The State of Information Communication Technologies in Gauteng Province – 1994 to 2002

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Thesis submitted in partial fulfilment of the requirements for the degree
of Master in Philosophy
(Value Analysis and Policy Formulation))

UNIVERSITY OF STELLENBOSCH

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March 2004

AUTHOR'S DECLARATION

I, the undersigned, hereby declare that the work contained in this thesis is my own original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

Summary

This study aims to assess the state of developments of Information Communication Technologies (ICT's) in the Gauteng Province as a driving factor for evolution into informational economy. Throughout the world the convergence of telecommunications, computing and publishing industries has changed the way in which the world economies and society at large are organized. It is important for every part of society to adapt to these changes.

Since 1996 a number of institutional developments at a global, national, provincial, industrial, municipality and community levels have taken place to prepare society for the digital revolution. These institutional initiatives took form of policies and programs that would have an impact on the Gauteng Province. Therefore, it is necessary for Gauteng Province to develop a planning framework that is informed by these changes and initiatives.

The theoretical basis of the study was Critical Multiplism. This approach employs multiple perspectives, methods, measures and data sources to arrive at plausible conclusions.

The study concludes that the Gauteng Province has reached a critical point for rapid growth of ICT's to take place.

Opsomming

Die studie fokus op die evaluering van die ontwikkeling van die Informasie Kommunikasie Tegnologie in Gauteng as 'n dryf faktor vir die evolusie na 'n informasie ekonomie. Internasionaal het die integrasie van telekomunikasie, rekenarisering en publiesieteit industrieë die manier van organisasie van wêreld ekonomie en die samelewing verander. Dit is belangrik vir die sameling se voortbestaan om aan te pas by hierdie veranderinge.

Sedert 1996 het verskeie institute en organisasies op globale, nasionale, provinsiale, industrieële, munisipale en gemeenskaps vlak reeds met voorbereidings begin vir die digitale revolusie. Hierdie inisiatiewe het die vorm van voorskrifte en programme aangeneem wat 'n definitiewe impak maak op Gauteng. Dit is belangrik vir Gauteng om 'n voorskriftelike raamwerk op te stel in lyn met hierdie inisiatiewe.

Die teoretiese basis van hierdie studie was Kritiese Vermenigvuldiging. Hierdie metode maak gebruik van verskeie sienings, maniere en inligtingsbronne om by 'n werkbare oplossing te kom. Hierdie studie beklemtoon die feit dat Gauteng 'n krietiesie punt bereik het vir vinnige groei in Informasie Kommunikasie Tegnologie.

Acknowledgements

I would like to express my sincere gratitude to my supervisor, Professor Johann Kinghorn for guidance and support. I would also like to thank Dr. Hans Muller, Ms. Lungile Mazibuko for additional support they gave me in doing this study.

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Conclusion: The value of the study

Glossary of Terms

Abbreviation	Definition
IT	Information Technology
ICT	Information and Communications Technology
FDI	Foreign Direct Investment
IDP	Integrated Development Planning
NGO's	Non-Governmental Organizations
Uitlanders	Immigrants to the Reef in search of opportunity
RSA	Republic of South Africa
ANC	African National Congress
BMI	A registered company that technology knowledge among others conduct ICT Research
e-Commerce	Electronic Commerce
e-Government	Electronic Government
e-Facilitation	Electronic application for social networking (Electronic-Facilitation)
ITU	International Telecommunications Union
WTO	World Trade Organization
PSTN	Public Switched Telecommunication Networks
PSTS	Public Switched Telecommunication Services
RDP	Reconstruction and Development Program
USA	Universal Service Agency
DOC	Department of Communications
MPCC's	Multipurpose Community Centres
GPG	Gauteng provincial Governments
CSIR	Centre for Scientific and Industrial Research
CIDRC	Canadian International Technology Industry Strategy
IDRC	International Technology Industry Strategy
SAITIS	South African Information Technology Industry Strategy
EC-DC	Electronic Commerce for Developing Countries
MIS	Management Information Systems
VANS	Value Added Network Services
NII	National Information Infrastructure
GII	Global Information Infrastructure
ISAD	Information Society And Development
MIT	Massachusetts Institution of Technology
LAN	Local Area Network
WAN	Wide Area Network
ISDN	Integrated Services Digital Network
UNCTAD	United Nations Commission on Trade And Development
IP	Internet Protocol
ISPA	Internet Service Providers Association
ARPANET	Advanced Research Projects Agency Networks
NSFNET	National Science Foundation funded by US Government

TCP/IP	Transmission Control Protocol/Internet Protocol
MERIT	Originally a state-wide IP Network operated by University of Michigan. Also a regional sub-network of the Internet
FRD	Foundation for Research and Development
TICSA	The Internetworking Company of Southern Africa
INE	Information Networks and Economics
OSI-RM	Open Systems Interconnection Reference Model
ITU/BDT	Board of Development and Trade
ATM	Automated Teller Machine
VR	Voice Response
SAARF	South African Advertising and Research Foundation
SITA	State Information Technology Agency
GDP	Gross Domestic Product
MIOS	Minimum Information Inter-Operability Standards
CCTV	Close Circuit Television
CBD	Central Business District
SMME's	Small Medium Micro Enterprises
BEE	Black Economic Empowerment
MEC	Member of Executive Council
GSSC	Government Shared Services
CFL	Centre for Learning
ABET	Adult-Based Education and Training
P&DM	Public and Development Management
CCC	Critically assess, Create and Communicate
PITS	Public Information Technology Services
SAPOS	South African Post Office Services
GDE	Gauteng Department of Education
GOL	Gauteng Online
CD-CD	City Deep-Container Depot
JIA	Johannesburg International Airport
GJMC	Greater Johannesburg Metropolitan Council
SACC	South African Council of Churches
SAFA	South Africa Football Association
SACU	South Africa Cricket Union
SARFU	South Africa Rugby Football Union
SABA	South Africa Boxing Association
LSM	Living Standard Measures
PFMA	Public Finance Management Act
MIN-MECS	Minister and Member of the Executive Forum, i.e. National Minister and his provincial counter-parts

Preface

The aim of this thesis was to develop a more nuanced understanding of the phenomenon and concept of *Information Communication Technologies* (ICT) and to identify and describe the content and implications for the Gauteng Province, of pertinent ICT policies, programmes and initiatives, undertaken by various spheres of government, parastatals, other institutions, and civil society.

The thesis was motivated by the author's observation, during his various engagements as a practitioner in policy formulation and programme planning in the area of ICT, of inconsistent meaning attached to the term ICT. The author also noticed paucity in the coordination of ICT policies and programmes, implemented by various agents in the provinces of South Africa, including Gauteng. Furthermore, no real attempt has up to now been made to charter the scope of institutional ICT activities in the province.

The coordination of policies and actions across spheres of government is a constitutional requirement stipulated in the principles of cooperative government. It is also critical for the enhancement of planning and monitoring of the institutionalisation of ICT, particularly as convergence of various technologies progresses.

The thesis is an attempt to strike a balance between academic research (which is often inaccessible to policy makers) and the practical needs in Gauteng Province to facilitate, plan and monitor ICT initiatives and their institutionalisation. Because of the extensiveness of these policies, programmes and initiatives, a fully exhaustive analysis is beyond the scope of this thesis. Of necessity the thesis will provide an outline view only. The findings presented here should, however, be sufficient to serve as a guide for policy analysts and planners.

The methodological approach followed in conducting the research was Critical Multiplism. This approach is appropriate to policy research where plausibility as opposed to factuality is sufficient to approximate truth.

The thesis concludes that most factors necessary for the rapid growth of ICT in Gauteng are in place. It also makes recommendations in respect of improving Gauteng's competitiveness.

Chapter One

Towards institutionalisation of ICT in Gauteng Province

1.1 Introduction

The focus of this thesis is the assessment of the state of ICT in Gauteng and the extent of their institutionalisation. Since the year 1996, a wide variety of ICT developments have taken place all over South Africa and in Gauteng in particular. However, there is no evidence of coordination and assessment of the impact of these developments. In Section 41(1) (h) (IV) of the constitution, it is stated, that "all spheres of government and all organs of state within each sphere must cooperate with one another in mutual trust and good faith by co-coordinating their actions and legislation."[1]

The potential problem that may arise because of the lack of co-ordination is conflict in intergovernmental policies, programmes, and relations. Coordination is also critical to create synergies that will ultimately institutionalise ICT and benefit society.

The dictionary of sociology edited by Mitchell describes the concept of institution as follows. "An institution consists of a concept (idea, notion, doctrine, interest) and a structure…..Institution is an established way of behaving, patterns of approved or sanctioned behaviour, laws, conventions governing daily social intercourse,.....vast complexes of norms established by society to deal in a regularised way with what is seen to be its fundamental

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[1] The Constitution of South Africa. 1997. Page19.

needs. These, (complexes of norms) can be mores and laws interwoven around one or more functions forming part of social structure."[2]

Institutionalisation is therefore, a process of bringing about institutions in society. Underpinning the process of institutionalisation is the emergence and entrenchment of certain systems of ideas and beliefs, policies, laws, norms and conventions that regulate behaviour and the availability of infrastructure and facilities around which people organise themselves.

According to Manuel Castells, the functions associated with ICT in society are "*the emergence of a new social structure associated with a new mode of development, informationalism as the new material, technological basis of economic activity and social organisation, made possible by digital technologies, shaped by historically determined relationships of production, experience, and power.*"[3]

It is clear from the description of institutionalisation presented above that the policies and programmes are critical factors in the process of institutionalisation. This equally applies in the area of ICT.

Worldwide, the importance of ICT was highlighted in 1996 and 1997, the years that are regarded as the watershed, at least on institutional and governmental levels. Three synergistic global events prepared the world for the global knowledge economy. Firstly, the International Telecommunication Union (ITU) Policy Forum approved a resolution in Geneva on October 12 to 23, 1996, to connect people across nations through satellite technologies. Secondly, the World Trade Organization (WTO) Ministerial Meeting in Singapore, on December 13, 1996 committed countries, of which South Africa is a member (representing more than 90% of the world market of about US$500billion in information products) to eliminate custom duties and tariffs. Thirdly, the WTO Agreement on Basic Telecommunication Services involved the liberalization and privatisation of the telecommunication sector. These events influenced the telecommunications policy environment in South Africa. This will become evident as the thesis proceeds.

The above-mentioned developments occurred parallel to the transitional period in the Republic of South Africa. After the 1994 first democratic elections, which saw the landslide victory by the African National Congress, a host of transformational policies were

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[2] Mitchell, DM.1968. Pages 99-101.

[3] Castells, M. 1996. Pages 14 & 15 Volume 1.

formulated to address the inequalities caused by the colonial and apartheid legacies. The constitution set a new policy environment, which had to be worked into every piece of new legislation in the country. The right to information for the South African citizens is enshrined in Section 32, schedule 6, and item 23(2) of the Constitution and reads:

"Every person has the right of access to all information held by the state, or any of its organs in any sphere of government in so far as that information is required for the exercise or protection of any of their rights and every citizen has freedom to receive or impart information or ideas."[4]

To realise these rights, several policies and institutional arrangements were created. The President accepted the Telecommunication Act Number 103 of 1996. The vision of the State for telecommunications was one that "balanced the provision of Basic Universal Service to the disadvantaged rural and urban communities, with the delivery of high level services capable of meeting the needs of a growing South African economy."[5] To implement the Act, Telkom was granted exclusivity to construct, maintain, and use the Public Switched Telecommunication Network and to provide Public Switched Telecommunication Services (PSTN & PSTS) in the entire Republic of South Africa. To balance the monopolistic powers offered to Telkom, stringent quantity and quality service targets were imposed, province by province.

The Telecommunication Act also promulgated the establishment of the Universal Service Agency (USA) "to promote the goals of Universal Service, encourage, facilitate, and offer guidance in respect of any scheme to provide telecommunications services in terms of the Reconstruction and Development Program Act (RDP)."[6] The USA established Tele-Centres, which together with other computerized community facilities, are collectively known as Community ICT. The Department of Public Works in conjunction with Government Information Services established Multipurpose Community Centres (MPCC) with ICT competencies. The MPCC provide a number of community services such as government information, public health education, tender bulletins, and libraries in some instances.

The Department of Communications plays a vital role in the formulation of policies ranging from telecommunications, multi-media, and postal services. The State Information

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[4] The Constitution. Pages 12 &123.

[5] The White Paper on Telecommunications Policy, Notice 291 of 1996. Paragraph 1.2. Page 17.

[6] Telecommunication Act of 1996. Section 59 (1) (b) (ii).

Technology Agency (SITA) plays a vital role to promote employment of ICT in the Public Service and to create economies of scale through government ICT-procurement programmes. In Gauteng, SITA works collaboratively with the Gauteng Shared Services Centre, which is responsible for Gauteng Government Procurement Services. It is important to know the extent to which the desired objectives of these institutions are realized in Gauteng.

The framework for collaboration between National Government Departments with their provincial counterparts is provided in Schedule 4 of the constitution which deals with concurrent national and provincial legislative competencies. It is also covered in Section Seventy Six of the Constitution with regard to policy development on "ordinary bills affecting provinces. Such bills must be referred to the National Council of Provinces in order to establish consensus among stakeholders."[7] With regard to finances, national and provincial cooperation occurs in terms of Section 155 (1) which reads, "A province shall be entitled to an equitable share of revenue collected nationally to enable it to provide services and to exercise and perform its powers and functions."[8] All these constitutional provisions can be applied effectively to enhance cooperation with regard to ICT, if there is an effective monitoring mechanism and credible information gathering system. Up until the time of writing this thesis, such monitoring competency did not exist in Gauteng. As a result, policy makers, planners, and programme managers could not be as effective as was the ideal in carrying out their tasks and in engaging their national counterparts.

Human resource development is an important part of creating ICT competencies. The requirements for ICT human resource development in South Africa is expressed in Chapter 4 of the Telecommunication Act. ICT human resource development is also largely carried out by Higher Education Institutions, the Universities, and Technikons. Although HEIs are not governed provincially, Gauteng Provincial Government can influence capacity planning in the institutions within Gauteng through sponsorship of learning programmes that are important for ICT developments.

Gauteng Provincial Government is also a major initiator of ICT developments. The provinces derive the power to initiate ICT developments as part of Provincial Planning Competency stipulated in the "Functional Areas of Exclusive Provincial Legislative Competencies, in

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[7] The Constitution. Page 32.

[8] The Constitution. Page 148.

Schedule 5 of the Constitution."[9] On the basis of the Provincial Planning Competency, the Gauteng Provincial Government formulated the Trade and Industrial Strategy in 1997. Some of the strategic thrusts stipulated in that document are "the development of the Province as a Smart Centre for the country with specific emphasis on information technology, telecommunications equipment, research and development and biomedical industries; targeted development of vocational training and advanced technical education; closer training links between technical training institutions and industry; consideration of overseas training models and technical skills upgrading mechanisms; support for on-going in-house training; concentrated development of science and mathematics in primary and secondary education."[10]

To transform public education in Gauteng to meet the human capital development challenges, the Gauteng Provincial Government initiated Gauteng Online Programme. The aim of the programme is to "give the province's 1.5 million learner's access to the Internet via an educational portal. The programme is structured to ensure that teachers are trained to educate learners with the use of computer technology; ensure that every learner has a personal e-mail address and free access to the internet. Each school would receive a minimum of 25 networked computers."[11]

The Gauteng Provincial Government also initiated, through a joint venture arrangement, the Innovation Hub, the aim of which is to "maintain a direct interface with education, industry and research and development, to help stimulate a culture of entrepreneurship, and high-tech innovation."[12] Another project by the Gauteng Provincial Government is a Wide Area Network (WAN) linking the City Deep Container Depot and Johannesburg Airport.

Municipalities initiate some ICT developments in Gauteng. The Midrand Municipality, which is now part of Johannesburg Unicity, has long positioned itself as a location for high technology companies such as Siemens, Mecer-Mustek, Microsoft, and Sun Micro Systems, to mention a few. Pretoria is the location for Telkom Head Office, CSIR (Council for Scientific and Industrial research) and the Innovation Hub.

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[9] The Constitution. Page.114.

[10] Gauteng Provincial Government Department of Finance and Economic Affairs. 1997. Page 70.

[11] Gauteng Provincial Government Briefing Document. 2000. Blue IQ Page 13.

[12] Gauteng Provincial Government Briefing Document, Blue IQ page 14

Parastatals such as Telkom and Eskom are the initiators of major ICT initiatives in Gauteng. Telkom's license, granted in terms of the Telecommunication Act of 1996, stipulated the rollout targets in Gauteng as well as other parts of South Africa. "One hundred and forty (140) under serviced areas in the Gauteng Province were targeted to receive PSTS from Telkom." [13] Telkom also rolled out other Social Responsibility initiatives such as Internet 1000. The amendment to the 1996 Telecommunication Act granted Sentech a license for broadband services. The license also stipulated social obligations to Sentech to roll out ICT laboratories in schools.

The infrastructure is as important as the extent to which communities know how to harness it to meet their needs. There are Community Based Organizations and Non-Governmental-Organizations which operate within Gauteng to promote and monitor the impact of ICT. These include political parties, gender activist groups, youth groups, professional associations, and special interest groups in ICT. There are also groups active in Gauteng that operate on a global scale. Some of these are Acacia, which works in conjunction with the Canadian International Development Research Centre (CIDRC), and the Open Society Initiative of Southern Africa, a Soros Foundation affiliate in Southern Africa. The activities of these organisations were considered as part of this thesis.

Two hypotheses underpin this thesis. Firstly, notwithstanding some challenges, the socio-economic context of ICT developments in South Africa has made Gauteng ready for a more rapid adoption and diffusion in the area of ICT. Secondly, that the developments and initiatives since the beginning of the democratic dispensation have reasonably redressed the backlogs in the previously disadvantaged communities while at the same time putting the country, and Gauteng in particular, in the pole position on the continent and in a competitive position relative to most of the middle income countries of the world.

The study is organized in the following manner. Chapter Two is about assumptions and the models that underpin the study. Chapter Three presents the methodology of how the study was done. Chapter Four presents an analysis, interpretation, and synthesis of findings. Chapter Five is about opportunities and challenges that are identified by the study. Chapter Six is about conclusion and recommendations.

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[13] Telecommunication Act of 1996. Page 86.

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1.2. Conceptual discussion and literature review

1.2.1.   The salient attributes of ICT and the definition of terms

ICT is an acronym which stands for Information and Communication Technologies. Newton describes *information technologies* as "...a fancy name for data processing, which became Management Information Systems (MIS), then became information technology, IT. It may have come from Europe, from Siemens and Nixdorf who merged in 1989. IT means all the equipment, processes, procedures, and systems used to provide and support information systems, (computerized and manual) within an organization and those reaching out to customers and suppliers." [14] Hanrahan says that information technology "refers to computing, networking, and software technologies that underpin important Information Systems, Internet and other applications. It also refers to capture, storage, and manipulation of information typically for commercial and government purposes."[15]

According to Hanrahan "Telecommunications refers to the provisioning of *access, switching, transmission, leased lines*, and *value added services* by telecommunications companies."[16] Section (1) (XXV) of the Telecommunication Act provides a legislated definition of telecommunications as being "...*the emission or reception of a signal from one point to another by means of electricity, magnetism, radio or other electromagnetic waves or any other agency of like nature, whether with or without the aid of a tangible conductor.*"[17]

"Access is a series of digits or characters, which must be dialed, typed, or entered in some way to get use of something. That something might be a telephone system, a long distance carrier, and an electronic mail service. An individual may get access by the use of an authorized code, which is used to identify the caller."[18] Telecommunication is made possible by switching, "a process, which enables a connection to be made between two parties using a telecommunication service. There are two broad types of switching, the circuit, and packet switching. Circuit switching is characterized by the provision of a dedicated path from source to receiver for the duration of the call. Circuit switching reserves the line for the entire call

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[14] Newton, H.15th Edition page 419& 451.

