Africa appears prosperous compared with her neighbours, approximately 46% of the population live on or below the subsistence level.

- The human development index (HDI) is 0,677 which ranks it 94th in the world (Statistics in Brief, 1996). The HDI measures people's ability to live long and healthy lives, to be able to communicate, to participate in the life of the community and to have sufficient means to obtain a decent standard of living.

- A recent report (Financial Mail, October 15, 1999: 94) quotes that "Southern Africa faces a human disaster on a scale never seen before" with an HIV/AIDS infection rate in excess of 23% (and as high as 32% in Kwazulu Natal), reported at antenatal clinics. It is estimated that South Africa's population growth will fall to about 0,8% by 2005, and into decline thereafter. AIDS-related deaths will increase from the current 400 000 per year to between 800 000 to 1 million, with life expectancy decreasing from 68 to 48 years. The Actuarial Society of South Africa predicts that by 2005, about 4 million families will experience a 20% reduction in discretionary funding due to higher taxation to cover State medical spending and personal medical costs.

- In June 1996, South Africa's Finance Minister, Trevor Manuel, announced the country's macroeconomic strategy, GEAR (Growth, Employment and Redistribution). GEAR promised to increase growth to an average of 4,2%, create 1,35 million new jobs by the year 2000, boost exports by an array of supply-side measures, and drastically improve social infrastructure. At its inception, the consensus was that GEAR was much more oriented to the corporate sector than labour, despite its apparent targets of substantial job creation. Since then, instead of spurring labour-intensive growth, GEAR has presided over significant job losses

Telecommunications

An analysis of the 1996 Census data reveals that about 28,8% of households have a fixed line or cellphone in their homes. About 81,6% of households indicated that they had access to a phone. Table 2 shows the percentage distribution of telecommunications in South African households, from the earlier 1995 October Household Survey.

Table 1: Percentage distribution of telecommunications in South African households.

Telecommunication by population group – Percentage distribution and total number of dwellings						
Telecommunication	Total dwellings [1/]	Total	Africans	Coloureds	Indians	Whites
RSA	8 802	8 802 [1/]	5 951 [1/]	748 [1/]	246 [1/]	1 858 [1/]
Total	**8 802**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**
Cellular phone only	37	0,4	0,2	0,2	0,4	1,3
Cellular phone and telephone in dwelling	152	1,7	0,2	0,5	3,4	7,0
Telephone in dwelling only	2 651	30,1	13,2	36,5	70,4	76,6
Access to telephone at neighbour	682	7,7	8,1	17,3	9,2	2,6
Communal telephone (pay phone)	1 444	16,4	21,6	13,7	3,4	2,4
Access to telephone at shop/clinic	1 028	11,7	16,2	4,3	2,2	1,6
None	2 809	31,9	40,6	27,6	10,9	8,5

[1/] Thousands Source: Statistics SA, October Household Survey, 1995

Research & Development (R&D)

South Africa's R&D expenditure was estimated at about 0,8% of GDP (R 5,72 billion / US$942 million) in 1997, a slight recovery from the stagnant economy of the 1980s. Though below most OECD countries (2,5 - 3% in Japan, Germany and the USA), this compares fairly well with many newly emerging countries and developing countries (Taiwan 1,1%, Mexico 0,6%), and is well in advance of other African countries.

Levels of expenditure on IT R&D amongst participants in the SAITIS Baseline Survey was low. Half of IT vendors reported no expenditure on IT R&D and 28% spent less than R100 000 (US$16 500) per year.

A 1993 National Research Foundation survey (then the Foundation for Research Development) of local R&D in computer sciences and communications, showed that South Africa spent only R58,6 million in 1993 on research into the computer sciences, representing about 2,3% of total R&D spending. The funding had decreased, and was down 33,5% from the 1991 level. The business sector had a greater involvement in funding computer science R&D, representing 63,4% of total funding in 1993. This suggests that IT R&D was, at that stage, more geared to business applications than to the more exploratory basic research conducted at academic institutions. The high level of business sector support for R&D in the telecommunications sector can be attributed to the local R&D capabilities of companies such as Alcatel and Siemens. This includes research into the adaptation of technologies, particularly software, for local conditions.