[15] Hanrahan,HF.1999. Page 3.

[16] Hanrahan, HF.1999 Page2.

[17] Telecommunications Act. Page 10.

[18] Newton, H.1999. Page 27.

usage. Packet switching is based on the fact that a number of sources of intermittent data can share a channel efficiently by seizing the channel to send short segments of data on an opportunistic basis."[19] "Leased line is a telephone line rented for the exclusive use of the customer twenty four hours a day, seven days a week from a telephone company."[20] "Transmission is a medium along which information is conveyed. The path can be constructed with electrical wire, radio, satellite and optic fiber and interconnecting switches. "[21]

In the words of Melody "telecom systems are rapidly becoming the electronic infrastructure for transmitting all kinds of information, voice, data, graphics, video, music. It already underpins broadcasting, computing, the press, banking and other industries."[22]

Newton defines Value Added Network Services (VANS) as "a data transmission network routing transmissions according to available paths, (which) assures that the message will be received as it was sent, provides for user security, high speed transmission and conferencing among terminals. It is closely akin to courier services or shipping forwarders in physical commerce."[23] From this definition, it is clear that the salient feature of VANS is data communication network services in which some forms of processing of a signal takes place, or information is added by the network. Hanrahan says that VANS "enhance the value of communication beyond that of basic bearer function."[24] Section 40(2) of the Telecommunication Act defines Value-Added Network services as "electronic data interchange, E-mail, protocol conversion, access to database or managed data network services."[25] Protocol conversion involves translation of one type of computer signals to the computer signals of another, thus making Internet, fax over Internet and intelligent networks possible. Hanrahan says "network intelligence consists of logic, usually in the form of computer programme for performing the operations required in a service and data that is

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[19] Hanrahan, HF.1999. Page55

[20] Newton, H. 1999. Page 475.

[21] Cohen, T. 1999. Page 5.

[22] Melody, WH. 1997. Page 1.

[23] Newton, H. Page 891.

[24] Hanrahan, HF. Page 2.

[25] Telecommunication Act. Page 42.

required to execute the logic."[26] VANS are made possible by packet switching discussed in the previous sub-paragraph.

Another concept that is important in ICT is that of *convergence*. Newton describes convergence as "a trend, now that most media can be represented digitally, for the traditional distinctions between industries to blur and for companies from consumer electronics, computer and telecommunications industries to form alliances, partnerships and other relationships, as well as to raid each other's market."[27] Melody says, "the convergence of telecom, data processing, and imaging technologies is ushering in the era of multimedia in which voice, data, and images may be combined according to the needs of users. The distinction between the traditional sectors of telecoms, information processing and broadcasting are increasingly arbitrary and perhaps irrelevant."[28] Convergence is made possible by digitization of the traditional industrial sectors, thus providing high capacity made possible by new technologies such as optic fiber and Dense Wave Multiplexing. Digitization is ubiquitous in mobile and fixed line telephony, intelligent network management, and data processing.

Nxasana, in an unpublished dissertation presented at Wits University, states that the "the examination of literature indicates that there is no universally accepted definition of convergence. A rigorous attempt to define the concept was made by Cutler and Company and it reads: "Convergence is the progressive integration of the value chain of the information and content industries, telecommunications, posts, broadcasting, print media, and data processing into a set of linked economic markets and a single value chain based on the use of distributed digital technology. The components of the value chain are content creators which is creative work of the intellectual form; publishers, programmers and packagers; network providers, a system, which supports a potentially unlimited number of different applications. This platform consists of physical infrastructure as well as the software operating systems."[29]

1.2.2. Related concepts and connotations:

The first concept to be examined is that of Information Infrastructure. Information Infrastructure linkages can occur at global, national and provincial levels. Society has always

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[26] Hanrahan, HF. Page 71.

[27] Newton, H. 1999. Page 208.

[28] Melody,WH.1997. Page 396.

[29] Nxasana, T. 1999. Page 13.

established information infrastructure in order to provide information services. Some of the infrastructure, such as the research and development facilities is used to produce information and knowledge. Some of the infrastructure, such as the libraries and data bases, is used to store information. Some infrastructure, such as the information centres, is used to distribute information. The emergence of ICT has changed the way in which information services and infrastructure is organized. The new way in which information services are provided is captured in the concept of National Information Infrastructure (NII) and Global Information Infrastructure (GII).

The Vice President of the United States of America, Al Gore, in his address to the International Telecommunication Union on the 12 October 1998 said: "We must improve access to technology so that every one on the planet is within walking distance of voice and data telecommunication services within the next decade. We must overcome our language barriers and develop technology with real-time digital translation so anyone on the planet can talk to anyone else. We must create a Global Knowledge Network of people who are working to meet our most important challenges in education, healthcare, agricultural resource, sustainable development, and public safety. We must use communications technology to ensure the free flow of ideas and support democracy and freedom of speech. We must use communication technology to expand economic opportunity to all families and communities around the world.[30]"

It can be concluded from the above stated Declaration of Interdependence that the purpose of the GII is the facilitation of progression of the world into Information Society. National Information Infrastructure, if planned properly, would facilitate the integration of nations into Informational society. Indu Singh alleges that "unfortunately, the current conceptualization of NII in many countries, including the United States, does not reflect a well thought out program to promote economic and social objectives."[31] Ann Leer quotes Dr. Charles Jonscher who said that the ICT paradox lies in the fact that "there have been two information revolutions. *One is the processing and transmission of data by machines, the other in the creation and use of knowledge by people.*"[32]

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[30] Lee, AC.1999. Page 14 - 16

[31] Singh. IB. Page S.4.7.3.

[32] Leer, AC. Page 280.

The point made in this argument is that the focus of the information infrastructure must not be limited to the processing and transmission of data. Equally important is the manner in which people are empowered by technology to develop ideas and knowledge in order to realize their life aspirations.

The second concept to be examined is that of Smart City. In a discussion paper about this subject, Mr. Indu B Singh starts the concept development of Smart City with a quote by the Greek poet Alcaesus about cities, "Not houses finely roofed, nor stones of wall well built, nay, nor canals and dockyards make the city but men able to use their opportunities. Smart City is a city modernized, based on advanced information and communication infrastructure to create prosperity, distribute opportunity, and enhances quality of life. It is a fully integrated approach to socio-economic development where government, business, and people are linked electronically to a comprehensive advanced information infrastructure. It must help to bridge the gap between information rich and information poor. It must connect homes, work place, and business and institutions, help people to work together on local, regional, national, and global levels, create citizenry where various community of interest in all segments of society shares knowledge." [33] Newton says "the Industrial revolution brought us into the city. But its primary by-products, the automobile and the highway, delivered pollution, downtown decay, urban crime and other unwanted problems. The low energy, non polluting telecom revolution is different. It gives each of us the opportunity to live where we choose. It is estimated that by the end of the year 2000 over fifty percent Americans will not work in conventional offices. They will workout of their homes, their cars, their RV's (recreational vehicles), their hotels and their temporary offices. As telecommunications calling costs plummet, the industrial world will export its services and jobs in the next twenty years, just as it exported its manufacturing and jobs in the past twenty years."[34]

The concept of a Smart Province can be derived from the concept of a Smart City. It is about how a province such as Gauteng can create prosperity, distribute opportunity, and enhance the quality of life of its inhabitants through the use of ICT. The development of The Smart Province is an attempt to this end.

The third concept to be examined is that of digital divide. This concept does not appear in Newton's Telecoms Dictionary. However, the examination of literature indicates that it

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[33] Singh, IB. 4-9 May 1998. Page S.4.7.1

[34] Newton, H.1999 Page vi.

derives its varied meaning from value judgment statements about the diffusion of digital technologies in various communities. Varied as the meanings may be, the key aspect of the concept is the level to which Universal Service is realized. According to Nicholas Garnham, Universal service "is the provision of affordable access to basic voice telephony or its equivalent for all those requesting it, regardless of where they live. It is the provision of services throughout a specified geographical. Universal service can be widened to include the provision of other services considered, for whatever reason, to be socially desirable. Within the context of the information society debate the definition of Universal Service should be broadened to include the provision of service levels above that of simple narrowband dial tone."[35]

Jamal Le Blanc and Rachel Anderson state "the discussion of digital divide employs the concept of information 'haves' and 'have-nots', which often focuses on the issues of race, gender, and economics. Digital divide must be seen as a continuum of divides. This continuum must recognize that access to technology does not and should not automatically imply accessibility. They make the following distinction between access and accessibility. Access is being able to get to the computer for its use. Access focuses on the availability of hardware, software, and infrastructure and, in the case of libraries and community technology centres, service hours and trained staff. "Accessibility" refers to whether or not the technology allows end-users to make use of technology. This includes technology skills, relevant content, and accessible design for people with disabilities."[36]

The digital divide issues, as they relate to trade and development, are spelled out in the Executive Forum 2000 of UNCTAD, jointly with the World Trade Organization. In this report, it is stated that "while connectivity is the first issue to be addressed, it is certainly the least complex. It (digital divide), touches on a number of national policies, telecommunications, science and technology, privatization, competition and monopolies. Foreign Direct Investment (FDI) policies are probably at the top of the list.

"The second issue concerns the right legal environment. Foremost among the rules to be adapted and adopted are the laws on removal of paper based obstacles and other that deal with the authentication of electronic records and signatures. Additional legal issues that

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[35] Melody, W H.1997. Page 207.

[36] Le Blanc J & Anderson R 2000, http://www.benton.org/DigitalBeat/db031000

require resolution are intellectual property rights, jurisdiction and dispute resolution, taxation laws on internet to prevent tax evasion and avoid double taxation.

The third digital divide issue concerns the financial environment. The key aspects of this issue are the need to finance the ICT infrastructure, to ensure that the digital economy start-ups have access to investment and working capital, the need to ensure that the national banking system is authorized and acquires the capacity to handle e-payments.

The fourth digital issue concerns education and skills. The wider challenge is to ensure that the national education system produces a sufficient number of graduates with the knowledge and skills profiles that are needed to lead the move to e-competency. This can be achieved by exposing learners to information and communication technology at an early age in order to demystify the computer and establish information culture. Formal computer-related education must be reinforced with informal access to computers through venues such as community centres and specialised, high standard technology institutes.

The fifth digital issue concerns E-governance. The ideal environment would be one of E-governance, where by government uses ICT and the Internet to open public sector system and maximize interaction with civil society. While E-governance is different from E-government, the latter means government use of ICT in its administrative functions, the two reinforce each other.

The sixth digital divide issue concerns bureaucratic procedures, especially as characterized by mechanical adherence to regulation, needless duplication of records and the compilation of an excessive amount of extraneous information, continue to result in prolonged delays or inaction."[37]

These six issues also provide evaluative criteria that will be used to asses ICT competency of Gauteng at a later stage.

1.2.3.   Conclusion

The study of literature does indeed confirm that various meanings are attached to the concept of ICT. This poses an epistemological and a research problem. Without a coherent conceptual meaning, it is difficult to define objects of observation in a manner that will have universal acceptance. The formulation of a conceptual framework, making explicit the underlying assumptions and the models that underpin the study is therefore of critical

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[37] Kubler, JK.UNCTAD Executive Forum 2000, Page 29.

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importance The conceptual framework itself will be invaluable in stimulating further studies and paradigms of policy formulation. These issues will be discussed in the next chapter.

Chapter 2

Assumptions and models that underpin the study

2.1. The diffusion of ICT in a country is determined by its propensity for knowledge production

NW Dunn says that one of the characteristics of Post Industrial Society, which determines the propensity for knowledge production, is the pervasiveness and dominance of an "educated professional-technical class."[38] He refers to Daniel Bell's book *the coming of Post-industrial Society* to present the following additional characteristics of Post-industrial Society. Such a society is characterised by "centrality of theoretical knowledge- creation of new intellectual technologies as a result of improvement in mathematical and econometric techniques; spread of a knowledge class, technicians, professionals including professional managers; change from goods to services...,health, education, social welfare, research evaluation, system analysis, computer programming; institutionalisation of science; production and use of information. Information is increasingly becoming one of society's scarce resources...and its production and use is required if optimal results are to be achieved."[39]

It follows from the above that the diffusion of ICT in a country is determined by its propensity for knowledge production, and this in turn is determined by the level of post-industrialization. The level of post industrialization of South Africa, and Gauteng in particular, is one of the determinants of the rate of diffusion of ICT. In this regard, it is often

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[38] Dunn, NW. 1994. Page 54.

[39] Dunn,NW. Page 54.

said that South Africa has a dual economy. On the one hand, it has all the sophistication of post-industrial society, and on the other, it has large scale informal sector.

In the case of Gauteng however, there is a high concentration of national scientific institutions such as the Council for Science and Industrial Research (CSIR), Human Science Research Council (HSCR), research and development capabilities of the corporate sector, a large pool of professional managers and technicians who work for trans-national, public and private corporations. It can therefore be assumed that the post-industrialization of Gauteng and the concomitant knowledge production base is sufficiently large enough to be a catalyst for rapid diffusion of ICT.

2.2. The diffusion of ICT in a country is determined by its position in a global hierarchy

Robert Heilbroner and William Milberg say that "globalisation is about increased *interconnectedness of markets in different countries....* What drives the globalisation process is the decline in transportation costs, a similar drop in communication costs, and the all together new degree of technological standardisation that made it possible to use low wage, but adequately skilled, labour in different countries, and to integrate these separate sub-production operations into a single global production flow." [40] Thomas Friedman defines globalisation as "the inexorable integration of markets, nation states and technologies to a degree never witnessed before in a way that is enabling individuals, corporations and nation states to reach around the world farther, faster, deeper and cheaper than before and in a way that is enabling the world to reach into individuals, corporations, and nation states farther, faster, deeper and cheaper than ever before.... Globalisation has its own defining technologies, computerisation, miniaturisation, digitisation, satellite communications, fiber optics and internet, which reinforce its defining perspective of integration. Once a country makes a leap into the system of globalisation, its elite begin to internalise this perspective of integration."[41]

One of the assumptions in this study is that what determines a leap of a country into the system of globalisation is its position in the global hierarchy. With regard to status in the global system, Friedman makes reference to what John Hagel III of McKinsey called

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[40] Heilbroner, R and Milberg W.1988. pages 151,153,

[41] Friedman, T 1999 Page 9.

"shapers and adapters". "The shapers are those companies, countries, or activists who define the rules and interactions that will govern certain activities in this ever networking world, whether that activity is making profit, making a war or making a government or corporation respect human rights. The adapters are those who adapt themselves to the rules and interaction frameworks shaped by others and learn to profit from them by carving out their own niches." [42] It is assumed that the position of South Africa in the global hierarchy makes the country an adapter, at least. Earlier it was said that there are global institutions and organizations which undertake initiatives with an impact in Gauteng. It is assumed that it is partly the initiatives of these institutions and organisations which make Gauteng adapt to global influences including the diffusion of ICT.

If the diffusion of ICT is partly dependent on the processes and dynamics of globalisation such as the position of a country in a global hierarchy, it can be argued that the diffusion and the value of ICT to society is susceptible to the inherent negative characteristics of globalisation. One of the negative effects of globalisation is the marginalisation and the displacement of certain sections of communities in the economic activities. Heilbroner says: "Globalisation favours mobile factors of production over those factors, like labour and governments that are unable to operate across national lines."[43] It is concluded that the marginalisation of certain sections of society along digital divide lines can be the manifestation of the negative attributes of globalisation. South Africa and Gauteng in particular, has large sections of cheap labour and the previously disadvantaged communities as a result of the legacy of apartheid. These communities are gullible to displacement as a result of globalisation and the consequential digital divide. Already the labour movement and some political groups in South Africa have identified globalisation as "the enemy of the people." The impact of globalisation on ICT needs to be balanced with developmental initiatives which are informed by the aspiration of the majority of people. It is mainly the role of democratic government to drive ICT developmental initiatives and to eradicate associated manifestations of underdevelopment such as digital divide.

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[42] Friedman,T.1999. Page 202.

[43] Heilbroner, R et al.1998. Page 157.

2.3. The essence of ICT is socially determined.

This paragraph emphasises the notion that the essence of ICT is more than infrastructure and machines for data processing and transmission. Carol Lea Clark says "no technology simply performs a mechanical function. Technology changes the way its users perceive the world because it introduces a new extension of human abilities and these changes in perception changes society."[44] In June 1995, the American Anthropological Association and the Computing Research Association hosted a workshop to explore research topics on the impact of ICT on society. There was consensus that "NII, like all other technologies is a social product. Social decisions and interests are reflected at all stages of its design, development, and end user appropriation. There is a reciprocal influence of technology and society characterised by co-evolution, mutual adaptation, or mutual determination between technology and society. Co-evolution of Information Infrastructure with a variety of social formations including the individual, primary groups, social classes, status, occupational groups and the different construction of national identity" [45]. This notion of technology emphasises Marshal McLuhan's most quoted point that *"the medium is the message... the message is the change of scale or pace or pattern it (the medium) introduces into human affairs."[46]*

The patterns introduced by ICT into human affairs are also discussed by Hamid Mowlana in his extended notion of communication in which information is defined "as a patterned distribution or patterned relationship between events and objects, and signs. It is about something other than the 'things' and signs themselves. Furthermore, it involves actors (i.e. creators, users) as indicated in the in the accompanying table, and it is not limited to a structural property such as the diversity of material things and processes."[47]

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[44] Clark, C. 1999. Page 137.

[45] American Anthropological Association and Computing Research Association. 1998. Page 35

[46] Clark, LC. 1999. Page 139.

[47] Mowlana,H. 2nd edition, Pages 5-25.

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Table 4: Mowlana's extended notion of communication

(a)Actors, i.e.: Government; Transnationals; Individuals
(b) Tangible resources and their allocation, i.e. Economics; Technology; Politics; Cultural products; Educational products; Military.
(c) Intangible resources and their allocation, i.e.: Belief and value systems; Ideology; Knowledge; Religion.
(d) Policies and Issues to be addressed, i.e.: Political, communication, economic, social, etc. Feedback.
(e) Impact, i.e. Individual: Modes of thought, education, work, leisure, etc. Institution: Politics, business, religion, military, etc. Inter-group: Law, regulation, traditional channels, etc. Ethnics and minorities: Participation, mobilization, identity Nation-State: Security, sovereignty, development, etc. Global: Cooperation/conflict, resource, trans-nationals.

ICT is a cumulative and dynamic medium of all the dimensions discussed above. Technology is only but one element in the category of the tangible resources and their allocation. Earlier in this discussion, it was stated that Gauteng suffers from a generalisation of the poor image of Southern Africa. What happens in Zimbabwe and Central Republic of Congo tarnishes the image of South Africa. Mowlana gives account of this phenomenon. "According to the cumulative imagery that emerges from network news reports, disorder looms eternal in the

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Third World. Violence is of a very particular kind; it is overt, blatant, and often irrational. The West stands for rationality, science over magic, purpose over activity, man over nature. Corruption in the Third World takes on more of a systemic quality, and a similar treatment characterises human rights violations. Idealisation of the primitive is implicit in much of the reporting. When reports highlight manifestations of primitivism, they can be grouped under one of two sub-motifs, exoticism or barbarism. Reports of the Third World, like the other stories on TV news, often offer the viewer with half truths which are void of the historical context of current affairs."[48]

Howard provides some of the truths that are often shunned by opinion setters. "Development means more than just meeting material goals. It is important that there are social, political and economic systems that allow the realisation of human potential. Most of the poor people in the world today are poor largely because they have been denied access to the resources and material wealth available in the modern world system. Underdevelopment is a reflection of how people are integrated into the modern world system. The underdeveloped parts of the world are those which occupy disadvantageous positions within international division of labour. They are areas whose resources are drained to support the wealthier portions of the world and whose people are poorly rewarded for their labour...Underdevelopment is commonly linked with dependency on outside powers...In such dependent underdeveloped areas, increased productivity frequently does not benefit the majority of people. Often it only means greater profit for the wealthy."[49]

Both Mowlana and Howard emphasise the point that the ICT is about not only material things, the availability and access to infrastructure. The ICT must be informed and inform the development objective, how the majority of people benefit from them. For this reason, it is important to understand the dynamics of development and how they apply to the ICT. In this regard, Ackoff quotes Senge, "the development ideal is omni competence, the ability, and capacity to perform effectively in the pursuit of the satisfaction of desires by a social system. Desire for competence underpins all other desires. A social system is developed to the extent to which it desires and is competent to meet the desires of all those who are affected by that social system."[50]

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[48] Mowlana, H. Second edition. Page 68.