Table 2: Computer Sciences and Communication R&D Inputs by Sector (in R 000's)

Sector	Computer Sciences		Communications	
	1991	1993	1991	1993
Government	11 706	17 045	4 402	8 297
Tertiary Education	8 852	4 454	2 413	1 375
Business	67 649	37 164	61 967	66 258
TOTAL	88 207	58 663	68 782	75 930
% of Total R&D	**3.2%**	**2.3%**	**2.5%**	**3.0%**

Source: National Research Foundation (then FRD, Foundation for Research Development), 1993

THE IT INDUSTRY IN SOUTH AFRICA

Traditionally, the South African IT industry developed through the transfer of technology from the West (largely the United States, but substantial contributions were made by the United Kingdom during the 1960s and 1970s) and the subsequent catalytic effect of this transfer on education and skills. In the early days, there was a clear separation of the IT and communications industries, the latter being relatively small and unsophisticated by today's standards. This is no longer the case and the industry is nowadays more frequently referred to as the ICT (Information *and Communications T*echnology*)* industry. This sector has grown from humble beginnings and a market offering limited choice where the

struggle for market share took place between IBM and 'The Bunch' (Burroughs, Univac, NCR, CDC, Honeywell).

The South African IT market has been on a high growth path for the past five years, with real growth rates of 10% or more a year. The growth spurt mirrors an international trend, as well as local restructuring and revival following the 1994 elections. According to BMI-TechKnowledge, the combined market for IT hardware, software and services (*excluding Telecommunications Services*) is set to exceed R40 billion in 2003, up from just under R20 billion in 1998. Including the Telecommunications Network operators (Telkom, Vodacom, MTN), it has grown from a R39 billion (US$6,4 billion) industry in 1992 to R59 billion (US$9,7 billion) in 1997.

Of interest are the generally low figures quoted for government IT procurement. According to BMI-TechKnowledge, this can be ascribed to lower government IT spend due to pressure to fund priority areas such as health, education and housing. In addition, IT spend by State-owned enterprises such as the Post Office, Telkom and ESKOM are not included in this category.

Major players in the IT industry

The major players fall broadly into two categories:

- Companies listed on the Johannesburg Stock Exchange (JSE) who largely import, market and distribute products derived from Europe, North America and the Far East, and provide a variety of services to the South African market; or subsidiaries of multinationals such as IBM that operate in a similar fashion; or
- State-owned enterprises such as Telkom.

There are three sectors on the JSE which would broadly be classified as belonging to the IT Industry. They are showing dynamic growth, as evidenced by their increase in market capitalisation (approximately 100% over a four-month period between September 1999 and January 2000).

Part of this growth is due to new entrants into these sectors, in particular M-Cell, with a market capitalisation of R35 billion (US$5,7 billion). M-Cell was listed in the Telecommunications sector for the first time over this period and the number of companies listed grew from 69 to 88. Both the growth and the new entrants are indicative of a buoyant stock market and of the expectation that these sectors will outperform the market in general.

Sector	Market Capitalisation 10/09/99 (R Million)	Market Capitalisation 11/01/00 (R Million)
Electronics and Electrical	9 722	10 941
Information Technology	56 280	88 015
Telecommunications	2 729	38 318
TOTAL	**68 731**	**137 274**

Total market capitalisation is thus in excess of R137 billion (US$22,6 billion) at the start of the new millennium. This excludes the venture capital sector, which is fairly unstable but probably contributes an additional R1 billion (US$16 million).

A further complication in attempting to size the 'real' contribution of IT to the national GDP is that many listed companies have diverse interests and cannot always be easily categorised in their designated sector. Similarly, companies listed under other sectors such as 'Media' have strong IT businesses.