[49] Howard, MC.1989, Pages 422-429.

[50] Ackoff, RL. 1981. Page 37.

It can be inferred from Senge's point that the key dimensions that determine development are the level of desire and the level of competencies to achieve the desired social ends. The social actors can either be social system agents, who are the holders of power in the social system, and system subordinates, those who are affected by the social system. The author has represented the dynamic interplay of these dimensions in the table that follows in order to identify the outcomes of the combination of factors.

Table 5.   **The Interplay between Social Systems Agents, Systems Subordinates, and Systems Outcome:**[51]

Systems Agents			
System Subordinates		**Desire**	**No desire**
	Desire	Consensus **Development and Growth**	Oppression, Frustration, Subversion, Anarchy **Under development**
	No Desire	Autocracy Elitism Orthodox policies **Partial development**	Stagnation Social System decimation **Under development**

Table 6:   **Interplay between Desire and Competencies in a Social System**

	Desire		**No desire**
Competence	Development & growth		Exploitation of the competencies by outsiders Dependency **Underdevelopment**
No competence	**Proactive leadership** Motivation Learning Adaptation **Development**	**Inactive leadership** Naivety Deviance behaviour e.g. crime **Under Development**	Traditionalism Exclusion **Underdevelopment**

The point elucidated by these tables is that is important to understand the socio political context of the ICT developments. Table 5 shows that if both the systems agents, which could be Transnational Companies and governments, and the systems subordinates, the general population, have a common desire, consensus that leads to development ensures. If the

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[51] Tables 5 & 6 are the author's personal descriptive representations

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system subordinates have a desire for certain social ends while the systems agents do not, oppression, frustration, system subversion, anarchy, and underdevelopment could result. If the systems agents have this desire but the systems subordinates have no desire, autocracy and orthodox policies tend to occur and this results in partial development that benefit the elite. In a case where both systems agents and subordinates have no desire for certain social ends stagnation occurs.

Table 6 shows the interplay between desire and competencies. A combination of desire and competencies in a social system leads to rapid development and growth. Where there is a combination of competence with low level of desire due to a lack of vision among other things, exploitation by outsiders is likely to occur. Where there is desire but low levels of competence, accompanied by proactive leadership, learning, motivation and adaptation is likely to occur. Where there is no desire nor competencies, traditionalism, stagnation and underdevelopment is likely to occur.

It is often said that South Africa is a dual political economy characterised by high competency levels in some sections of the population and the subsistence economy characterised by low competency levels in other sections of the population. The existence of these two scenarios, combined with a democratic activist government, create a situation conducive for rapid growth and development. The scenario of high levels of social aspiration accompanied by low competency levels is typical of most people from the previously disadvantaged communities. The role of government in this regard is to foster motivation, learning, and adaptation to world systems such as ICT.

In this regard Friedman refers to "democratisation of technology, when it is possible for hundreds of millions of people around the world to get connected and exchange information, news, knowledge, money, family photos, financial trades, music or television shows in ways, and to a degree, never witnessed before." [52]

The assumption made in this regard is that in South Africa and Gauteng in particular favourable factors presented in these tables are in place. There is space for global and multilateral institutions which set agenda, transnational and public corporations which are the transmitters of technological diffusions, albeit local suspicion of their agendas. These agendas are balanced with activism of organized structures of civil society such as Non

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[52] Freedman, T.1999. Page 50.

Governmental Organizations, some of which operate at a global scale, Trade Unions and Community Based Organizations.

Alexander King explains the role of government in bringing about technological success. "The long term technological success of a nation depends on the existence of fundamental and innovative research, entrepreneurship, and the role of government is to decide the extent to which incentives for this can be developed in balance with other socioeconomic priorities. Government can provide appropriate fiscal policies on the availability of risk capital, the existence of a basic technological capacity, appropriate education at all levels, management development, and skills and capacity to drive diffusion of technological innovations timely. There is another factor, national psychology, the ability to adapt and to change from tradition, and establish a tradition of coping with change, the factors which encourage or discourage innovation."[53]

In line with Alexander's point, The Digital Opportunity Initiative (DOI), a partnership between Accenture, a management and technology consulting firm, the Markle Foundation, a not for profit philanthropy working to realise the developmental potential of the ICT, and the United Nations Development Programme, formulated a strategic framework on how development agents, including governments can harness ICT to improve living conditions of the majority of people. The framework consists of five critically interrelated areas for strategic intervention. These are, "*Infrastructure,* deploying core ICT network infrastructure, achieving relative ubiquity of access, and investing in strategically focused capacity to support the development priorities. *Human capacity building,* a critical mass of knowledge workers, increasing technical skills among users and strengthening local entrepreneurial and managerial capabilities. *Policy,* supporting a transparent and inclusive policy process, promoting fair and open competition, and strengthening institutional capacity to implement and enforce policies. *Enterprise,* improving access to capital, facilitating access to global and local markets, enforcing appropriate tax and property rights regimes, enabling efficient business processes and stimulating domestic demand for ICT. *Content and applications,* providing demand driven information which is relevant to the needs and conditions experienced by local people."[54]

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[53] William, T. 1978. *A History of technology.* Volume VI. Page 118.

[54] Digital Opportunity Initiative. July 2001. Page 6.

The DOI study also recognizes two different approaches that can be adopted in undertaking the different strategic areas. The first approach is *"ICT as a production sector.* This involves policies which focus on the development and or strengthening of ICT related industries such as computer hardware, software, telecommunications equipment and ICT enabled services. The second approach focuses on *ICT as an enabler of Socio-Economic Development.* This involves the adoption of holistic, cross sector strategies which aim to harness the uniqueness of ICT to accelerate wider development process." [55] These two approaches are not mutually exclusive, but emphasis can be skewed toward one or the other. In South Africa the skew is towards the latter approach.

2.4. Progress in ICT is determined by the agendas of institutions including government

Earlier it was mentioned that the focus of this study was on institutional developments that would plausibly form permanent changes and lead to the evolution of Informational Society. The agenda presented by South African government at the WTO is one such normative and regularized way of dealing with transforming society. It is presented in the table that follows. The examination of the chronology in the agenda shows that South Africa has achieved most of the milestones up to the year 2002. The importance of this agenda is that it is a driving force for the initiatives undertaken by other institutions. The Gauteng Province has also responded positively to this agenda as it is evident from the programmes undertaken by the province.

Table 7   South African ICT Agenda presented to the WTO and ITU.   [56]

Chronology Years	Defining Events
1985-1987	The embryonic phase of internet in RSA
1991-1996	Post and Telecommunications separated in South Africa
1991	MTN &Vodacom awarded cellular license
1993	White Paper on Telecommunications published.
1995	Telecommunication Act passed-giving birth to South African Telecommunication Regulatory
1996	Authority, Universal Service Agency and the Universal Fund

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[55] Digital Opportunity Initiative. July 2001. Page 19.

[56] BMI TechKnowledge Communication Handbook. 1997 Page 7

1997-2002	-Telkom starts rollout of 2500 lines; Strategic Equity Partner Thintana Consortium took 30% stake in Telkom. -ICASA is born through the amalgamation of IBA and SATRA -IPO Initial Public Offer of Telkom finalised -SNO Second Network Operator begins operations -Sentech granted an international license. -Edunet and e-Rate for education kick in. -New Mobile Operator, Cell C begins operations.
2003-2008	-Broadband services proliferate -Market expansion -Competition begins, probably based on "hot switch on" -e-commerce scales up -e-governance begins -Entry of the Third Operator
2009-2015	-Entrenchment of competition -Rapid growth of a wired consumer -Alignment of telecommunication tariffs on a global scale. -Procurement of services all over the globe a reality -Telephony over Internet becomes a reality. -Rapid growth of biometric devices e.g. retina scan or figure printing

2.5. ICT is an evolving concept

Moschella speaks of a paradigm shift in information technology to describe "those rare times when a wide range of essential IT industry dimensions begin to change fundamentally, simultaneously and systematically in reaction to common force or a set of forces, as indicated in the table that follows." [57]

Table 8 IT Industry evolutions, 1964-2015

Dimensions	Systems centric 1964-1981	PC centric 1981-1994	Network-centric 1994-2005	Content –centric 2005-2015
Key audience	Corporate	Professional	Consumer	individual
Key technology	Transistor	Microprocessor	Communication Bandwidth	Software
Governing principle	Grosch's law	Moor's law	Metcalfe's law	Transformation law
Vendor offering	Proprietary systems	Standard products	Value added services	Custom service
Channel	Direct	Indirect	Online	Customer pull
Network focus	Data center	Internal LANS	Public networks	Transparency
User focus	Efficiency	Productivity	Customer service	Virtualization
Supplier structure	Vertical integration	Horizontal value chain	Unified computers and communication chain	Embedded
Supplier leadership	US systems	US components	National carriers	Content providers

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[57] Moschella, DC. 1997. Pages vii – xi.

Number of users at the end of a period	10 million	100 million	1 billion	Universal
End of period market size	$20 billion	$460 billion	$3 trillion	Too embedded to be measurable

The tabular presentation of the evolution of the IT industry must not undermine the complex nature of the paradigm shifts. Each paradigm shift is a manifestation of a complex interaction of the industry dimensions characterised complexity.

Paul Cilliers says, "In a complex system there are loops in the interaction. The effect of any activity can feed back onto itself, sometimes directly, sometimes after a number of intervening stages. This feedback can be positive (enhancing, stimulating) or negative (detracting, inhibiting). Both kinds are necessary."[58]

The table assists to highlight a major point made in this paragraph, that ICT is an evolving concept. Therefore, ICT competencies must be seen against these evolution and paradigm shifts. In this study, an assumption is that Gauteng has reached a critical threshold point for network centric phase and the current developments have put Gauteng in a good stead to evolve into the content centric phase. However, in certain communities, particularly the historically disadvantaged communities, large scale PC Centric developments still need to take place. Therefore, ICT developments in Gauteng are a combination of PC-centric, Network-centric and Content-centric, all occurring simultaneously. This brings us to another most important assumption. The phases of IT evolution do not necessarily occur in a linear manner as it may appear in Moschella's model of evolution. Rather, the different phases can occur all at the same time in a way that forms a complex interlinked value chain. Moschella provides fundamental laws that govern each phase of evolution.

Grosch's Law: Computer power increase as the square of the cost. If one computer was twice as expensive as another, then it would be four times more powerful. This law was the basis for data centre management approach.

Moore's Law: Semiconductor performance would double every two years. Microprocessors based systems emphasized best price combined with best performance. This law was the basis for client server computing and end user management.

Metcalfe's Law: While the cost of a network expands linearly with increases in network size, the value of the network increases exponentially. As networks expand they

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[58] Cilliers, P. 1988. Page 4.

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become dramatically more cost effective. It is this law that is used to justify Wide Area Networks online channels electronic commerce.

Law of transformation: The extent of an industry's transformation will be equal to the square of the percentage of that industry's value add which is accounted for by pure information (bit) as opposed to atom processing activity. For example if banking industry is 90 percent information processing and manufacturing industry is 30 percent, the law of transformation would suggest that the banking industry will be nine times more transformed by IT than manufacturing: 0.9x0.9 = 0.81, 0.3x0.3=0.09, 0.81/0.09 = 9. It is this law that is used to justify content centric industries and convergence." [59]

2.6. Models that underpin the study

The purpose of this section is to crystallise all different aspects of ICT into a conceptual model that will be used to conduct research. The conceptual model will be based on the notion of an emergent value chain of ICT. The Value Chain will be presented in charts that show value added by various industry segments. Value added is defined in the dictionary of Economics as "the difference between total revenue and the cost of bought in materials services and components."[60]

2.6.1. The International Telecommunication Union Bureau for Development in Telecommunication (ITU/BDT) Value Chain

The ITU/BDT value chain segments the ICT industry into content providers, media and network operators, and consumer electronics. Content can be music, sports, and specialised software to provide professional services such as accounting, architecture, arts, published material such as news, books, films, games and information databases. Content is transmitted through various media, which can be traditional print media, live shows and electronic media. When content is transmitted through electronic media it forms a basis for bandwidth which is provided by network operators. Consumers receive services via consumer electronics which can be television, radio, video print media, personal computers, hi-fi, telephones, and electronic terminals such as ATMs (automatic teller machines). According to Moore's Law, the power of electronic consumer goods double every two years while the price keeps on declining.

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[59] Moschella, DC. 1997. Pages 15, 103,263.

[60] Bannock G, et al.1998. Page 425.

The model shows how convergence along horizontal and vertical integration can take place. For example, a content provider can choose to deal in music, and film production. An example of vertical integration is when a network operator provides their services via a paid channel to subscribed customers. The model can also be used to identify bottlenecks and digitization hurdles along the value chain. Large scale migration to Content centric phase can only occur if sufficient digitization has taken place along all the components and dimensions of the value chain and the critical mass of citizens are empowered to utilize ICT.

Table 9   ITU/BDT value chain model. [61]

Value Chain Segment	Applications Portfolio			
Content	Music	Sports	Software	Arts
	Publishing	Film	Games	Databases
Service Delivery	Public Switched Telecommunications Networks **PSTN**	Live Shows	Cellular	Newspapers
	Broadcasting	Internet	Satellite	Books
Information consumption	Television	Video Phone	PC's	Telephone
	Radio	Print Media	Hi-Fi	Terminals,.ATM.

2.6.2.   Modified David Brown's ICT Value Chain

David Brown's Model is based on research findings on the study of US information industries with the capitalization of $10 Billion or more. The study was conducted in May 1999 and reported in the Journal of the Institute of British telecommunications Engineers. [62] The purpose of the study was to identify business models and the profit levels of companies in various segments of ICT value chain. In this research, both the ITU/BDT and David Brown models helped to clarify areas of observation, units of analysis and in the design of the research instruments.

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[61] Shastri Jayram. Speakers papers Telcom Africa 2000. 10th Conference & Tableion. Page 10.

[62] Brown David. January, March 2000. Page 45.

Table 10. David Brown's ICT Value Chain[63]

Value chain segment	Tradable value	Segment Strategies	Key skills in The segment	Segment profile	Strategic thrust
Content	News, music Statistics, Publishing, videos Education.	Capturing into data base scarce content, branded services, utilization of multiple channels, subscriptions, video rentals, cinemas.	Reporters, researchers, actors, singers, sporting Personalities.	8% market capitalization 6% margins, low growth.	Customer Management Systems, Online payment Systems.
Transaction Packaging	Any type of service over the Internet.	Nichemanship, Seek and maintain number one position, branding, personalized Content.	Portal development & Management.	5% market Capitalization. 363% growth over the last three Years. Low margins. Risky future Prospects.	Relationship marketing, Personalized Content.
Context companies	Provide information about other Information providers.	Portal development. Relationship marketing, Advertising Rapid shift to e-commerce.	Analysts, Advertisers, Branding, Researchers.	1% market Capitalization. 1000% over the last three years low profits.	Smart Network Devices. More Accessibility to Information.
Internet Service Providers	Access networks Servers for e-mail, Web hosting, Backbone, Customer support, News, Backbone and International connectivity to the Internet.	Economies of scale, Virtual Private Networks, Voice over Internet Protocol, Resale of bandwidth, Web Television, Servicing business Customers, Vertical Integration with telephone companies.	Content provisioning, Big business Accounts, management, Provisioning of Virtual Private Networks, Voice over IP Service to SMME's	High Growth Area Profits are high if economies of scale can be realized and high bandwidth requirements can be provided via Digital Subscriber Lines (DSL).	Cable and Digital Subscriber Line.
Backbone Providers	Pipes, optic fibers With Dense Wave Division Multiplexing.	Economies of scale, (Pile high/sell cheap) Build network at		Capitalization is 12% Growth is 74%	Merging with traditional companies And Telecoms.

[63] Brown David. January, March 2000. Page 45.

		the right Place, Collect internet traffic, Negotiate good Interconnection.		over 3 years.	
Telecoms	Trade in basic telecommunications, Access networks, traffic over the network, Private Networks. Transmitting and switching Wireless access and Mobile Tele communications Transmission and switching International Gateways	Global growth, reduction of cost, customer service orientation.	Marketing, professional sales force Smart Networking Devices.	Highly profitable High capitalization High growth due to increased traffic	Liberalization of markets, Privatization Managing transition to Data. networks
Equipment sector	Telecom equipment, computer hard ware soft ware, computer electronics	Alliances with telecom companies, business-to-business, self-obsolescence of software, consumer marketing.	Engineering Marketing,	High growth due to telecoms led demand for new technologies High profitability	

The model segments the ICT into seven categories which are presented in the first column. The various segments are content, transaction packaging, context companies, Internet Service Providers, Backbone Providers, telecommunications, and equipment sector. The next five columns present the aspects of the business models of each segment, the description of tradable values, generic segment strategies key skills requirement capitalisation profile and profit margins and strategic thrust.

Content industries are traditionally publishing and broadcasting industries and they trade in news, published material, statistics, education, music, and other forms of entertainment. The generic segment strategies involve the creation and branding of data basis and utilisation of multiple channels to distribute their wares and to get subscriptions. The key skills required in this segment are reporters, researchers, singers, actor's sports and celebrities. This segment accounts for eight percent of market capitalisation. Profit margins are about six percent and growth in this segment is low. Differential strategic thrust involves the development customer management systems and online transactions.

Transaction packaging companies trade in any type of services over the Internet. The generic segment strategies involve maintaining number one position in a particular niche, which is obtained through providing personalised services and branding. Key skills required in this segment are portal developers and managers. This section accounts for five percent of market capitalisation. Margins are low and yet the segment is experiencing exponential growth, albeit risky. Differential strategic thrust involves relationship marketing and customised and personalised content.

Context companies trade in information about other information providers. The generic segment strategies involve rapid shift to e-commerce, portal development, relationship marketing and advertising. Key personnel required in this segment are information analysts, researchers, advertisers and brand management. This section accounts for one percent of market capitalisation. Margins are low but the segment has experienced exponential growth over the last three years. Differential strategic thrust involves development of smart networks and the provision of access.

Internet Service Providers trade involves provision of connectivity, as well as e-mail, web hosting, backbone and customer support. The generic segment strategies involve creation of economies of scale, the creation of Virtual Private Networks, voice over internet, resale of bandwidth web based services and vertical integration with telecommunication companies. Key skills required in this segment are content provision, big business account management, provision of Virtual Private Networks, advertising and sales to obtain contracts from small to medium businesses and the domestic market. Differential strategic thrust involves meeting high bandwidth requirements which are provided through Digital Subscriber Lines.

Backbone provider's trade involves the installation of pipes, optic fibre and dense wave multiplexing. The generic segment strategies involve creation of the economies of scale, by building networks at places where they will get high internet traffic. Backbone providers must also negotiate good interconnection contracts. The key skills required in this segment are technicians and sales. Capitalisation accounts for about 12% and there has been a reasonable growth over the last three years. Differential strategic thrust involves merging with telecommunications companies.

Telecommunication companies trade in basic fixed telecommunications services, access networks, traffic over the network, provision of private networks, switching and transmission, wireless access, mobile telecommunication services, broadband services and international gateways. Generic strategies in the segment involve deregulation, unbundling,

global expansion, cost reduction and customer service. The key skills required are expertise in telecommunications policy and regulation, marketing professionals, network engineers, and customer service providers. This segment is highly capital intensive and in recent times it has experienced phenomenal growth due to increased demand for telecommunication traffic.