Apart from being represented in South Africa by locally-owned companies (e.g. most networking products produced by companies such as Cisco and US Robotics are distributed through local agents), there are a number of large multinationals who operate subsidiaries in this country. They include IBM, Unisys, Microsoft, ICL, Intel, Systems Applications Products (SAP), Dell, Novell and Compaq. Their business models vary widely, from a largely 'facilitation' role (e.g. Microsoft) to the active marketing and support of their products on the ground (e.g. SAP). What is undoubtedly true, however, is that the South

African IT industry has been effectively created through foreign multinational support and the industry is very dependent on their continuing participation.

Hardware categories such as networking have taken off dramatically, as a result of the trends towards network architecture and Internet technology. Software and services markets continue to exhibit high growth rates of close to 20% per annum. Part of this growth is fuelled by a trend towards companies outsourcing more of their IT functions than before. Other stimulants are network implementation, (including Internet and Intranets), solving the Year 2000 bug problem, and growth in applications such as enterprise resource planning (ERP). The next generation of applications that will fuel growth include Electronic Commerce, Supply Chain Management, Customer Relationship Management (CRM), and Knowledge Management.

Telecommunications

South Africa's telecommunications sector is the largest in Africa by probably all important measures, including number of fixed lines, number of cellular subscribers, data services users, financial revenues and investment, technological capability and local equipment design and manufacturing capabilities. However, liberalisation is a comparatively recent phenomenon and a few major players still dominate the Telkom market.

Telkom is the dominant player in the Telecommunications Services Industry. The turnover of the entire telecommunications sector of the JSE was less than R1,5 billion (US$25 million) as at September 1999, as compared to Telkom's revenue of over R20 billion (US$3,3 billion). If revenue from the cellular operators is included (R4 billion / US$0,6 billion), then it can be seen there is a strong concentration of power in a few companies, all of whom are making profits well in excess of that found in most other parts of the economy.

Internet

During 1998, demand in South Africa for connectivity to the Internet grew even more rapidly than in the preceding four years. The number of dial-up subscriber accounts of all ISPs combined grew by more than 100%, reaching 370 000 by year-end 1998. Table 3 shows growth in key Internet and e-Commerce indicators.

Table 3: Notional Estimates of Key Internet and E-Commerce Indicators

Sector	Installed base of Internet-enabled PCs year-end 1998	1998 Value of e-Commerce Transactions (Rm)
Agriculture Forestry Fishing	50 000	500
Mining	50 000	750
Construction	25 000	50
Manufacturing	150 000	6 000
Transportation Communications Electricity	75 000	50
Wholesale	25 000	1 000
Retail	150 000	2 500
Finance Insurance Real estate	175 000	2 000
Services	200 000	3 000
Public Administration	100 000	150
Total	**1 000 000**	**16 000**

Source: BMI-TechKnowledge, 1999

Note: E-Commerce transaction value is the total for Internet and non-Internet. The great majority of transactions in 1998 were non-Internet i.e. they took place over Value-Added Networks using Electronic Data Interchange (EDI) standards.

The rise of the Internet is providing companies such as Amazon.com with global reach even though they may have no physical presence in this country. Their impact is difficult to assess, particularly if one includes companies such as Dell who are represented in South Africa but conclude much of their business electronically.

IT Users

Although South Africa has a number of companies who are enterprising and progressive users of IT, there is clearly a lack of publicly available data on the subject. Even more difficult to ascertain is how, and how well South African enterprises are using their IT facilities. According to a study completed in 1996, the financial services and retailing sectors appear to be making the most effective use of IT and in several cases could be considered world-class users. Manufacturing is clearly behind (a reliable estimate put the IT spend of the manufacturing sector at 1% of turnover, compared with a figure of 4% in Europe at the time). Another significant grouping that lags behind in IT usage are the SMMEs (Small, Medium and Micro- Enterprises), which often do not have the resources or skills to introduce IT effectively.

National initiatives relating to the IT industry

Several significant South African initiatives are underway:

- **info.com 2025**
  The Department of Communications has launched a wide range of IT-related projects which, collectively, are intended to establish a networked information community that empowers people in the way they work, live and play, and to make South Africa globally competitive. Projects that appear to have progressed most strongly and/or received the most publicity are: the Houwteq Academy (now called the Institute of Software Applications and Knowledge), Community Information Centres (CIC), Internet 2000 (offering access to the Internet to a defined percentage of schools), Public Information Terminals, and the Electronic Commerce debate.

- **Universal Service Agency**
  The Universal Service Agency (USA) is a statutory body established by the Telecommunications Act No. 103 of 1996. It was established in 1997 and has as a goal the provision of ensuring universal access to all telecommunications services (voice, fax, Internet etc.), predominantly through telecentres.

- **State IT Agency (SITA)**
  As a solution to government's IT problems, and by Act of Parliament, the State Information Technology Agency (Pty) Ltd. came into existence on 29 January 1999. It is to provide IT-related services exclusively to the Public Service with guaranteed performance levels.

- **Foresight**
  Initiated by the Department of Arts, Culture, Science and Technology, South Africa commenced a Foresight study early in 1998. The aim of the study is to help identify those sector-specific technologies and technology trends that will best improve the quality of life of all South Africans over the next 10 – 20 years. Working groups of 20-30 people each were formed to represent diverse interests and experience in each of twelve sectors. Along with the ICT working group, there were groups studying the environment, biodiversity, education, youth, health, mining, energy, business and finance, agriculture, manufacturing, tourism and safety.

Table 4: Summary of ICT SWOT analysis (developed during the Foresight process)

Strengths:		***Weaknesses:***	
S1.	Accelerated roll-out of infrastructure	W1.1.	Inequitable Access
S2.1.	Education and learning in the IT field	W1.2.	Lack of a National IT strategy
S2.2.	Existing skills base in place [in some areas] - pockets of excellence	W2.1.	Low Levels of Literacy and Education
		W2.2.	Inadequate IT Skills Base, worsened by the brain drain
S2.3.	English - ICT's lingua franca	W2.3.	IT "Phobia" and Elitism
S3.	Government will to introduce IT facilitated Public Sector Services	W3.1.	Poor Government Services hamper IT roll-out
		W3.2.	Industrial Age management is still being used in the IT age
S4.1.	Existing IT Infrastructure	W4.1.	Small Local IT Market
S4.2.	IT Costs are relatively low	W4.2.	Poor Technology Transfer
S5.1.	South Africa's IT Leadership in Africa	W5.	International lack of clout in IT
S5.2.	South Africa's International IT links	W6.	Poor conditions for investors
S6.	IT is a new driver of the Economy	W7.	IT precipitated antisocial behaviour
Opportunities:		***Threats:***	
O1.	Emerging Information Society	T1.	IT worsens disparities in the Information Society
O1.1.	[Continued] accelerated roll-out of telecommunications infrastructure	T2.1.	Lack of IT skills in the labour force outside the IT sector
		T2.2.	Education funding is low
O1.2.	Policies to foster an Information Society	T2.3.	Distance education is not a mature medium
O2.	IT enabled Learning/Education/Training	T3.1.	Government Inefficiencies - too sluggish for the fast moving IT sector
O2.1.	Distance education		
O3.1.	National policy to stimulate IT development	T3.2.	Government policies may lead to job losses
O3.2.	Public Service Delivery through IT	T4.	Redundant and Inappropriate Technologies
O3.3.	Transformation of Government using ICTs	T5.	Globalisation favours the developed world
O4.1.	Software development to address developing world problems	T6.	A weak economy is further threatened in a global information society
O4.2.	Indigenous knowledge exported via ICTs	T7.	New social problems arise
O4.3.	Less legacy infrastructure than the developed world		
O5.	International links solve several IT weaknesses.		
O6.1.	Various ways of financing IT operations		
O6.2.	SMMEs, the future of the IT industry		
O6.3.	Work patterns are more flexible		
O7.	ICTs can enhance security and safety		

[ ] = additions made by the SAITIS project team Source: Foresight study, 1999: unpublished report

- The Department of Trade and Industry (DTI) designs and administers many programmes to stimulate economic growth, such as industrial investment incentives and medium-term loan financing.