The equipment sector supply telecommunication equipment, computer hardware, and consumer electronics such as television sets, personal computers, and servers. Generic strategies in this segment involve forming long contracts with telecommunication companies in the case of telecommunications equipment and introducing new products in the market quicker than the rest of competitors by establishing distribution retail channels. The key skills required are engineering, marketing and retailing. This segment has experienced a phenomenal growth over the last three years.

The Brown's model introduces an important segment of the ICT value chain, professional services such as transaction packaging and context services. What it omits is applications and software segments. This segment produces computing programmes for unlimited applications and security software such as firewalls and encryption. Generic strategies involve striving to be the most dominant vendor. The key skills required are programmers, programming language developers and customer support services. Differential strategic thrust involves self-obsolescence of products to keep an edge over competitors, and the winner takes all competition.

The value of these models to this study is that they provide clarity on what is to be observed in conducting research. The models will also inform strategic planning and future assessment of the state of these segments of the value chain in Gauteng in respect of growth patterns, capitalisation levels, the extent to which each segment is affected by policy and regulations, and the assessment of skills development patterns to meet the requirements of each segment.

Chapter Three

Methodology

3.1. Research goal and hypothesis

In Chapter One it was mentioned that the focus of this thesis is the assessment of the state of ICT and the extent of their institutionalisation in Gauteng Province as manifested by developments and initiatives undertaken by various institutions. In this respect, the thesis purports two hypothesis.

Firstly, the socio-economic context in South Africa, have made Gauteng ready for rapid adoption and diffusion process of ICT.

Secondly, the developments and initiatives since the beginning of the democratic dispensation have reasonably redressed the backlogs in the previously disadvantaged communities while, at the same time putting the country and Gauteng in particular, in a front position in the African Continent, and a comparable advantage to most of the middle income countries of the world.

Considerable body of knowledge and research exists on the process of adoption and diffusion of innovations. The theoretical framework presented in the discussion that follows was taken from William, who defines the concept of adoption as "the decision to use an innovation in a regular basis, and diffusion as a process by which the acceptance of an innovation is spread by communication process to members of a social system over a period of time."[64] In providing clarity about the relationship of adoption and diffusion, William points out that "adoption is a micro process which is concerned with the mental process by which a single individual comes to adopt an innovation. This process consists of five sequential stages. The first stage is *awareness,* whereby an individual knows of the new idea but lacks sufficient awareness about it. The second stage is *interest,* whereby an individual becomes interested in the idea and seeks more information about it. The third stage is *evaluation*, whereby an individual mentally applies the innovation to present and anticipated situations, and makes a

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[64] Williams, TG. 1982. Page 264.

decision for or against trial. The fourth stage is *trial,* whereby the innovation is used on a trial basis to determine whether or not it meets the buyer's needs. The fifth and the final stage is *adoption*. If the innovation is satisfactory, an individual accepts it for use on continuing basis."[65]

Diffusion, on the other hand is "a macro concept concerned with aggregate of all individual adoption over time."[66] He further points out that there are four basic components to a diffusion process: "the innovation, communication from one individual to another (about an innovation), the social system that receives the innovation, and the time dimension of the process. The innovation is an idea or products perceived in varying degrees as new by potential users. Communication may be transmitted through either formal or informal channels. A social system is a population of all those individuals or firms in a specified area who could use the innovation.....The rate and the extent of diffusion is influenced by the orientation of a social systems. A modern social system would tend to adopt an innovation more rapidly than a traditional system. A modern social system is typified by, positive attitude towards change, advanced technology and skilled labour force, general respect for education and science, emphasis on rational and ordered social relationships as opposed to emotional, interaction with persons outside the social system, facilitating infusion of new ideas, capability of the members of the social system to see themselves in various roles."[67]

The time dimension concerns the rate at which diffusion goes through various phases, which are introduction, rapid growth phase, maturity and decline. The introduction phase is characterised by adoption by innovators, people who tend to adopt new products more readily. The early phase of rapid growth is characterised by adoption by early majority and the late phase of rapid growth is characterised by adoption by late maturity. The maturity phase is characterised by adoption by the rest of the population. Decline phase is characterised by abandonment of the product concept in favour of substitute.

William points out that "research indicates the tendency for diffusion to follow a Normal Distribution Curve."[68]

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[65] Williams, TG. Page 279.

[66] Williams, TG Page 288.

[67] Williams, TG.1982. Page 288-289.

[68] Williams, TG. Page 268.

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To conclude, in this thesis, it is hypothesised that the introduction phase of ICT in Gauteng has been completed. The Province is ready for rapid growth phase characterised by adoption by early majority. In some categories of ICT such as Public Switched Telecommunication Services, (PSTS), the adoption is already characterised by late majority due to service roll-out initiatives to redress the backlogs in the previously disadvantage communities.

3.2. The study approach and methods

3.2.1.   Methodological approach

In deciding about the methodology to be followed, it was important that the approach adopted needed to be appropriate to policy research, which is more concerned with plausibility of claims and their importance for the formulation of intervention programmes. Empirical research approach, while it could provide a lot of relevant information, on its own would not be adequate for the purpose of this study. The information obtained from empirical research needed to be augmented with information obtained from other sources.

The methodological approach that was found appropriate to this research was Critical Multiplism. Dunn says, "Critical Multiplism employs multiple perspectives, methods, measures and data sources in approximating the ultimately unknowable truth. It is a response to the inadequacies of logical positivism, as a theory of knowledge and an effort to develop new procedures on the basis learned from doing policy analysis. This approach is well suited for policy research where plausibility as opposed to factuality is a sufficient to approximate truth. "[69]

The methods used were a combination of Personal Interviews, guided by Structured Questionnaires, Research and Practice Synthesis, modified with some elements of Social System Accounting. The questionnaires were designed around the ITU/BDT and David Brown's ICT Value Chain models as discussed in paragraph 2.6. "Research and Practice Synthesis technique involves a systematic compilation, comparison, and assessment of the results of the efforts to implement public policies and programmes. The sources of information in Research and Practice technique are usually case studies of policy formulation and implementation and research reports that address relations among policy actions and outcomes. The Social System Accounting prescribes the formulation of Social Indicators,

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[69] Dunn, NW. 1994. Page 8.

statistics that are used to measure social conditions in terms of objective quantitative and qualitative parameters. "[70]

The social indicators commonly used in communications and adopted in this study are Universal Service Measures, comparison of the correlation of the size of population in the provinces as a percentage of the national population, the provincial percentage contribution to the Gross National Product and the penetration of telephone services. Universal service is defined as "the provision of affordable access to basic voice telephony or its equivalent for all those reasonably requesting it, regardless of where they live. It is measured in terms of Teledensity, "which is a measure of the number of telephone lines per one hundred people of the population."[71] "Universal service can be widened to include the provision of other services considered, for whatever reason, to be socially desirable."[72] This could include Internet and e-commerce indicators. The assessment of Universal Service in Gauteng and elsewhere in the country is an important measure of the performance of the Telkom roll out in terms of the license granted to the operator in accordance to the Telecommunication Act.

A relatively new measure used over and above the conventional number of household Internet is Bits Per Capita (BPC) which is a measure of Internet usage in terms of bandwidth available from publicly accessible Internet Protocol. In the research by IDRC, it is stated, "the size of the Internet in a country indicates an element of its progress towards an information-based economy. International Internet bandwidth provides a measure of Internet activity. Many people share accounts, or use corporate and academic networks along with cyber cafes and business centres. Outgoing bandwidth also takes better account of the wide range of possible use, from those who write a few e-mails each week, to users who spend many hours a day on the net browsing, transacting, streaming, and downloading. Because of this, the often used 'Number of Internet Users' indicator may have less relevance in the developing world than in other places."[73]

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[70] Dunn, NW. Pages 341 -359

[71] Melody, WH. 1997. Page 821.

[72] Melody, WH. Page. 207

[73] IDRC- www.network.idrc.ca

3.3. The Field Research

3.3.1.　　Preparations for the field research

The objects of observation in the research were policies, physical and social projects. Policies included bills, legislations, and regulations. Physical projects refer to the various dimensions of ICT mentioned in the value chains models discussed in paragraphs 2.6.1 and 2.6.2.The dimensions were consolidated into a table on the ICT Classification System presented in Appendix 1.

The data capturing instruments designed for the field study were three questionnaires. The first questionnaire was designed to capture data about policies. The second questionnaire was designed to capture data about physical projects and the third questionnaire was designed to capture data about social development which have to do with the development of human capacity, education and training and social networks and forums. The questionnaires are presented in Appendix 2.

The populations of study were institutions which individually and collectively would have a far reaching impact on the institutionalization of ICT. They were classified according to global institutions, government institutions under which fell twenty seven national departments, eleven provincial government and ministries, municipalities, three Unicities and three district councils. The next category was Parastatals which consisted of Telkom, Eskom, Transnet, South African Broadcasting Corporation, Sentech State Information Technology Agency, and South African Postal Services. The next category is Higher Education Institutions within Gauteng. The next category was Development Agencies which were divided into foreign government and donor agencies. The final categories were Non Governmental Organisations, political parties, sports, business, emergent, arts and culture groups and religious institutions. The Population of Study is presented in Appendix 3.

The informants that were targeted within institutions were ICT managers. Since the project managers needed authorization by heads of institutions to provide information, the Chief Executive Officer (CEO) of The Gauteng Department of Education was requested to send letters to the heads of institutions, requesting their cooperation. The CEO's letter was preceded and followed by telephone calls in order to create anticipation and acknowledgement of receipt of the letter. Once the right informants were identified the questionnaires and the covering letter were sent explaining the purpose of the study and the models of ICT on which the study was based, so that they could start to familiarize

themselves with the required data. The letters were followed by telephone calls by researchers to make clarifications, to assess the level of motivation and to make appointments.

The field work was carried out at a budget of R 250,000.00. Eight researchers and two research project coordinators were employed. Physical facilities such as work space, eight computers were leased from a recruitment and training company that assisted with recruitment of field workers. Training of field workers commenced during the first week of September 2001. The field workers were inducted about the purpose of the study and during induction comprehensive explanation took place on the nature and the importance of ICT in society, the ITU/BDT and David Brown's models. The induction was followed by field training which involved mainly coaching on the completion of questionnaires and workshops on problems and pitfalls to be anticipated.

The first anticipated problem concerned *public accounting and reporting requirements of institution.* Some of the institutions operate at a national level and their activities and budgets for ICT are not broken down province by province. This problem was resolved by extrapolating Gauteng estimations by multiplying national figures by 37.4%, this figure being Gauteng contribution to the GDP.

The second anticipated problem concerned the fact that the *information required would most likely be dispersed across several business functions*. For this reason it would be difficult to get all the data unless there were data-bases and specific reports on integrated ICT initiatives from which information could be drawn. To solve this problem, IT managers within institutions were targeted because it was assumed that they would be in the best position to provide data and reports. The informants were sensitized to this problem and to the fact that the definition of ICT in this study stretches beyond the conventional functions of IT departments.

The third anticipated problem concerned the *level of motivation by informants to participate in the study.* The completion of the questionnaires required a certain level of commitment by the informants. Earlier it was stated that, to solicit commitment, the institutional heads were requested to mandate information technology managers as informants. Even with the instruction by their institutional heads, the informants could still be unwilling to cooperate, citing among other excuses, pressing tasks that are important to their own business prerogatives. It was for this reason that questionnaires were backed up by face-to-face interviews.

The fourth anticipated problem concerned reporting errors. The first aspect of this problem related to the informants. They could give incorrect data simply to get rid of the interviewer or omit some data fields. To solve these problems field workers were instructed to request source documents such as plans and official audited reports, or to obtain information from the web sites of institutions. Despite this attempt, item omission occurred, particularly, the fields about financial and time lines of projects. The second aspect of this problem concerned the field workers. It is a common problem in research that field workers do not cover all informants and fabricate data and information. This problem was addressed by employing field-work supervisors who followed up every interview once the questionnaire was received.

Another matter of importance in research concerns the level of confidence, the significance to which the results of a study reflect or deviate from reality and population parameters as a result of problem formulation, sampling and response issues. In positive research three types of error are recognized: Type One Error: Rejection the hypothesis when it is true. Type Two Error: Accepting a false hypothesis. Type Three Error: result from weakness of formal definitions or conceptualisation in depict reality which may result from using wrong theoretical framework.

While this research was not positivistic, the possibilities of these errors were considered. Starting with Type Three Error, it was stated that the conceptualisation of ICT tends to be biased towards processing and transmission technologies and leave out content and convergence issues. In this study this problem was addressed by presenting an all inclusive conceptual framework. This framework was used to design the questionnaires.

The avoidance of Type Two Error was addressed by applying a multiple perspective criteria in evaluating research findings. Type One Error could result mainly from poor sampling methods, application of inappropriate research instruments and from poor response rate. In this study the response rate was 73%, against the reported norm of 50.1% by BMR, Bureau of Market Research on surveys. The findings of the study were compared with the statistics obtained from SAARF and there were no significant disparities between the two.

3.3.2. The research process

The field work commenced on the first week of October 2001 and continued up to the middle second week of November 2001.During the first week field workers made appointments with the informants, whose addresses and contacts were already available. During face-to-face interview contacts, field workers captured data in the form of hand written notes using

questionnaires. Questionnaires were checked at the morning coordinating meetings, first by supervisors and by the researcher for completeness and comprehensibility. The supervisors marked satisfactory questionnaires against the checklist of institutions. The field workers or the supervisors followed up telephonically questionnaires which required completion of some data fields. Completed questionnaires were captured into MS Word and backed up into diskettes and physical files. Field workers were also required to search for additional information from web sites of institutions. This information and other supporting documents were kept in the physical files, which were catalogued in the names of institutions.

The study of supporting documents was done institutions by institution as soon as the files were declared complete. Documents were summarised extracting the description and essence of content relevant to research.

The policy and projects journals were compiled from the files of individual organisations and these are shown in Appendix 4 and 5. As shown in these appendices policies were classified according to sector, which ranged from National Government Ministries, Regulatory Bodies, Provincial Government, Municipalities, Parastatals religious institutions, and global institutions.

One of the goals of the study was to determine the cumulative value of projects deployed in Gauteng. As it was indicated on the discussion about problems that were anticipated the budgets of National Departments and some of the parastatals are deployed all over the country and their accounting systems do not require that they indicate provincial allocations. This problem was resolved by approximating Gauteng allocation by using a weight of 37.4%, which is Gauteng percentage contribution to the National Gross Domestic Product.

There were institutions, which did not respond or reported no projects. The response rate was 73%.of 93 institutions that composed a population of study. The list in Appendix 6 shows those institutions which did not respond.

3.4. Secondary studies

The primary study research was supplemented with the analysis of other sources with relevant information. These were Telkom presentations to Gauteng, 8 May 2001 by Thami Nxasana of the Regulatory and Government Relations, South African Advertising and Research Foundation (SAARF) Report, Research study conducted by IDRC on Internet in Africa. This section will report on the research processes of these studies.

A claim was made in the hypothesis that the backlogs in the previously disadvantaged areas in respect of ICT services have been reasonably addressed. Exclusivity granted in terms of the Telecommunication Act to Telkom was in respect of the provision of Public Switched Telecommunication Services in the previously disadvantaged area. Therefore it is important to assess whether the performance of Telkom achieved the desirable goals in Gauteng.

The variables accounted for in the Telkom Rollout Report were (1) a total number of subscriber lines, (2) priority customers, which are public service institutions such as hospitals, clinics, schools, and municipality offices, (3) under serviced areas such as townships in previously disadvantaged communities; (4) village targets in peri urban areas, (5), total new services, both in serviced and under serviced areas. The report also included non obligatory Social Responsibility Projects. The extract from a report are shown in Appendix 7.These figures were extracted by the author from March to April 2001 from various internal departments in Telkom Head Office and Gauteng Regional Office while in the employ of the company.

The SAARF study was used in this thesis research to assess the impact of the ICT industry in Gauteng. The Industry is an institution in its own right.

The variables that were analysed are (1) Cellophane usage, (2)Consumer Premise Equipment,(3) Television sets, (4)video cassette recorders, (5)Hi-Fi/Music Centres, (6) Internet usage and access

The primary study did not succeed to get sufficient data and information in respect of ICT pertinent human capital output of the Higher Education Institutions in Gauteng. The source of secondary data which was used for this purpose was adapted from the 2000 SAITIS Baseline Studies. The variables of interest that will be analysed are first degrees and diplomas awarded in computer science by Universities and Technikons respectively, particularly those in Gauteng from 1992 to 1996.These statistics will be presented and discussed in Chapter Four.

It was stated in the hypothesis that ICT developments have put Gauteng at the forefront of in the continent. This claim will be supported among other sources by the International Development Research Centre, (IDRC) study on Internet Out of Africa. IDRC is a public corporation created by the Parliament of Canada in 1970 to help developing countries use science and technology to find practical, long term solutions to the social, economic, and

environmental problems they face. Support is directed toward developing an indigenous research capacity to sustain policies and technologies.

The variable measured in the Internet Out Of Africa study are comparative figures of bits per capita across the continent as at mid 2002, to measure progress of various countries towards information society.

Bits per Capita, a relatively new measure of Internet use which takes into account a wide range of possible use, from those who share accounts, use facilities in companies, universities and public facilities such as internet cafés, write a few emails each week, to users who spend many hours a day on the net browsing, transacting, streaming, and downloading. This measure is a response to the inadequacies of 'Number of Internet Users' as an indicator of realities in the developing world. In the analysis that will be done in the following chapter the information provided will be used with the number of internet users to assess and infer the comparative position of Gauteng on the continent of Africa. This report is shown in Appendix 10.

Chapter 4

Presentation, analysis, and synthesis of findings

The South African Concise Oxford Dictionary defines the word analysis as "a detailed examination of the elements or structure of something, a process of separating something into its constituent elements."[74] As mentioned earlier, the constituent parts examined in this study were policies, infrastructure and social programmes, and projects carried out by different classes of institutions. The primary field study succeeded in eliciting **36 ICT** policies. It also helped to identify to the total value of **R 50.7 billion** including the Telkom roll out. The reports on the findings are presented in Appendix 4 and 5.

4.1. Analysis of policies

4.1.1. Policy initiatives by National Government Departments

The Department of Arts, Culture, Science and Technology has developed South Africa's Green Paper on Science and Technology, Preparing for the 21st Century which provides policy framework for the National System of Innovation (NSI). NSI is defined as a "system of interacting private and public firms (either large or small),universities and government agencies aiming at the production of Science and Technology within national boarders."[75]

One of the deliverables of NSI is the establishment of Information Infrastructure for Science and Technology. "Central to this is first an effective library infrastructure, and second, electronic access to information (internet, the worldwide web etc)."[76]

The Department has also developed the National Film and Video Foundation Act 73 of 1997. The purpose of the Act was the establishment of the National Film Video Foundation, a

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[74] Dictionary Unit for South African English. 2002 Page 38.

[75] South Africa's Green Paper on Science and Technology. 1996. Page 25.

[76] South Africa's Green Paper on Science and Technology. Page 52.

statutory body that would promote the development and distribution of South African film, particularly in the previously disadvantaged communities. The Foundation was established in 1999.

The Department of Communications accounted for 9 out of 36 policies reported in this research. *The Telecommunication Act 103 of 1996* would have a far reaching impact on transforming South Africa to a favourable ICT environment.

The Act provided a legislative framework for the establishment of institutions to transform the telecommunication sector. Telkom was transformed through partial privatisation that resulted in the sale of 30% to Thintana Consortium, a joint venture between the SBC, an American telephone company and Telecom Malaysia. The sale resulted in capital inflows to the value of R5.2 billion into South Africa. This capital was used mainly to roll-out telecommunication services in a manner that was unprecedented in the country. It also promulgated the establishment of the Universal Service Agency (USA) to promote the goals of the Universal Service, "to encourage, facilitate, and offer guidance in respect of any scheme to provide telecommunications services in terms of the Reconstruction and Development Program Act (RDP)."[77] It also resulted in the establishment of the South African Regulatory Authority (SATRA), which acted as surrogate competition to counteract uncompetitive monopolistic behaviour.

The Telecommunications Policy Directives Gazette number '22169' was launched in the final quarter the year 2000. The key aspects of the policy document concerned, firstly, the structure of the telecommunication industry post Telkom exclusivity period. The document suggested the introduction of two operators to compete with Telkom. Secondly, it presented the framework for the Sentech license for international transmission and career services as well as the license for broadband service transmission of data voice and image. Sentech was also granted rights to initiate digital terrestrial services in order to transform broadcasting systems from analogue to digital. Digital broadcasting presents a number of advantages such as freeing some of the spectrum so as to make more channels per frequency possible, lower power requirements for broadcasting, widen services offered to audiences, and improve quality of image. Thirdly, the policy directive presented the policy framework for the establishment of Edunet, a network to connect all public schools and the Higher Education Institutions, and to introduce the E-Rate, a discount of 50% for bandwidth requirements for

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[77] Telecommunication Act. Section 59 (1) (b) (ii).

schools. Fourthly, the policy directive gave rights to the SMME's to roll out telecommunication services in those areas which were not covered by Telkom. Finally, the providers of Value Added Services were still prohibited from carrying voice over Internet until an unspecified future date that would be fixed by the Minister through a notice posted in the Government Gazette. The DOC has also developed the Electronic Communications and Transactions Act, which legalised electronic commercial transactions. It is now legitimate in South Africa to conduct business through the electronic media.

The Department also initiated the following policies:

Children's Media Policy. The objective of this policy was the formulation of strategies for children's media services in South Africa, thereby realising the fundamental and constitutional rights to all the Children of South Africa. The policy process involved countrywide public hearings that would result in the drafting of a White Paper.

Disability Policy. The objectives of this policy were to promote accessibility to information and communication technologies for the disabled and to ensure the implementation of the INDS (Integrated National Disability Strategy) principles in the Communication Sector.

Digital Broadcasting Policy. The objectives were to develop policy and legal fr-mework for the introduction in South Africa, and migration from analogue to digital broadcasting systems, to formulate legal framework for the regulation of technical standards, digital gateways, and promotion of convergence.

Community Electronic Multimedia Policy. The objective of this policy was to promote the establishment of community electronic multi-media such as community radio, community television, Public Information Terminals, Telecenters and Multi-Purpose Community Centres.

South African Content Policy. The objective of this policy was to promote content in different African languages, use of Internet in indigenous languages and to support other government policies, programmes, and activities.

The National Department of Education has developed the *Education Information Technology Strategy.* This strategy discusses how ICT can be used to improve administration in schools but it does not discuss ICT as part of a curriculum, or how ICT can be used to deliver curriculum. *The National Education Policy Act of 1996* mentions the necessity for developing information skills among educators and learners. However, it does not provide details of how this can be done.

The Department of labour has developed four policy instruments, the *Immigration Act, the Skills Development Act, the National Qualification Framework, the Skills Levy and the Employment Creation Act.* The most salient aspect of the skills policy directly pertinent to ICT development was the establishment of ISETT SETA. (Information Systems, Electronics and Telecommunication State Education and Training Agency). ISETT SETA's mission is to develop South Africa into a knowledge-based society through skills development in the domain of information technology, electronics and telecommunications. Its key functions are the development and accreditation of learnerships, training, and job placement.

The Department of Public Enterprise collaborated with the Department of Communications to develop Foreign Direct Investment Policy that would generate about R40billion worth of investment through, among other things, the resale of state assets such as partial privatisation of Telkom in 1998. The second similar project was to seek a Strategic Equity Partner for the Second National Operator (SNO) of Public Switched Telecommunication Services. The envisaged capital structure of the SNO was as follows: 30% would be given to Transtel, a Transnet telephone company as well as Izitel, an Eskom telephone company 19% would be given to a Black Empowerment Company and 51% would be given to the Strategic Equity Partner. The department also "combined the information technology division of Eskom, Datavia in Transnet and Ariel Technologies in Denel into Arivia.kom which started operations in January 2001."[78]

The policy initiated by the Department of Public Service, which would have a far reaching institutional effect in the delivery of ICT in the public sector is the SITA Act of 1998, which led to the founding of State Information Technology Agency (SITA). The aims of SITA are to create economies of scale in public sector ICT procurement. At the time when this study was conducted, the SITA Amendment Bill was underway. The essence of the amendment was that all government departments in all spheres must procure their ICT requirements through SITA. The institution also plays a central role in developing and implementing policy driven initiatives of the Department. One of the policy initiatives identified by this study was The Gateway Project, a portal and a toll free call centre which would work together with Multi Purpose Community Centres across the country to improve delivery of government services. The policy framework for this project recommended collaboration with

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[78] Department of Public Enterprises. 2001/2002. Page 6.

the Department of Provincial and Local Government, and Government Communication Services (GCIS) in implementing this project.

The Department, in conjunction with SITA developed a Handbook on Minimum Information Interoperability Standards (MIOS), a blueprint to guide seamless and interoperability in Public Service Networks. Interoperability is achieved through government's technical policies and standards for a networked and web enabled governance. Adherence to MIOS would be a catalyst for the public service to develop standardised Value Added Information Services and to ensure easy flow of information between government departments and the delivery of Public Services electronically. "The main thrust of the framework (in line with international best practice), is the adoption of the Internet and the World Wide Web standards for all government systems. The strategic decision was to adopt Extensible Mark-up Language (XML) and Extensible Stylesheet Language (XSL) as the core standard for data presentation, integration and management."[79]

The department in conjunction with SITA also formulated policies for Open Source Software development to decrease licensing costs associated with vendor appropriated wares and to improve customer choice and stimulation of the South African software manufacturing base that is capable of developing solutions for South African problems.

The policy framework created by the Department to promote social initiatives involved the creation of the Government Information Technology Officers Council (GITO) and the Centre for Public Service Innovation (CPSI). GITO is constituted by information technology officers from government departments. The main purpose of GITO is to enable government information technology officers to coordinate projects in order to achieve efficiencies and the economies of scale, and to share and cross pollinate best practices. The CPSI was established to develop innovative ways of improving service delivery by harmonising policies, structures systems and staffing.

The Department of Trade and Industry has developed a number of economic incentives, which can be a catalyst for the rapid development of ICT. Through the Critical Infrastructure Programme, targeted financial assistance is provided for the development of new infrastructure or upgrading of existing infrastructure intended to support or service new investment projects, expansion of existing investment projects or, in exceptionally special

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[79] Department of Public Service. Handbook on Minimum Information Interoperability Standards. Page 11.

cases, existing investment projects. Funding ranges from 10% to 30% of the qualifying infrastructure development costs. Infrastructure projects intended to service Industrial Development Zones qualify for a grant of 30% of the infrastructure development cost. The projects, which qualify for funding by CIP, are transportation systems such as roads and railroad systems; Electricity transmission and distribution system; telecommunication networks such as cabling and signal transmission systems.

The SIP, Strategic Industry Programme, is an incentive programme designed to encourage investments into South African operations by local and foreign investors. Its primary aim is to contribute to the growth, development, job creation and competitiveness of specific industry sectors by providing industrial investment allowances, in the form of tax relief, to qualifying industrial projects. The SIP incentive is accessible to industrial projects participating in all listed manufacturing activities such as computers and computer related activities such as consultancy, software development, data processing (excluding standard secretarial services), and database activities, research and development activities, experimental development on natural sciences and engineering. The SPII, Support Programme for Industrial Innovation, finances research and development initiatives. The SPII makes allowances of 50% of Research and Development costs. The SMEDP, Small to Medium Entrepreneurial Development Programme, provides incentives to SMME's for fixed property, land and building, capital goods, and a percentage of total labour cost.

4.1.2. Policy initiatives by Regulatory Bodies

All over the world, the regulation of ICT industry was based on the principles of forbearance and competition substitution where there were monopolies. Forbearance involved the creation of sector specific regulators that worked independent of each other. In South Africa, there were two sector specific regulators, The South African Telecommunication Regulatory Authority (SATRA) for telecommunications and Independent Broadcasting Authority (IBA) for broadcasting. Advances in convergence technologies put pressure on governments of the world to transform the regulatory regimes by changing from the line of business regulation. The South African Government responded to this challenge through the merger of SATRA and IBA into ICASA in the year 1999.

Since its establishment, ICASA focused on transformational initiatives of the telecommunication and broadcasting sectors and on the licensing of the Value Added Services. The transformation of the telecommunication sector involved monitoring of

operators, Telkom and mobile operators, against set performance targets and social obligations, tariff rebalancing of short and long calls, and facilitation of progression towards post Telkom exclusivity industry structure. In the area of mobile cell operations, ICASA focused on the preparation and licensing of the third cellular operator, a bid which was won by Cell C.

In the area of broadcasting, ICASA focused on "inquiry in terms of section 28 of the Independent Broadcasting Authority Act into the review of South African content quotas. ICASA published a discussion paper, which was followed by public hearings in May 2001."[80] The inquiry process resulted in the recommendations presented in the following table.[81]

Table 11. Local Content Quotas

Type of broadcasting	Previous Quota	New quota	% Increase
Public broadcasting TV Services	30%	55%	25%
Commercial free-to-air TV Services	20%	35%	15%
Subscription Services	5%	8%	3%
Public Service Radio Station	20%	40%	20%
Community Radio Stations	20%	40%	20%
Commercial Radio Station	20%	25%	5%

ICASA also focused on the granting of licenses for Value Added Network Service Operators. Of the total number, one hundred and twenty four licenses were granted by October 2000, 76 were Gauteng based entities.

4.1.3.   Telkom policy relevant initiatives

Starting from the year 1997, Telkom policy activities can be divided into three parts. Firstly, communication of its mandate and performance in terms of the Operators License granted in terms of the Telecommunications Act to the critical stakeholders including all the Portfolio and Standing Committees at the National and nine Provincial Legislators, organized local

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[80] ICASA.15 February 2002. South African Content on Television and Radio Position Paper and regulations Page 8.

[81] ICASA.15 February 2002. South African Content on Television and Radio Position paper and regulations. Pages 32 & 42.

government structures that are affiliated to SALGA, South African Local Government Association. Secondly, to set a favourable climate for the Initial Public Offer through which the company would be enlisted in various Stock Exchanges. Thirdly, preparation was made for the post exclusivity competitive environment. Fourthly, critical engagement in policy development process to protect the best interests of the company in the competitive environment.

With regard to post exclusivity period, the parastatal advocated for equal regulation for all telecommunication providers, a bias towards market self-regulation as opposed for the impositions by the Statutory Regulator. According to the company, this regulatory regime would result in the ability for all players to earn on investment. The parastatals also advocated for technology independent, facilities based competition as opposed to serviced based. In the case of service based competition it would be possible for new operators to run their business over Telkom facilities. Those who favoured service based competition argued that Telkom facilities used to belong to the state before privatization, and therefore, all sections of society must be able to benefit from Telkom's networks.

With regard to the Initial Public Offering, Telkom played a catalyst role in the granting by the Interministerial Cabinet Committee on the Restructuring of State Enterprises to grant the Minister of Communications to initiate discussions on an Initial Public Offer. On 10 May 2000, Cabinet approved the Telkom IPO and the appointment of the global coordinator to manage the process.

4.1.4. Gauteng Provincial Government policy relevant initiatives

It was mentioned earlier that Gauteng Provincial Government formulated the Trade and Industrial Strategy in 1997, on the basis of the "Provincial Planning Competency stipulated in the constitution. One of the strategic thrusts for growth stipulated in the 1997 Strategy was the development of the Province as a Smart Centre of the country with specific emphasis on information technologies, telecommunications equipment, research and development and biomedical industries. Gauteng Provincial Government also established the Gauteng Shared Services Centre (GSSC) to coordinate among other things ICT procurement. The GSSC collaborate with the provincial departments in the formulation of plans and budgets of ICT.

The Gauteng Province Government also formulated 'GT11' policy to promote empowerment of ICT Small Medium Enterprises (SMME's) through preferential procurement.

In the year 2000 the Provincial Executive Council approved the policy framework for GautengOnline, a programme to provide twenty-five networked personal computers on Wide Area Network (WAN) and Local Area Network (LAN), and to introduce electronic learning systems at all levels of schoolings. A total R500 million budget was allocated over a period of three years to kick start this initiative.

The provincial government realised that slow electrification programme constrained the uptake of electronic consumer goods. In order to address this problem, 'Mayibuye Project' was initiated by the Department of Housing to install electricity in all houses provided by government.

4.2. Analysis of programmes and projects

4.2.1   Telkom projects in Gauteng Province.

The graphs that present Telkom roll-out in Gauteng are shown in Appendix 7. A cumulative growth of 442% in subscriber lines occurred between 1997 to 2000 in under serviced areas. A growth of 767% between 1997/98 and 1998/99 financial years in previously serviced areas was attributed to two related factors, the conversion from analogue to digital as well as installation of more than one telephone per household. A total of 3,460 priority customers, schools, hospitals, local authorities, and libraries received services. This amounts to a growth of 296% in the three financial years from 1997/98 to 1999/2000. 25,415 public telephones were installed between the years 1997 and 2000. Just in the financial year 1999/2000, new services, which include prepaid services and advanced services such as ISDN (Integrated System Digital Network) and PABX (Private Automatic Branch Exchange), were highest in residential areas and lowest in the public sector, a point that shows that a large-scale government Value Added Service had not taken off the ground. The village target measures show that only six villages were done in the year 1999/2000. The reason for this is that Gauteng Province has negligible rural areas.

Telkom Social Responsibility Projects were mainly in the areas of education and Black Economic Empowerment. In Gauteng, 240 schools were provided with Internet services and 480 teachers were trained in basic computer literacy and Internet usage. Ten schools were identified for the Super Centre project, which involved erecting computer laboratories with twenty-one desktops computers, a server, a printer, internet connection, and telephone rebate for two years. Forest Town, a school for learners with special educational needs, received a

laboratory with special software to cater for special needs, over and above free Internet connection.

In the area of Black Economic Empowerment, the major thrust was the allocation of five percent to National Empowerment Fund and two percent was allocated to staff. Because of the location of Telkom Head Office in Gauteng, these initiatives would have positive socio economic multiplier effect for the province.

4.2.2. The analysis of programmes and projects initiated by various government spheres, departments, institutions and organized communities

FREQUENCY OF ICT PROJECTS IN GAUTENG
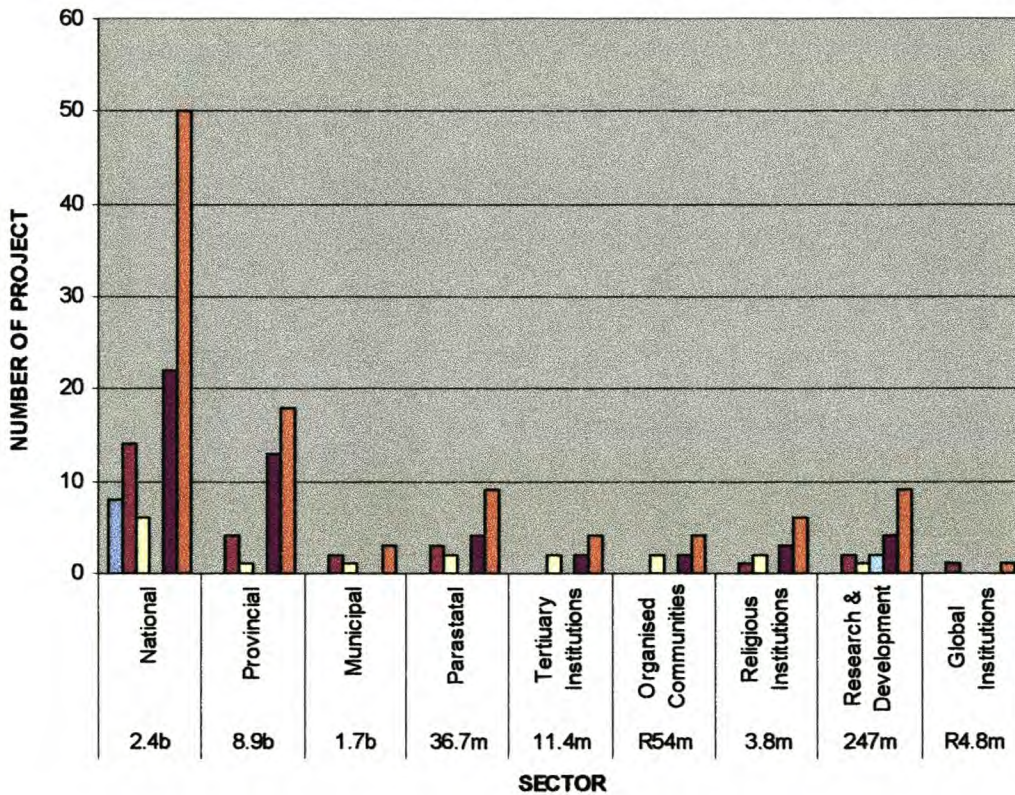
Diagram 1

The bar graph presented above shows an overall picture of the research findings, excluding the Telkom rollout. The classification of projects is in terms of the type as indicated on the

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icon, institutional category and concomitant monetary values identified along the horizontal axis and the number of projects along the vertical axis. The project types are content, service delivery infrastructure social developments, research, and development and integrated services. The word integrated is denotative of budgets which were allocated for a combination of outcomes, for example simultaneous infrastructure roll out and capacity development.

One hundred and four (104) projects with a monetary value of about R 50.4 billion, including 37.4% of the total Telkom roll-out. The highest frequency of projects according to institutional categories ranges in the declining order from the national level, followed by the Province, the Parastatals, and Research and Development respectively. The Global institutions and the municipalities account for the lowest number of projects. The frequency of projects according to type ranges in the declining order from integrated to infrastructure to social development and lastly research and development. Content development commands only eight projects and all of them are at the national level. When the projects are ranked in the declining order of budgetary commitment, parastatals account for 74%, followed by provincial government at 18%, followed by national government, which accounts for 5%. Lastly, Municipalities account for three percent (3%). The figure for parastatals includes Telkom projects. The application of a weight of 37.4 % as a GDP contribution of Gauteng to the national economy leads to the inference that Parastatals account for 54% of all programmes rolled out in Gauteng, followed by the provincial government at 35%. Municipalities (Unicities) account for 7%, and national government initiatives account for four 4%. Of the contribution by the Parastatals, Telkom accounts for fifty-six percent (56%), followed by the Public Information Technology Services (PITS) project by the South African Postal Services (SAPOS), which account for 41%. The State Information Technology Agency (SITA) accounts for 3%

This paragraph will provide some insight about the PITS programme because of its significant contribution to infrastructural projects. The PITS represents a new step in bringing the benefits of information technology within everyone's reach. The DOC and South African Post Office Services launched the programme in 1998 as a joint initiative. PITS include multi media kiosk, the deployment of terminals in post offices and other access sites around South Africa. The Smart-card technologies are used to access a range of electronic communication links. Twelve out of one hundred PITS deployed nationally are in the following areas in Gauteng: Vaal (Sebokeng), Soweto, Alexandra, Attridgeville, Moretela

Park, Pretoria (Church Street), Zithobeni, Sebenza, Feranani, Katlehong, Meyerton and Braamfontein in Johannesburg. It was planned that the rollout of PITS in all South African Post Offices would be completed by the year 2005.

The key projects rolled out by the Gauteng Provincial Government were the call and contact centre, a GPG (Gauteng Provincial Government) wide portal, Gauteng Online, and the Innovation Hub. The call centre roll-out would start at GSSC to offer telephony and case management functionality. It would then be rolled out into other departments. The roll-out would start with a telephone contact and later provide e-mail and Internet services.

The objectives of Gauteng Online were discussed under policies initiated by provincial government. The programme was launched in June 2001 in one of the schools in Soweto. A pilot was subsequently conducted in thirty-five schools with a budget of R100 million contributed by the ICT industry, and it was completed by March 2002.

A strategy for GPG wide portal that includes SMME, employees, and citizens sub portals was formulated as part of a Smart Province initiative.