- The Technology and Human Resources for Industry Programme (THRIP) was established in 1991 and supports the development of technology and appropriately skilled people for industry, to improve South Africa's global competitiveness. THRIP performs this task by providing resources and mechanisms in support of collaborative research in the areas of science, engineering and technology (SET). Research groups in natural science, engineering and technology within

educational institutions can participate in collaboration with any private company or consortium of companies. In 1997, more than R110 million (US$ 18 million) was provided from government and industry for THRIP research projects.

- The Innovation Fund (IF) is a programme of the Department of Arts, Culture, Science and Technology (DACST). It is a programme of support that addresses problems "serious enough to impede socio-economic development or affect our ability to compete in products and services". It also supports large-scale science, engineering and technology (SET) innovation programmes. These projects should generate new knowledge leading to novel products, processes or services. Funding can be accessed by statutory research and technology institutions, the higher education sector, the business and industrial community, and non-governmental bodies. The fund encourages multidisciplinary collaboration through consortia-type partnering.

Provincial Initiatives Relating to the IT Industry

The two prominent provincial initiatives relating to IT are the Cape IT Initiative (CITI) and the Gauteng SDI. The Cape Information Technology Initiative (www.citi.org.za) is an independent Section 21 company promoting the development of the cluster of information technology (IT) industries in the Western Cape. CITI facilitates initiatives to grow the IT industry through business incubation, provision of venture capital, IT education, industry research and marketing, and networking of individuals and organisations. The South African Government has created a programme to establish Spatial Development Initiatives (SDIs) and Industrial Development Zones (IDZs) which aim to attract investment, and create new, viable jobs around clusters such as tourism, manufacturing, agriculture. The Gauteng SDI, with its high-technology focus, is one such development.

Development Initiatives

International agencies are realising that ICTs offer new opportunities to leapfrog stages of development in Africa, including problems associated with weak infrastructure. Over seventy donor programmes are now at work on a variety of ICT projects in Africa. Previously many donors had treated information and communications as a supporting mechanism for their operations and projects but increasingly there is an acceptance of a relationship between knowledge and development. Projects can be found in many areas including policy reform, infrastructure, e-commerce, education, health, agriculture, natural resource management and the environment. Key initiatives include the IDRC's Acacia initiative, the Leland Initiative of the United States Agency for International Development (USAID), and World Bank programmes.

IT JOBS AND SKILLS

Professional skills are in short supply in South Africa, creating a continued high growth in demand for IT services. Competitors in this market are also competing for the same skills base.

The 1998 Human Sciences Research Council (HSRC) Telecommunications study clearly revealed an interaction between the supply of highly skilled human resources and the growth potential of organisations (and eventually the further demand for labour). However, the HSRC study highlights that there is a chronic shortage of highly skilled human resources in various segments of the market. The poor balance between supply and demand is mainly seen as the result of a lack of co-ordination between the education system and the labour market. A large proportion of the stakeholders interviewed for the SAITIS Baseline Studies supported this statement.

The 1998 HSRC Labour Study revealed that between 1965 and 1994, there was a rising proportion in high level employment which was matched by a decrease in lower level occupations. In addition, total employment in the formal economy (excluding agriculture) is expected to increase by about 45 000 job opportunities between 1998 and 2003, which amounts to growth of less than 1% over the entire period. Growth rates vary considerably across occupational categories. The communications sub-sector is one

of the fastest growing sub-sectors in the economy and employment is expected to grow at an annual rate of 1.3% per year. Telkom and the Post Office dominate the communications sub-sector, but most employment in this sector is likely to occur outside these organisations.