The Innovation Hub is an Industrial Park situated in Centurion, created to attract high technology enterprises including ICT. It is collaboration between GPG, The Department of Trade and Industry and the Council for Scientific and Industrial Research.

The projects initiated by Unicities were, a drive by Jo'burg Unicity to promote Mid and as an ICT industrial zone and a Close Circuit Television anti crime network in the streets of the inner city. At Ekurhuleni a Wide Area Networks (WAN) was rolled out to link the towns of Germiston, Boksburg, Alberton, and Benoni into one Unicity.

The availability of appropriate education was stated to be one of the measures against digital divide. This section will asses the capacity of Higher Education Institutions to supply sufficient graduates in the critical areas of ICT. In terms of South African education policy, Higher Education Institutions (HEIs) are national entities. Their budget allocation comes from the National Department of Education. Although they draw students from all over the country, they tend to serve communities in which they are situated, to a great extent. Of the fourteen national universities and twelve technikons analysed in this study, three and four are situated in Gauteng respectively. The analysis that follows, adapted from the1998 HSRC telecommunication study mentioned in the 2000 SAITIS Baseline Studies, will show a comparison of the outputs of the institutions situated in Gauteng with the rest of the country concerning the production of graduates in computer science.

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Table 12 **First degree graduates in Computer Science and Data Processing from South African Universities: 1992–1996**[82]

	Name	1992	1993	1994	1995	1996	Average Annual Growth 1992- 1996
Universities in Gauteng	Rand Afrikaans University	26	40	44	34	35	8,0%
	Pretoria	20	18	90	94	108	51,8%
	WITS	43	31	40	71	55	6,5%
	TOTAL	**89**	**89**	**174**	**199**	**198**	
Other Universities	Fort Hare	3	4	3	3	3	0.6%
	Orange Free State	11	31	11	10	22	17.6%
	Potchefstroom	52	57	49	60	37	-8.1%
	Rhodes	23	32	26	14	12	-16.0%
	Cape Town	45	58	63	44	49	2.2%
	Durban-Westville	8	9	10	14	12	-16.0%
	Natal	43	45	43	43	43	-0.2%
	UNISA	36	33	39	47	34	-1.4%
	Univ of the North	2	2	10	0	0	Data lacking
	Port Elizabeth	16	12	14	13	13	-5.2%
	Stellenbosch	18	18	90	94	108	51.8%
	Western Cape	17	3	11	15	25	10.9%
	TOTAL	**273**	**305**	**299**	**281**	**267**	
	GRAND TOTAL	**362**	**394**	**473**	**480**	**465**	**6.5%**
	% Gauteng of National	**25**	**23**	**37**	**41**	**43**	

Table 13. First Diplomas awarded in Computer Science by Technikons 1992-1996[83]

	Name	1992	1993	1994	1995	1996	Average Annual Growth 1992- 1996
Technikons in Gauteng	Gauteng North	16	34	40	35	66	43.2%
	Pretoria	134	132	117	94	79	-12.3%
	Vaal Triangle	34	37	34	22	22	-10.3 %
	Witwatersrand	69	69	69	80	82	4.4%
	TOTAL	**253**	**272**	**260**	**231**	**249**	
	Border	0	0	0		14	

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[82] Esselaar et al. 2000 *SAITIS BASELINE STUDY*. Page 45.

[83] .Esselaar,et al 2000. *SAITIS BASELINE STUD.Y* Page.46.

Other Technikons	Cape	89	71	69	77	104	4.0%
	Free State	29	19	36	20	20	-8.9%
	M.L. Sultan	34	41	55	82	78	23.5 %
	Mangosuthu						
	Natal	42	28	0	21	31	-7.3%
	Peninsula	36	25	34	33	37	0 7%
	Technikon RSA	1	8	84	74	51	168%
	Port Elizabeth	43	56	59	59	68	12.1%
	TOTAL	**273**	**248**	**337**	**336**	**403**	
	GRAND TOTAL	**526**	**520**	**597**	**597**	**652**	**5.5%**
	Gauteng as a % of National	48%	52%	43.6 %	38.7 %	38%	

Table 14. Total output by HEI's

	Category	1992	1993	1994	1995	1996	Average Annual Growth 1992-1996
	universities	362	394	473	480	465	6.5%
	Technikons	526	520	597	597	652	5.5%
	Total	**888**	**914**	**1070**	**1077**	**1117**	**6%**
	% Gauteng located varsities	25	23	37	41	43	
	%Gauteng located technikons	48	52	43.6	37	38	

The figures above show that that the average skills supply in computer science by South African HEI's was about one thousand per year from 1992 to 1996, and the average annual growth was about six percent per annum. According to the HSRC "the supply would not be able to meet the demand for computer science occupations and an undersupply of between fifty four to sixty percent was estimated for the period 1998 to 2003…. The skills shortage experienced by the telecommunication industry pertains not only to the number of people qualified in a particular field, but also to the combination of skills required in one person."[84]The skill shortage and the limited output by the HEI's located in Gauteng was a recognized concern by the Gauteng Provincial Government and other national government departments. The University of Witwatersrand responded to the demand for ICT education by establishing the Link Centre at the Graduate School of Public and Development Management (P&DM). The Link Centre runs educational programmes that range from basic

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[84] Esselaar,et al 2000. *SAITIS BASELINE STUDY.* Page 45,46.

computer literacy, community outreach programmes, and open lectures to a Certificate in Telecommunication Regulation and Management.

Religious communities showed a reasonable level of commitment to ICT. Leading the way was the JIREH Christian Ecumenical Networks, followed by the Hindu and the Muslim communities. The South African Council of Churches (SACC), the largest body representing Christian constitutional churches, did not report any ICT related projects. Of the political groups, it was only the African National Congress that reported ICT initiatives. The ANC policies focused on the utilization of ICT for community empowerment, the loss of jobs caused by technology and globalization. None of the big umbrella bodies such as the South African Football Association (SAFA), South African Cricket Union (SACU), South African Boxing Association (SABA), and the South African Rugby Football Union (SARFU) reported ICT initiatives.

The only Research and Development Institution that reported ICT related initiatives, the THRIP, (The Technology and Human Resource for Industry Programme), was the National Research Foundation. THRIP was established by the Foundation jointly with The Department of Trade and Industry to develop science and technology skills in order to improve South African global competitiveness, high technology SMME's, and industry wide innovation joint ventures.

The global institutions which reported initiatives in South Africa were the International Telecommunications Union (ITU) and the International Development Research Centre (IDRC), a Canadian Institution. The ITU mandated South Africa to host the 1998 and 2001 ITU Telecommunication Summits. The hosting of these two summits in South Africa had a significant diplomatic value and recognition of South Africa as a player in the field of ICT. The IDRC provided capital as well as expertise to the Universal Service Agency in rolling out the telecenters, a project that would inform policy with regard to advanced Universal Service.

4.3. Analysis of information obtained from South African Advertising Research Foundation (SAARF)

The table below shows the level of penetration of electronic consumer goods, personal computers, credit cards, petrol cards, ATM banking cards, the usage of internet for banking, e-mail purchase, and information search. The level of penetration of these electronic

consumer goods indicates the extent to which ICT affects the daily lives of the citizens as well as the status penetration relative to the rest of the country.

Table 15. Comparative penetration of ICT in Gauteng as a national percentage

ICT category	PC's	Credit card	Petrol card	ATM	Overall usage
% of national population	8	5	2	32	n/a
% of Gauteng population	15	9	4	45	n/a
Gauteng as % national population	39	40	42	30	n/a
Internet usage					
Usage category	Banking	e-mail	Purchase	Information	Overall usage
% of national population.	1	4	1	4	5
% of Gauteng population	2	6	1	7	9
Gauteng as % national population.	47	40	97	41	40
Source: SAARF Electronic Services and product usage Survey. 2001					

The table shows the following penetration levels of some of the key ICT:

The Percentage of the national population with PCs is 8%. The percentage of Gauteng Provincial population with PCs is 15%. Gauteng Accounts for 39% of the national penetration.

The percentage of national population with credit cards is 5%. The percentage of Gauteng Provincial population with credit cards is 9%. Gauteng Accounts for 40% of the national penetration.

The percentage of national population with ATM facilities is 32%. The percentage of Gauteng Provincial population with ATM facilities is 45% Gauteng Accounts for 30% of the national penetration.

The percentage of national population with internet facilities is 5%. The percentage of Gauteng Provincial population with internet facilities is 9%. Gauteng Accounts for 40% of the national penetration.

The overall picture that emerges from the data is that the penetration in Gauteng accounts for 39% for PC's, 40% for credit cards and 40% for internet usage. These penetration levels show a high correlation with the overall contribution of Gauteng Province to the GDP, which is 37.4%.

4.4. Analysis of IDRC Report

The IDRC study on Internet Out of Africa was reported in Chapter Three, and this section presents the findings which demonstrate that South Africa is on the forefront of the continent in respect of this measure. The table presented below shows the corresponding Per Capita GDP and Bits Per Capita of various African countries available from publicly available IP networks as at in the middle of 2002.

Table 16   International bandwidth in bits per capita (BPC) available in Mid 2002

Country	Per Capita GDP in USD	Bits Per Capita
Egypt	1000-2000	5
South Africa	2000-4000	5
Seychelles	N/A	5
Gabon	4000-10000	5
Tunisia	2000-4000	5
Morocco	1000-2000	5
Botswana	2000-4000	5
Senegal	1000-2000	5
Mauritius	N/A	4
Algeria	300-1000	4

Source: Adapted from IDRC *www.network.idrc.ca*

South Africa is almost on par with Egypt on this measure. The high rank of South Africa could be linked to a rapid roll-out of Community ICT. The Universal Service Agency (USA), The Government Communication and Information Services, The Department of Public Service, The Department of Communications, and Cellular Operators carried out the rollout of Telecenters with Internet facilities Multi Purpose Community Centres. In particular, Telkom rolled out Internet to 1000 schools as part of its social obligation.

South Africa also leads the continent on several other key indicators of internet penetration. One such indicator is the number of internet-hosted computers. The ITU World Telecommunications Indicator Database shows that of the 129,300 hosted computers in

Africa, South Africa accounted for122, 025 at the beginning of 1998.The report also shows that South Africa ranks the highest at 287.8 as at January 1998 on the Host per 1000,000 people Indicator. On the number of PC to Internet host indicator, an indicator of the ratio between the numbers of Internet host to hosted PCs, South Africa ranks the second after Namibia.

Table 17 Other Internet Comparisons in African Continent

Top 10 Countries By Internet Host Jan 1998		Top 10 Countries By Host Per 100,000 People Jan 1998		Number Of PC's To Internet Host, Africa Jan 1998	
South Africa	122,025	South Africa	287.8	Namibia	3
Egypt	1805	Namibia	40.6	South Africa	13
Morocco	1405	Botswana	36.8	Botswana	18
Namibia	640	Swaziland	35.2	Morocco	32
Zimbabwe	599	Mauritius	13.7	Ghana	79
Botswana	550	Sao. tome	8.9	Mauritius	1.79
Kenya	458	Morocco	5.1	Mozambique	217
Swaziland	330	Zimbabwe	5.0	Uganda	350
Cote d'voire	253	Egypt	3.0	Swaziland	513
Ghana	252	Zambia	2.2	Tanzania	1176

Source: Adapted from ITU World Telecommunication Indicators Database, Network Wizards (www.nw.com)

The high levels of Internet penetration in South Africa could be attributed to scientific and technology research, entrepreneurship and political will. The origin of Internet in South Africa as discussed by Arthur Goldstuck is "associated with Rhodes University. In 1985 the Committee of University Principals commissioned Mike Lawrie to examine the computing needs in South African universities. The sub-committee on networking was formed and chaired by Philip Welman of Potchefstroom University. Lawrie and Welman set up a dial-up link between these two universities using a network of IBM mainframes.

The first breakthrough in South Africa occurred in 1987 when the Foundation for Research and Development, then, part of the CSIR funded the formation of Uninet, a South African

response to NSFNET and MERIT in the United States of America. In 1989 FRD provided the budget for connecting Uninet to international links.

1993 was the year for the first commercial link to Internet. It was initiated by a cooperative TICSA (The Internetworking Company of Southern Africa), located in Cape Town. TICSA was connected via an undersea cable to AlterNet in Virginia in the United States of America. The first Internet service provider in Johannesburg was Internet Solutions."[85]

In 1997 Telkom entered the Internet race by establishing SAIX as an Internet backbone and Intercom as an ISP. The parastatal provided the Internet services on a competitive basis as part of its Value Added Licence Services.

To conclude, the argument and the evidence presented in this section about the leadership position of South Africa on the continent, considered together with the evidence that Gauteng is in the national forefront of ICT as indicated in the SAARF report shows that Gauteng in particular is leading the continent on ICT initiatives. It was mentioned earlier that the Provincial Cabinet initiated Gauteng Online in 2001, a programme that is intended to provide connectivity and ICT training to 67,000 educators in the province and about 2, 4 Million learners.

A claim is made that in the 1997 Trade and Industrial Strategy that "the South African IT market is the twentieth largest in the world and valued at R1.5 Billion.....over 90% of the sub sector that includes computer maintenance and repairs, computer programming services and data processing and preparation services are based where most of the Multi National Companies have presence in the form of distributorships and Service Centres."[86] These claims are plausible, although the figures need verification.

4.5. Synthesis of the findings

4.5.1.   Strengths

The purpose of the study was to verify the claims made in the hypothesis by identifying initiatives and actions of various institutions that would together constitute a state of critical mass and E-readiness for rapid growth and development. The diagram that follows shows Gauteng's socioeconomic advantage relative to the rest of the country.

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[85] Goldstuck, Arthur.1995. Page 21.

[86] Department of Finance and Economic Affairs. Trade and Industrial Strategy 1997. Page 57.

Comparison of GDP, Telephone Service and Population Between South Africa's Provinces
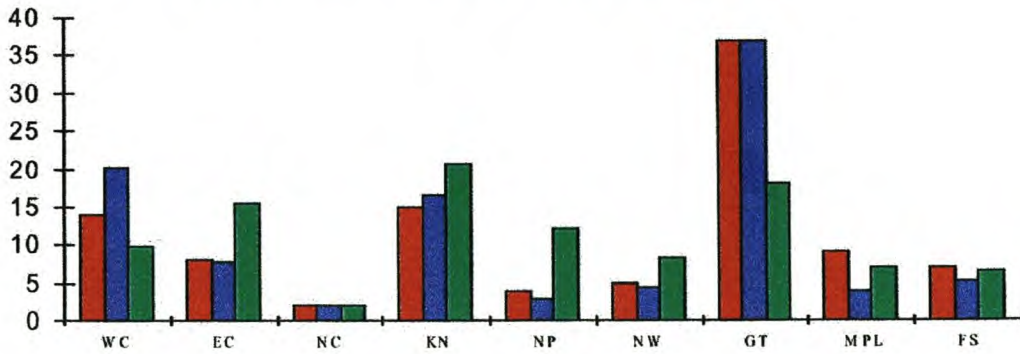
	WC	EC	NC	KN	NP	NW	GT	MPL	FS
% CONTRIBUTION TO GDP	14	8	2	15	4	5	37	9	7
% MAIN TELEPHONE SERVICES	20.24	7.85	1.96	16.59	2.81	4.33	37.03	3.90	5.28
% POPULATION	9.75	15.53	2.07	20.74	12.15	8.27	18.11	6.90	6.49

Diagram 1. Source[87]

The graph shows a positive correlation between Gross Domestic Product, population size and the penetration of telephone services. The penetration of telephone services in Gauteng is the highest in the country and it is about thirty seven percent, which is also a measure of Gauteng contribution to the GDP. The graph also shows a comparison between provincial percentage contribution to the GDP and percentage penetration of the telecommunication services relative to the population of the province as a percentage of the national population. Gauteng has the highest favourable ratio in comparison to the rest of the country. The findings presented in this graph make more sense when interpreted together with the teledensity map presented below.

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[87] Telkom Government Relations and Regulatory Affairs Division. May 8 2001.Telkom Report to the Gauteng Legislature. Page 29

Main telephone services per 100 people (Teledensity)

Provincial boundaries
Magisterial boundaries

| Lesotho |
| 0 - 1 |
| 1 - 5 |
| 5 - 8 |
| 8 - 10 |
| 10 - 12 |
| 12 - 15 |
| 15 - 20 |
| 20 - 30 |
| 30 - 100 |
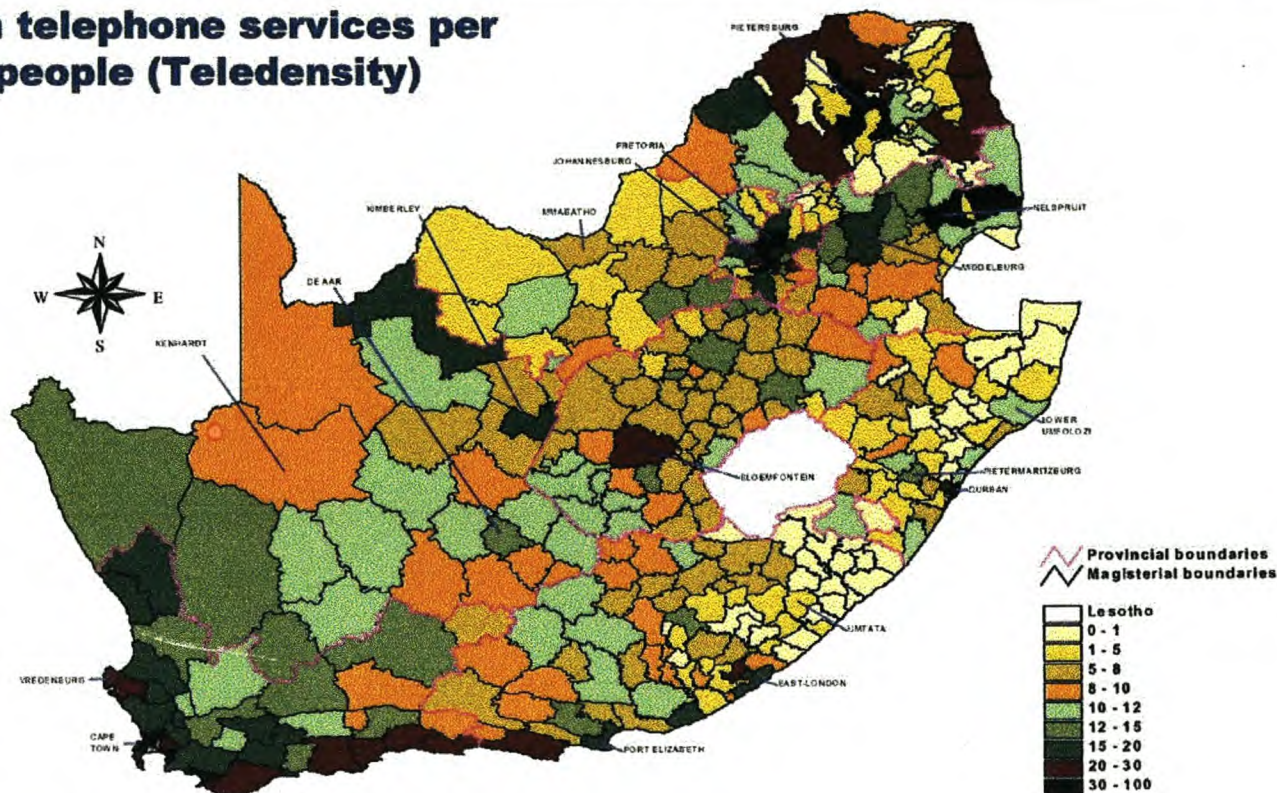
Diagram 2. Teledensity map of South Africa. Source[88]

The geographic map above shows the level of teledensity by magisterial district and provincial boundaries. The map shows a high level of teledensity in Gauteng, only super ceded by Western Cape Province. It is only some areas north of Pretoria and South West of Johannesburg that have teledensity measures below the substandard, and most of these areas are new informal settlements. These measures correlate positively to the observations made from SAARF presented earlier. All these measures point out conclusively to the fact that the level of ICT penetration is determined by socio-economic factors and to the fact that the Gauteng Province has a relative comparable advantage over other provinces.