Retention of IT staff

Organisations in the public sector reported that they could not compete for certain skills (i.e. they could not afford the market salaries) and often lose highly skilled people. Although they try to counter shortages with alternative employment measures, this loss impacts negatively on their functioning. This situation is exacerbated by the shortage of black professionals qualified in the field of study relevant to IT. Organisations are trying to change their staff profiles to comply with present labour legislation.

Brain Drain

During the course of the interviews conducted for this study, the brain drain was cited as the most common cause of the local skill shortage. The demand for South African IT Skills remains in the international market place and includes both the newly qualified IT graduate, who is in search of opportunity and concomitant financial reward in the short-term, and the experienced and qualified individuals who are in pursuit of a perceived improvement in quality of life in first world countries. International employers see South Africa as a "soft-target", given the performance of the Rand, the crime statistics, the high level of IT skills available, and the consequent mobility of the highly skilled and educated individual. A recently conducted IT Staff Survey (CPL Survey, November 1998) indicates that 29% of programmers and 23% of analyst/programmers and systems analysts who voluntarily changed jobs, left the country. At management level, this amounts to about 31%.

A second factor which emerged from the SAITIS baseline study interviews, is the "job-hopping" characteristic in the IT industry. Once an employee becomes sufficiently skilled to perform a job, they move jobs looking for change and new challenges, once again creating a gap to be filled. Since the IT industry is one driven by change and challenge, those successful in this industry are likewise driven by change and challenge, the result being a skills merry-go-round.

Black Empowerment

Given the historical context of South Africa, and the legacy which apartheid has left in terms of inequity in jobs, education, and access to healthcare amongst others, it should be no surprise that the IT sector is likewise affected. There have been major moves afoot through bodies such as the Black IT Forum (BITF), and affirmative procurement policies by government, to encourage black empowerment. It is significant though that the number of black companies is still relatively small, although growing, and that participation by this part of the IT industry needs to be far more visible. This issue is probably of little significance in other parts of the world, but in South Africa the growth of the IT industry will depend on its ability to stimulate the growth of a vibrant Black Economic Empowerment (BEE) sector.

SAITIS QUESTIONNAIRE SURVEY RESULTS

Some of the key findings from the IT Jobs and Skills survey include:

- ***Significant under-investment in IT Skills Training***

  Forty percent of respondents did not invest in IT training or were unable to provide details of their investment in training. Amongst IT vendors only 23% spent in excess of R100 000 on IT training in their last financial period. Organisations in the public administration sector (mostly government and state-owned enterprises) spent the most per company on IT training. IT vendors spent more on IT training per person than any other sector. In general, although larger organisations spend more per company on IT training, smaller companies invest more per employee on IT training.

- ***Sectoral distribution of IT staff***

  Just under 2% of the total staff covered by the survey are IT employees. IT vendors have the highest concentration of IT staff as a percentage of total staff, followed by finance and insurance and professional, scientific and technical services. Real estate, public administration and construction companies have the highest proportion of contract IT staff to permanent IT staff.

- ***Categorisation of IT staff by skills domains***

  Respondents were asked to categorise their IT staff into the eight IT skills domains developed by the IT National Qualifications Framework:

  - 25% of IT staff are employed in systems development;
  - 14% of IT staff were employed in information systems management;
  - 14% in computer operations
  - 14% in end-user computing.

- ***Race and gender distribution***

  Seventy percent of IT staff covered by the survey are White. Thirteen percent of IT staff are African, whilst Asian and Coloured IT staff each make up 8% of the remaining employees. Female employees make up 27% of IT staff covered by the survey.

- ***Use of contract staff***

  Systems development has the highest proportion of contract staff to permanent staff, followed by hardware and computer architecture, and education and training. The highest percentage of vacancies are in systems development and end-user computing. Systems development experienced the highest turnover rate. IT sales and marketing, and data communications and networking also experienced high turnover rates. Most recruitment was taking place in systems development, data communications and networking, and hardware and computer architecture.

- ***Projected employment estimates for IT staff***

  Respondents expect a 56% overall increase in IT staff by 2003. The greatest increases are expected in:
  - systems development 90%
  - IT education and training 76%
  - information systems management 79%

  Little or modest increase is expected in computer operations staff (0,75%).

- ***IT Outsourcing***

  This is emerging as a definite trend. Over 63% of respondents outsource some of their IT activities, and over 30% of respondents outsource more than half their IT activities. Organisations in the utilities, construction, wholesale trade, retail trade, and food and accommodation services sectors reported the highest levels of outsourcing.

- ***IT Social Investment***

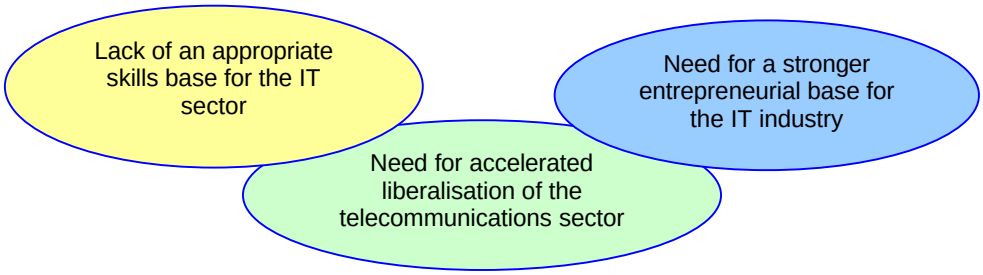
  Very little was invested in IT social projects by participating organisations. Over 80% of respondents indicated that they did not invest in any IT social responsibility projects over the last year. Only 7% of total respondents and 15% of IT vendors spent over R50 000 on IT social responsibility projects.

- ***IT vendor profile***

  More than half of IT vendors in the sample were involved in services and consulting. Forty-four percent were involved in software development and 26% were involved in training. Close to half of all IT vendors currently generate revenue outside of South Africa's borders. A third of IT vendors generate part of their revenue from other African countries.

ISSUES AND CHALLENGES FACING THE IT INDUSTRY

Three major areas of concern emerged during the SAITIS Baseline studies, with a high level of consistency amongst key stakeholders who identified these areas:



Identified issues could further be clustered in four areas. Some examples of issues raised are included are:

- ***Competitiveness***

  - Global competitiveness was hardly raised by stakeholders. Internal problems around labour, crime and security are receiving most of the attention;
  - There is a lack of a strong culture of R&D and innovation;
  - South Africa is not exploiting its position as the interface between developed and developing world;
  - Earlier market strengths in the security and surveillance area should be rejuvenated;
  - E-commerce will be the driver of the future;
  - A "Made in South Africa" trademark is lacking, with South Africans having little confidence in their IT abilities;
  - The SMME sector lacks vibrance, with few support structures in place;
  - Affirmative procurement policies are not working.

- ***The enabling environment***

  - The fragmented governmental approach to the IT industry and the development of the Information Society is of concern;
  - More appropriate baseline indicators are needed. Current definitions and related statistics gathering processes are more appropriate for a manufacturing-based economy;
  - Access to finance is problematic, particularly for the SMME sector. Perceptions are that there is limited access to venture capital;
  - More incentive schemes are required and a more friendly environment to encourage investment;
  - The Telecommunications Act of 1996 provides inadequate legislation to address the rapid pace of technology change;
  - The National Qualifications Framework requires more support from multinationals;
  - Existing bandwidth e.g. ESKOM and Transtel is under-utilised;
  - The Telkom monopoly is perceived as problematic and increased liberalisation is required;
  - Lack of an integrated national focus is resulting in 'patchy' roll-out of infrastructure;
  - The industry / government interface needs to be improved.