One of the assumptions mentioned earlier was that ICT developments depend on the propensity for knowledge production, which also depends on the availability of knowledge workers. Various sources, the Computer Society of South Africa (CSSA), Black Information

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[88] Telkom Government Relations and Regulatory Affairs Division. May 8 2001.Telkom Report to the Gauteng Legislature. Page 29

Technology Forum (BITF), and Forge Ahead data bases as well as survey of black IT professionals presented in the table below, indicate that Gauteng has the greatest concentration of ICT's professionals compared to other provinces

Table 18 Geographic distribution of IT professionals

Provinces	CSSA	BITF	Forge Ahead database	Black professionals
Eastern Cape	95	1	96	12
Free State	51	1	85	8
Gauteng	1858	181	2576	902
Kwa-Zulu Natal	291	4	171	52
Mpumalanga	0	0	24	5
Northern Cape	0	0	3	1
Northern Province	0	3	20	13
Northwest	0	0	17	9
Western Cape	993	45	82	64
TOTAL	**3288**	**235**	**3074**	**1066**

Source: [89]

The high concentration of ICT professionals signifies the location advantage of Gauteng. Head Quarters of most international and national companies are situated in Gauteng. Bureaucracies of national government are located in Tswane, one of the Unicities in Gauteng. Bureaucracies of Provincial government are located in Johannesburg. Three major Unicities of South Africa are located in Gauteng. Midrand and Centurion are areas in Gauteng, which are already established locations for high technology industries including ICT.

The analysis of the policy environment showed a high level of policy developments initiated by various national government departments to create a favourable climate for ICT. The milestones on The South African ICT agenda presented to the WTO and ITU have been achieved up to the year 2001. The exclusivity of Telkom expired, and the Initial Public Offer of Telkom process also started in the year 2001 and the licensing process of the second national fixed line operator commenced. The entry of a third cellular operator was completed

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[89] Esselaar et al. 2000 *SAITIS BASELINE STUDY*. Page103.

and Cell C won the bid. Electronic Communication and Transaction Act was promulgated into law to prepare the country for E-Commerce and E-Governance. During the late part of the year 2001 a draft discussion paper on convergence policy was prepared to get ready for the convergence policy colloquium that was scheduled to take place in mid year 2003. Sentech was granted a broadband and a gateway license to be the carrier of carriers. All these developments created readiness for the next phase of The South African ICT agenda that involves the proliferation of broadband services, and the scaling up of E-commerce and E-government.

In the year 1998, Telkom acquired a Strategic Equity Partner to buy 30% of equity. A favourable climate was created for the IPO and the Second National Operator for the Fixed Network Services. The Department of Public Service initiated policies that would result in the transformation of governance through interoperability standards and the setting up of State Information Agency (SITA) to bring about the economies of scale to government ICT services.

A general pattern that emerged from the analysis of policies was the creation of policy implementing institutions to deal with the challenges brought about by ICT. These institutions were, the privatized and transformed Telkom, the creation of ICASA, the unbundling of South African Broadcasting Services (SABC) into Public Broadcasting Services (PBS) and Commercial Broadcasting Services (CBS), the creation of the Universal Service Agency to deal with challenges of equitable distribution and use of ICT across all communities, the creation of SITA to create the economies of scale across the spheres of government in the area of ICT and the creation of the National Film and Video Foundation to promote the development of local film content.

To harness and exploit the developments that emanate from different levels and sectors of society, the Gauteng Provincial Government (GPG) formulated the 1997 Trade and Industrial strategy that prioritised ICT initiatives. This strategy led to the establishment of the Innovation Hub and the Smart Province initiatives branded as Blue IQ. In line with national institutional developments, the GPG established Gauteng Shared Services Centre (GSSCS) to collaborate with SITA and other national institutions to create the economies of scale for the province. GPG also created Gauteng Economic Development Agency (GEDA) to attract investments into the Province.

The study showed that there was at least fifty billion Rand worth of initiatives rolled out. The Telkom two-pronged roll out strategy to redress the backlog of services in the disadvantaged

communities while preparing the country for global competitiveness by introducing digital networks was successful. The GPG responded proactively to the ICT challenges. Gauteng Online Program would be strategic in many ways. It targeted education to create a wide skill base for ICT. It initiated alliances with the ICT industries and the Research and Development institutions, attracted global expertise, and provided a catalyst for the initiation of E learning framework policy development for the entire country. Bottom up social impetus, characterised by high political will and a high level of ICT enterprises by Community Based Organisations, were made evident by the study.

4.5.2. Weaknesses

The major weakness identified by the study was paucity of content development initiatives. It was shown in the David Brown model that content production is made possible by content creators in the form of news, music, statistics, publishers, and education; content packaging, and context entities. On the one hand, local content markets in South Africa are fragmented by cultural and language traditions. On the other hand, South Africa is a net importer of content as manifested by the entertainment and computer software industries. Discussions on convergence in South Africa are dominated by the convergence of networks, broadcasting, telecommunications, and voice over internet protocol, to provide for broadband services, voice, data, and image. What lacks is a national digital content industry strategy, funding and economic incentives that will create a comparable advantage and export potential. The incentives provided by the Department of Trade and Industry, discussed earlier, are not necessarily geared to develop comparative advantage to the developing countries such as India, Malaysia and Korea, to mention a few. There are attempts to address these problems, as shown in the new local content quotas in the broadcasting sector, the policy for Open Source Systems (OSS) developed by the Department of Public Service, the establishment of the National Film and Video Foundation to promote production of local film and finally, the establishment of the South African broadcast Content Production and Funding Agency was mooted in the 1998 White Paper on Broadcasting. At the time when this study was conducted, no funding allocation had been done for the establishment of this Agency.

It was evident from the analysis of the initiatives by the Higher Education Institutions that the supply of ICT skills in South Africa is below the levels necessary for rapid growth. The poor supply of ICT skills can be attributed to poor supply by the education system at the matriculation level of candidates suitable for technology and commercial disciplines at the tertiary sector. The introduction of computers at the school level, unless used to address the

mission critical objectives of improving mathematics and science subjects, is not likely to improve the quality of education. The capacity for the production of ICT skills must not only be sufficient to produce new graduates but it must also cater for the reskilling of the existing workforce through crush programmes. Most of the HEI's in South Africa are not geared for this kind of service. In Gauteng, the Department of Education alone has about sixty thousand personnel who need to be imparted with new skills in order to be able to bring the Gauteng Online ideal into a reality. While the skills development institutional framework exists, accessing funds and learnerships provided by ISETT SETA is an administrative impasse.

The general lack of transformation and change management processes towards ICT based organizational styles is another weakness that needs to be addressed. Although there were several integrated development initiatives, which addressed physical infrastructure developments together with human capacity requirements, the dominant mode of thought with regard to organization and work still remains largely old and "Fordist".

Table 19   Comparison between Fordist and IT paradigms of organisations

Fordist paradigm (old)	IT (new)
Energy intensive	Information intensive
Standardised (mass production)	Customised production
Dedicated plant equipment	Flexible production systems
Single firm	Networks
Hierarchical management structures	Flat horizontal management structure
Centralisation	Distributed intelligence
Special skilling	Multiskilling
Government control and planning	Government information, regulation, coordination and Vision
Minimal training requirements	Continuous training and retraining
Rather stable product mix	Rapid change product mix

Source from UNCSTD Report. 1997:2-4.[90]

Limited transformation and change management, coupled with demanding decision making by management, will result in techno-phobia and the entrenchment of bureaucratic tendencies and red tape. The net effect of this is delays, inertia, failure to meet programme objectives and undesirable side effects.

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[90] Esselaar et al. 2000 *SAITIS BASELINE STUDY*. Page 2.

4.5.3.   Threats

It was observed in the analysis that there were a number of policies that were formulated without any fiscal allocation for implementation. In certain instances, the budgets were too low to achieve the desired societal impact. These situations can be attributed to the pressure on the government to provide for competing social needs such as housing, health, large scale electrification, water and sanitation, provision of new class rooms and maintenance of old ones, crime prevention and the alleviation of abject poverty. The net effect of these demands is the reduction of resources to futuristic initiatives such as ICT.

Low educational achievement and literacy levels are the great inhibitors of the adoption and usefulness of technologies by the majority of people. According to the Living Standard Measures "only sixteen percent of the population of South Africa has an average grade twelve educational attainment."[91] The figures for educational attainment are compounded by a high unemployment level. To conclude on this point, unemployment and low literacy levels make digital divide an inevitable reality for some disadvantaged people.

Churn, "the level of disconnect from service relative to the total subscriber base,"[92] is a threat that discounts the value of investment made in communication network. The majority of schools in previously disadvantaged communities that received Internet connectivity, and computers for ICT laboratories, do not use the facilities because ICT is not part of the schooling administration, control, and assessment systems. Cable theft cause long hours of downtime and offline, denying subscribers' services. Computer theft in the schools and cyber crime in the form of pornography, and cyber delinquency by learners was high during the pilot of Gauteng Online. The law and order enforcement agencies are not yet equipped to deal with these kinds of new crimes.

High mobility of ICT skills characterized by job hopping, brain drain and inability to attract foreign skills due to the exchange rate and attractive opportunities in the developed countries is another impediment to rapid ICT developments in South Africa. Social tensions, the level of crime and uncertainty about the future of the country are some of the reasons why highly qualified personnel emigrate, and South Africa does not have strategies to counter the brain drain.

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[91] Langschidt.T, Second Edition. Pages 2-9.

[92] Newton, H.15th Edition. Page 172

The global cooling down of the ICT industries is another impediment for rapid growth of the ICT industries in South Africa. Local and foreign investors tend to direct their investments to well-established industries. The difficulty to attract capital for ICT initiatives in South Africa was evident in the delays in getting the strategic equity partner for the Second Network Operator and Telkom Initial Public Offer process.

Chapter 5

Opportunities and challenges – exploring policy options

Earlier, it was said that Gauteng has a location advantage. Most of the time opportunities that exist for South Africa affect Gauteng positively. The balanced assessment of South African ICT opportunities was presented in the World Markets Research Centre Rating of the

Table 20   April 2001 World Markets Research Centre Ratings of South Africa[93]

Risk Factors	Rating	Weight
Overall country risk rating	2.38	25.0 %
Regulatory environment	1.50	9.0%
Planned regulatory adjustments	3.00	4.0%
Obstacles to competition in fixed communication	5.0	3.50%
Obstacles to competition in mobile communications	1.50	3.50%
Obstacles to competition in equipment supply	1.50	3.50%
Obstacles to competition in satellite communications	3.00	2.25%
Obstacles to competition to cable communications	3.00	2.25%
Limitation of ownership in that industry	4.00	2.0%
Local attitude towards foreign investment in the industry	1.00	5.00%
Opportunity Factors		
Taxation rates	1.5	3%
Local availability of skilled workforce	1	3.5%
Market potential (fixed line)	1	7%
Market potential (mobile)	1	7%
Market potential (equipment)	1	7%
Market potential (satellite)	2	4.5%
Local availability of credit	1	3%
Market potential (cable)	2	4.5%

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[93] World Markets Research Centre. 2001. South African Ratings and Country Regulatory Analysis. Pages 45. 12 Farringdon Road Cardinal Tower. London.

Risk-Rating (1-Best, 5-Worst)	2.51	60%
Opportunity Rating (1-Best, 5-Worst)	1.3	40%
Overall Weighting (1-Best, 5-Worst)	**2.12**	50%

The World Markets Research Centre Ratings use an ordinal scale whereby a score of one indicates best rating and the score of five indicates worst rating. Highly attractive markets are given a rating of one and unattractive markets are rated at five. The weights reflect a general socio economic climate of a country. The table shows that the overall opportunity rating for South Africa is above average. This means that the country reasonably satisfies the requirements of investors. The table also shows different ratings for regulatory environment and planned regulatory adjustments, which is rated more risky. These differences can be attributed to the fact that ICASA in 2001 was yet to conduct the review of ownership of broadcasting media in terms of Section 48, 49 and 50 of the IBA Act. According to these provisions, no foreign interests could own more than twenty percent of the broadcasting license in South Africa. Cross media ownership was limited to only two in the category of Frequency Modulation (FM), two in the category of Medium Wave and one television license in the same geographic area. SABC as a national broadcaster was excluded from these provisions. This state of affairs, together with the protectionist tendencies of the monopoly of the SABC did not auger well with foreign investors. The situation that led to a poor rating with regard to obstacles to competition in fixed line industry was the Telkom exclusivity, again a situation which was seen by investors as a delay of opening telecoms to competition. This situation has since changed. The exclusivity period expired in May 2001. Nevertheless, the point made is that the ratings show that South Africa is a fair consideration to world investors.

To turn opportunities into concrete value, minimise risks, and the impact of weaknesses and threats, is a daunting challenge that requires a strategic vision informed by knowledge of the dynamics of the ICT and knowledge industries. The discussion of the IT industry evolution shows different thrusts at different times. From that perspective, it is evident that the first challenge for Gauteng is to deal with PC centric, Networks centric, and Content centric challenges simultaneously in an integrated manner. Because of the legacy of apartheid, South Africa went through the evolutionary process from a position of disadvantage. Notwithstanding rapid progress that has taken place since the new dispensation; some communities still, do not have access to ICT facilities. In these communities, the priorities are about the provision of basic survival needs such as clean water, housing, and sanitation.

The paradoxical challenge that faces the country is to deal with the backlogs of the past and futuristic initiatives such as the roll out of ICT in a socially accepted manner.

The ability to respond to the challenge discussed in the previous paragraph requires an ICT sector development policy and strategy that goes beyond the expressions in the existing provincial industrial strategy. Such a strategy must address mission critical requirements for economic growth and social development initiatives such as E-education, E-governance, and digitisation of creative and cultural industries. The projects that were identified in this study can be integrated into a Gauteng Province Information Infrastructure, GPII, that links up with the Gauteng Government Provincial Service Portals, national networks, libraries, schools, universities, research institutions, and Community Based ICT, all running on the same protocols with high speed internet services.

Firstly, the strategy must include ways of curbing the brain drain and attract human and material capital to roll out convergence services and to manage large-scale network enterprises. The formation of local and foreign collaboration partnerships framework would form the basis of this strategy. The framework must specify the role of the private sector with regard to the production of electronic goods and services. It must also specify how Gauteng Provincial Government will support the private sector in terms of incentives, beyond those provided by national government. The policies and strategies must not only be responsive to the needs and opportunities of large-scale institutions and organizations. It must also cater and support SMME's, NGO's and CBO's and entrepreneurial individuals through commissioned and unsolicited grant funding, availability of venture capital and expert support and export drive.

The second strategic challenge for Gauteng is the creation of institutional capacity to monitor the penetration and ICT developments in the province. The Provincial planners and decision makers need to be provided with an analysis of the implications of policies generated by national bodies, so that they can participate in an informed and knowledgeable way in the policy processes and institutions such as the National Council of Provinces. The value of ICT in society and smart growth and development is determined by the extent of ubiquitous, inclusive and affordable access to ICT by the greater majority of citizens. The investment in ICT can be justified by the exponential growth of ICT usage, and the opportunities it provides for the creation of prosperity. It is often said that ICT destroy jobs, but the new jobs and opportunities it creates are not recognised, a situation which results in techno phobia and social resistance. Social indicators need to be designed to measure the achievement of

mission critical initiatives and desirable social ends. These social indicators must be aligned with new measures of aggregation such as bits per capita and these measures must be communicated to the citizens and to the bodies with legitimising powers such as the SADC ICT bodies, the ITU and the WTO.

The third strategic challenge is the positioning of Gauteng as one of the nodes in the map of global smart spaces. Relevant concepts and constructs in this regard have been discussed, The Smart City concept, and how the diffusion of ICT is partly determined by the position of a place in a global hierarchy. It was also stated that this study would determine whether Gauteng Smart Province initiatives were in line with these concepts and constructs. It was discussed how Gauteng would benefit because of location advantage, from the improvements in the ratings of the South African telecommunication sector. To craft a positioning strategy is an initiative that needs a pragmatic combination of all these factors together with those mentioned in Mowlana's extended notion of communication. It is an initiative that must be underpinned by knowledge of the characteristics of global and smart city phenomenon, the processes of creating global spaces and pertinent governance issues.

According to Henry Wai-chung Yeung, "global city formation can be conceptualised as a deliberate effort by strategic actors in the cities-states to extend their influence in relation and beyond their limited geographic spaces. These global city regions come to function increasingly as regional motors of the global economy, that is, as dynamic local networks of economic relationships caught up in more extended world-wide networks of inter-regional competition and exchange. Large global city-regions function as territorial platforms for firms to compete in global markets. These firms are embedded in the relational assets of these global city regions….The mechanisms of emergence and governance of these global city regions are participation in material influence, engagement in discursive practices, and building institutional capacity." [94]

Participation in material influence involves facilitation of flows of capital, goods, services, expertise, people, and information through urban planning processes that establish, Central Business Districts, new towns, industrial estates, transport and communication infrastructure that are distinct to global spaces of flows. Discursive practices "refer to how some countries construct the myth of global cities to gain social and political support. The distinctive feature is to place the politics of urban development in the context of broader forces at the level of

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[94] Wai-chung Yeung, Henry. Annual 2000 Lecture. Page 8

the national, and in some cases, international political economy."[95] The construction of the myth of a global city is made possible by the creation of coalitions formed by politicians, business people, chambers of commerce and non governmental organizations, which have vested interest in the global agenda of a particular city. Governance consists in realizing that the political constituencies of a city stretch beyond local communities to include international communities. The liberalisation of the political economy of the world is embraced in all facets of government. In this regard, Held argued that "the emergence of international regimes of governance has transformed the nature of global political economy such that national governments are increasingly locked into an array of global, regional and multilateral system of governance, resulting in a world of overlapping communities of fate." [96]

The cities within Gauteng Province do have some elements of global spaces of flow. The Central Business District of Johannesburg is undergoing urban renewal along the lines of global cities such as New York and London. It is positioned to be the Centre of African Trade. The Johannesburg International Airport has been revitalised to meet the demands of international traffic. Gauteng is the location of one of the world's largest landlocked container ports, and it is the location of the National Stock Exchange. Pretoria is the location of international embassies. Industrial estate developments in all the three cities within Gauteng are done in terms of the Industrial Development Zone Programme as stipulated in the Manufacturing Development Act no 187 of 1993 Regulation 3(b)(1) which reads, "The Minister shall only proclaim an area as suitable for development as an Industrial Development Zone if the Minister has consulted with Provincial and Local Governments in the area in which the proposed Industrial Development Zone is to be located."

There are some discursive practice facilities in Gauteng. Firstly there is the Sandton International Convention Centre which has global standard facilities. Gauteng hosted a United Nation Summit on Sustainable Development. This event resulted in the upgrading of transport, communication and security systems to the global standards. The New Partnership for Africa (NEPAD) is driven from Pretoria, thus making the city a regional space of diplomatic flows.

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[95] Wai-chung Yeung, Henry. Annual Lecture 2000. Page 9.

[96] Held et al 1999. Page 55

Although some elements and characteristic of global cities are found in the cities of Gauteng there is a need to scale up efforts to position these cities as global spaces of flow. This is more the case because of the intensification of competition by other cities in South Africa to acquire the status of global spaces of flow. For instance, the City of Cape Town is succeeding in positioning itself as a Global Gateway into the World. This is made possible by the fact that the Western Cape Provincial Government formulated a policy on the knowledge economy, which underpinned initiatives such as Cape Online. Durban has succeeded in positioning itself as a global convention centre through deliberate efforts of the City Council in collaboration with business coalition and the tourism industry.