- ***Human resource development***

  - South Africa is experiencing a serious skills shortage in IT-related skills, particularly in areas such as systems integration, Oracle-based skills, and higher-level management;
  - The 'pipeline' of potential skills development requires greater co-ordination between industry and the various government departments;
  - Education at all levels is crucial. IT-literacy should be introduced at primary school level. An IT-based MBA should be considered;
  - The private sector is not involved closely enough with educational institutions to ensure that relevant curricula are developed for the IT industry;
  - The brain drain is a reality, and South African IT professionals have been targeted by developed countries;
  - Current migration policies make it difficult to recruit international staff.

- ***Creating a South African Information Society***

  - The need to create an Information Society was raised as a major concern. South Africa is unlikely to play a role in the global information economy if there is no national vision for creating the Information Society;
  - There is a general lack of awareness of broader IT-related activities being undertaken in the country by bi- and multilateral donors. Private sector awareness may result in better leveraging of such funds;
  - Promotion of IT-literacy should be emphasised, and a greater visibility and accessibility of IT should be encouraged.

RECOMMENDATIONS AND ACTIONS

The recommendations and actions are based on the outcomes of the individual interviews, the four SAITIS Baseline Discussion Groups and telephonic interviews held with key individuals. They were consolidated by the project team, but reflect primarily the views of the key stakeholders with whom the project team interacted.

- ***Competitiveness***

  - Incentives to attract foreign investment have to be improved;
  - Create incentives for the private sector to invest in retraining of staff ;
  - Establish co-ordinated structures to support SMME development specifically in the IT sector. Implied in this recommendation is the need to understand more clearly what is happening in this sector and to improve current data collection;
  - Investigate the development of more appropriate IT-related indicators.

- ***Enabling environment***

  - National objectives should be set to develop the IT industry as a key industry;
  - In line with the above recommendation, stronger co-ordination is required between the industry, government, IT-related associations and other key stakeholders;
  - Investigate the development of a co-ordinating mechanism for IT-related associations. The formation of Information Industries South Africa may go some way to meeting this objective;
  - Guidelines and regulations for the South African Telecommunications Regulatory Authority (SATRA) should be re-examined. Since a monopoly currently exists in this country, it is necessary to strengthen SATRA's ability to regulate and monitor the dominant players;
  - The reporting lines within government are not optimal and should be re-evaluated, particularly where the Department of Communications, SATRA, the Independent Broadcasting Authority (IBA) and the South African Broadcasting Corporation (SABC) report to the same Minister;

- The Telecommunications Act should be reviewed to prevent an extension of the Telkom monopoly beyond 2002;
- Investigate mechanisms to improve access to venture capital.

- ***Human Resource Development***

  - Establish a strategy to actively encourage foreign nationals to work in the IT industry in South Africa. Investigate opportunities to import IT skills into the country.
  - Identify potential sources of skilled labour. This will require action to address the current restrictions on importing staff from other countries. Attract South African exiles.
  - Work with the donor community to investigate the establishment of skills development programmes in IT. Make use of experienced volunteers on sabbatical, as a short-term solution.
  - Create mechanisms that will ensure stronger linkages between industry, government and educational institutions so that the right skills mix is developed in South Africa;
  - Entrepreneurial development training is required at secondary and tertiary levels of education. There are too few skilled staff who understand business and who can apply their IT skills into the business.
  - Training programmes should be addressed as part of a national IT strategy and not as a separate initiative. A mechanism could be created to facilitate exchange of ideas, and possible collaborative projects, to ensure leverage of limited funds;

- ***Creating the Information Society in South Africa***

  - The emphasis on infrastructure roll-out, public Internet access points such as the Public Internet Terminals (PiTs) and telecentres will increase the demand for IT-related services;
  - The need for innovative solutions to increase visibility of ICTs may also create an opportunity for technology-enhanced learning technologies;
  - A stronger relationship needs to be formed with the international donor community, which is already undertaking major initiatives in Africa, and South Africa, to promote the development of the Information Society.