The creation of the global myth of a city also depends on the extent to which the city is famous in creating the body of knowledge about global cities. This is particularly the case for cities in the developing countries. The body of knowledge and discourse, in various disciplines such as sociology, knowledge economics, urban studies, policy and ICT must start to reflect the context and the realities of the developing world. By and large paradigms in global cities studies tend to be Euro-centric and they are imported into the developing world through the adoption of world best practises by strategic actors. The experiences of the emerging cities tend to be shunned and their role in the map of global spaces of flow tends to be restricted to that of "command and control centres responsible for channelling trans-national flows into their home countries. They do not host the origin of significant outward flows to service the global economy, as often expected in our definitions of global cities."[97]

The point made in this argument is that the discursive practices need to be articulated into a positioning strategy and the legitimizing power of the coalitions need to be expanded through the creation and communication of the body of knowledge about how the cities in Gauteng emerge as smart cities. The creation, packaging and distribution of this knowledge requires collaboration and coalitions of the political leadership, ICT industries, HEI's and structures of civil society. The interests of these coalitions must form chapters of the national coalitions such as the Presidential National Commission on Information Society and Development (PNC-ISAD) and NEPAD. They must also be represented in global formations such as the International "Smart Cities Institute, Smart Growth Network,"[98] and the World Economic

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[97] Wai-chung Yeung,Henry. Annual Lecture 2000. Page 6.

[98] The international Smart Cities Institute mission statement is to facilitate cooperation among international cities through information sharing and collaboration among its members, especially as it relates to the use and application of information and telecommunications technologies, for the purpose

Forum. These social networks must be backed up by ICT devices such as web sites, online publicity campaigns and community networks.

With regard to governance, the Provincial Government and Municipalities must create capacity to manage coalitions in a similar manner as the office of the President has done. The foreign and local business chambers, the HEI's and special interest groups must be represented in these coalitions. These coalitions would be the driving force of the discursive practices and favourable global positioning of the cities in the Province.

What is emphasized in this discussion is the fact that ICT are tools used to achieve among other things, the formation and the maintenance of relationships of value through the creation and dissemination of knowledge and information as part of the flows that auger the image of a particular space. The topology of ICT must reflect the logic map of dominant social networks to which Gauteng is affiliated. These maps must be part of urban planning in a similar manner as the roads, highways and airways are part of urban planning and they are recognized as signifiers of population movements between nodes of settlements.

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of developing or enhancing a community's social, cultural and economic position and for mutual progress. The Smart Growth Network invests time, attention and resources in restoring community and vitality to centre cities.

Chapter 6

Conclusion: The value of the study.

The purpose of this thesis was stated to be the exploration of the concept of Information Communication Technologies and its institutionalisation in Gauteng. The developed conceptual framework would then be used in the research to be conducted as academic requirements for the thesis. It is also hoped that the developed conceptual framework would facilitate policy formulation and strategic planning in Gauteng.

The thesis purported two hypotheses. Firstly, that the socio-economic context of ICT developments in South Africa have made Gauteng ready for rapid adoption and diffusion process. Secondly, that the developments and initiatives since the beginning of the democratic dispensation have reasonably redressed the backlogs in the previously disadvantaged communities while at the same time putting the country, and Gauteng in particular, in a front position in a continent and a comparable advantage to most of the middle income countries of the world.

The processes of adoption and diffusion were considered key drivers of institutionalisation of ICT, and therefore theoretical frameworks were presented.

Analysis indicates that the ICT concept is a complex of signalling systems, made of physical infrastructure, computing, and content creation, the convergence of which is made possible by digital technologies. It is also a complex that is historically and futuristically determined by economic, social and technological factors, acting simultaneously. It is a complex that is driven by and is also driving integration or alienation of societies, communities, and individuals into various networks of flow, ranging from global to national to communal and to intra-organizational networks. The processes of integration and disintegration into networks create new social formations and inter and intra relationships between these social formations. It is important to recognize that ICT are about two revolutions, knowledge and information revolution, and the digital transmission of signals. Knowledge and information have always had instrumental value to mankind. What sets apart ICT is their ability to produce and handle information intelligently, even better than human beings in some

instances. The Internet revolution has democratised the ICT in that it is far more affordable than the voice telephony and other means of communication.

The multidimensional nature of ICT, its adoption and diffusion is presented in the diagram below. It shows that the diffusion process itself is a complex interaction and convergence of systems centric, PC centric and network centric and content centric phases of the ICT evolution. It would seem that research that is more theoretical should be conducted on the subject of the diffusion of ICT, and in particular on the transformational model.

Diagram 3 **Graphical representation of the phases of ICT's evolution and growth. Adaptation from Moschella** [99]
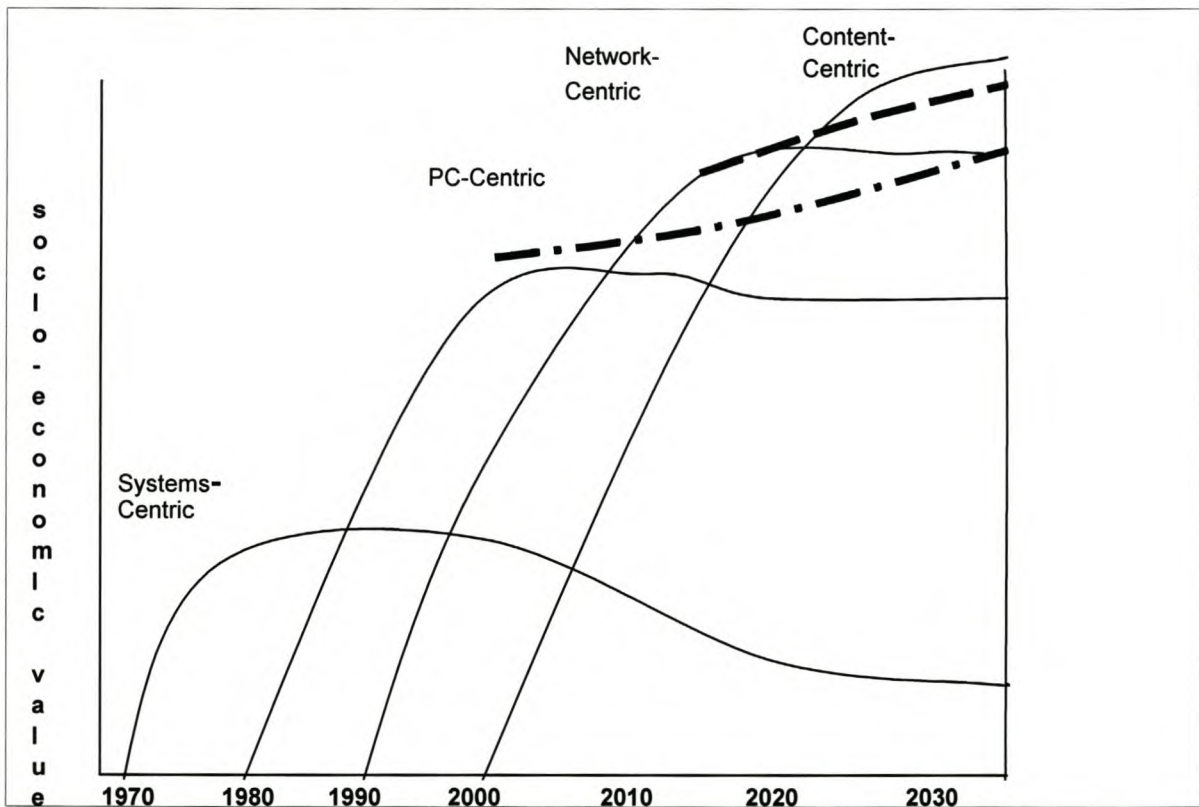
For now, it suffices to say the graphs in the diagram show that maturity of the PC centric phase has happened and rapid growth of the network centric phase and the early stage of the content centric phase are happening currently. In the developing countries, including South Africa the situation is different. The rapid growth of PC centricity is happening parallel to network centricity. This is what is denoted by the dotted lines. It was for this reason that

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[99] Moschella, DC.1997. Page 98.

earlier it was said that the challenge for South Africa is the simultaneous management of convergence of PC centricity, network centricity and content centricity.

The analysis and synthesis of findings in this study show that since the new democratic dispensation South Africa has responded positively to the ICT challenges in a manner that created an advantage for the Gauteng Province. The province itself responded proactively to the challenges in a manner that has poised it for rapid growth along a diffusion curve as presented in the diagram below.

Rapid growth means a combination of the extent and the intensity of institutional intervention in terms of investment, creation of a conducive regulatory climate, availability of incentives for innovations, the extent and intensity of pro-activity by Gauteng actors, the ubiquitiousness of interconnected computers and other citizens points of presence and attempts to make citizens adopt ICT. All these, as characteristics of early phase as shown in the diagram below, have taken place. The year 2003 was regarded as a cut point for rapid growth to start to happen. Most of the interventions necessary for rapid growth have taken place. These are expansion of networks, policy and programmes in E-governance, security and privacy issues have taken place, a framework for convergence.

Diagram 4 Graphical representation of ICT's Life Cycle. Adaptation from Moschella [100]

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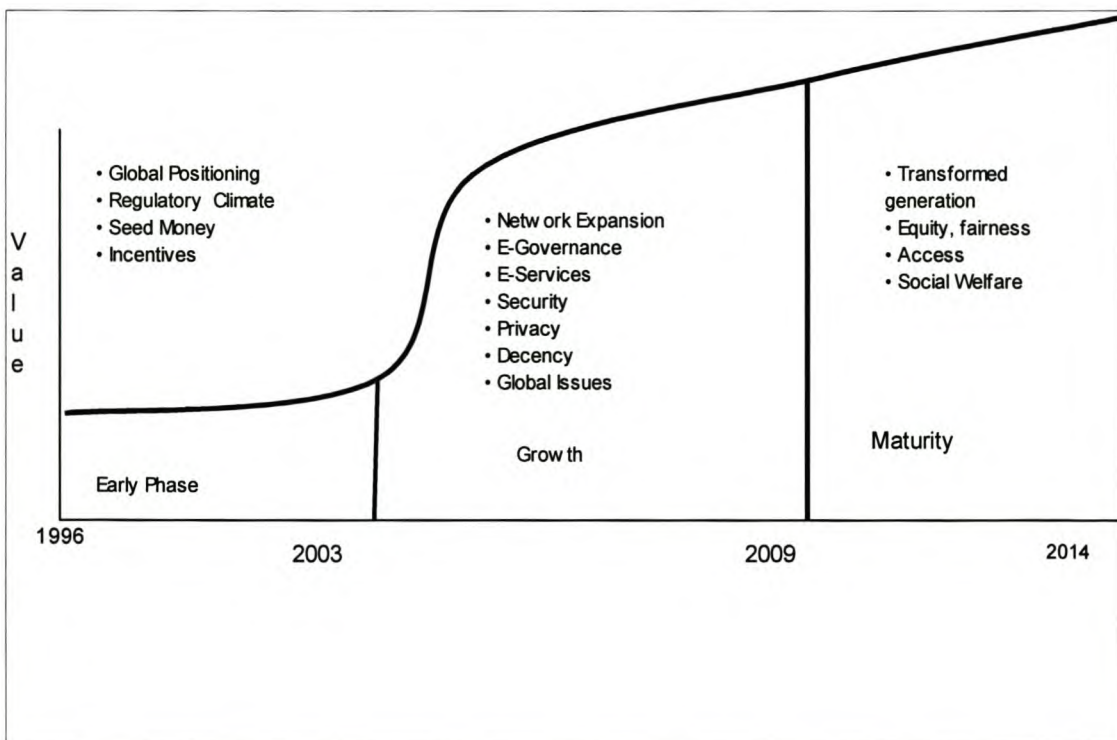
[100] Moschella, DC.1997. Page. 257.

While it is accepted that on the whole most of the interventions necessary for rapid growth to occur are in place, there are some challenges that still need to be addressed. The first challenge involves human capital development, which is characterized by undersupply of graduates in disciplines related to ICT by Higher Education Institutions. The undersupply of skills is also a reflection of poor supply by the schooling system of eligible candidates for ICT related disciplines. The scarcity problem of human capital is further compounded by the brain drain out of South Africa, which is also a manifestation of the attitudes of the technical elite about their career and future prospects in South Africa. The second challenge concerns the creation of Social Indicators and monitoring of developments. The new aggregate measure, the bits per capita, has been developed, but this measure is not yet used in South Africa. This challenge requires the institutions responsible for developing socio-economic indicators to work in collaboration with government to institute this measure. Gauteng Provincial Government can champion this cause by sponsoring a pilot programme as a demonstration of commitment to ICT developments in the country. The third challenge, involves global positioning of Gauteng as part of the global map of ICT. A niche needs to be developed by unique characterisation of Gauteng cities in terms of town planning and smart physical infrastructure beyond the current notions of the Smart Province. Discursive processes and governance practices that are accepted by the global community as characteristic of Smart Places need to be put in place. A body of knowledge about the Smart Places in the context of Southern Africa and the developing countries need to be created in collaboration with the Higher Education and Research Institutions, and major ICT players. This knowledge must be communicated to the world as part of the outflows.

It must be recognized that ICT consists of two revolutions, the communication revolution, and the knowledge revolution. In terms of Metcalfe's law, investment in networks must be balanced and measured in terms of well-defined socio-economic internalities and externalities.

It is hoped that this study will facilitate discussions and planning of ICT in the Gauteng Province. It is a knowledge product, relevant to policy analysis and programme development in South Africa and in Gauteng in particular. Most of the body of knowledge used for planning and policy development in South Africa originates from other places, and it comes in the form of world best practice, sometimes with little relevance to the South African context. Figures and statistics in the imported material usually reflect milieus other than South Africa. The tables used in this study are the reflection of the South African milieu. The

study also highlights the importance of seeing ICT in a broader perspective of communication studies that goes beyond telecommunications. The study has educational value. It is a product of education in knowledge dynamics, value and policy analysis and, therefore, it can be used as an example of the application of disciplinary knowledge in the area of ICT. Most of all the study has strategic value for Gauteng and South Africa. It shows investment that has been done in Gauteng Province by various institutions. It also shows strengths, weaknesses, opportunities, and challenges to put Gauteng as a regional node in the global spaces of flows. It also alludes to the processes that can be applied to achieve this end. In that regard the following recommendation are made:

Knowledge Development and Management There is a need to develop a body of theoretical knowledge on the concept of ICT because of its insignificance to the provincial planning. The province must set aside R & D budget to commission and collaborate with research institutions, academic and applied research for producing ICT value. The study indicated shortage of capacity in the HEIs within Gauteng. The Provincial Government must collaborate with the National Departments of Labour and of Education to produced a skills plan that combines education and training programmes with clear short-term , medium and long-term goals. The skills plan must include, curbing of brain drain and importation of skills.

Entrepreneurial development

This is one of the key requirements. The province must create its own incentive scheme and harness these with those provided by the Department of Trade and Industry to attract investment and Gauteng bound relocation of entrepreneurs.

Collaboration with the ICT industry

Calls for industry participation to spearhead ICT developments together with government abound in several documents. It was reported in this thesis that South African ICT is fragmented. The relationship of industry with the government to co-create ICT future needs to be nurtured.. Initial steps towards this course have been taken. The key industry players have entered into a Memorandum of Understanding (MOU) to pilot Gauteng Online, a Networked Education System to integrate the ends of Outcome Based Education System and e- learning. However, collaboration with industry needs to be focused on developing a Gauteng Province Information Infrastructure.

Positioning

The province has many successes in the area of ICT and future developments. What is lacking is a positioning strategy to highlight success and create a competitive advantage in terms of international relations. For an example, a diplomatic strategy crafted in conjunction with the South African embassies abroad about successes in Gauteng need to be crafted. Media relations including global, which goes beyond mere isolated media briefings by politicians, need to be formulated. Public diplomacy strategy whereby local media is used to create confidence in local communities needs to be in place. This particular approach will go a long way to address the crisis of service delivery, which compromises any successes by government at large. Local, national and international summits need to be utilised to make Gauteng a conference destination for ICT.

Establishment of Gauteng ICT Centre of Excellence

The study comes at the time when scenarios for 2014, twenty years of democracy are currently being developed in Gauteng. It is hoped that the study will be found useful for that process.

The offices of the State President have created the Presidential National Commission and Information Society and Development PNC –ISAD. The Department of Public Service and Administration DPSA has also created GITO. Gauteng Provincial Government must create similar structures to coordinate and liaise intergovernmental initiatives, formulate policy, and manage programmes. The Gauteng Provincial Government has established similar institutional capacity structures such as Gauteng Manufacturing Advisory Centre (GAUMEC), to spearhead high value added manufacturing, SMME sector. It has also established the Gauteng Film Office to promote Local and Foreign Film production in the province.

All these initiatives must be guided by understanding that ICT factors of production are highly mobile and competitive across the world, hence the need for an aggressive strategy to create an attractive environment for ICT entrepreneurs.

APPENDIX 1

ICT CLASSIFICATION SYSTEM

ICT MARKET					
VALUE CHAIN SEGMENT	APPLICATIONS PORTFOLIO	YES	N O	MARKET SIZE IN RANDS	
				National %	Gauteng %
CONTENT	Music				
News	Sports				
Videos	Packaged Software				
Portals	Arts Industry				
e-Books	Games				
	Database				
	Film				
	Publishing				
TOTAL					
SERVICE DELIVERY	PSTN				
	Satellite				
	Cellular				
	ISP				
	e-Mail				
	Website				
	Electronic Billboards				
	Broadcasting				
	Paging				
	Call Centre				
	Transmitter				
	Live Shows				
TOTAL					
INFORMATION CONSUMPTION (CPE)	Television				
	Radio				
	PCs				
	Telephone				
	Terminals e.g. ATM; Kiosks				
	MPCC's				
	Video Phone				
	Hi-Fi				
	Electronic Media				
TOTAL					
PROFFESIONAL SERVICES	ICT Research				
	Information Services				
	Education & Training				
	Skill Development				
	Customer Support				
	Other: (Specify)				

APPENDIX 2

QUESTIONNAIRES

2	POLICIES [Legislation/Regulations]				
	Has your Institution/Organisation have policies that will impact on Gauteng				**?**
	Yes ☐ No ☐	If yes, please fill in the form			
2.1	Institution/ Organization				
2.2	Title & Reference of Policy/Leg.				
2.3	Objectives of Policy				
2.4	Key issues addressed				

2.5	Temporal Dimension	Historical	Current	Intended	
2.6	Policy Scope	Global			
		National			
		Provincial			
		Municipal			
2.7	Policy Implementation				
2.7.1	Policy Life Time	Initiation Date			
		Termination date			
		Project Cycle			
2.7.2	Policy Admin & Enforcement				
2.7.2.1	Admin Budget by Province (Gauteng)				
2.7.2.2	Personnel by Province (Gauteng)				
	Others				
2.7.3	Policy Performance in Gauteng Province				
	Key Performance Indicators-1				
	KPI-2				
	KPI-3				
	KPI-4				
	KPI-5				
	KPI-6				
	KPI-7				
	KPI-8				
	KPI-9				

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3	QUESTIONNAIRE FIELDS [For Physical Projects]			
	Has your Institution/Organisation previously/currently/future undertaken **TO IMPLEMENT** ICT project/s in Gauteng ? Yes No If yes, please fill in the form			

3.1	**Organisation/ Institution**			
3.2	**Project Title** as a Public Service Delivery			
3.3	**Project Manager** of Service provided			
	Name:			
	Telephone:			
	Email:			
	Mobile:			
3.4	**Aim of Project**			
3.5	**Key issues addressed** within the service provided			

3.6	**Temporal Dimension**	Historical	Current	Intended	

3.7	**Project Scope**		
	Global		
	National		
	Provincial		
	Municipal		

3.8 **Input Resources**

3.8.1	*Project Life in Time*		
	Initiation Date		
	Termination date		
	Project Cycle		

3.8.2 *Capitalization*

3.8.2.1	*Source of Capital*	Completed Rands/Cents	Current Rands/Cents	Anticipated Rands/Cents	Total Rands/Cents
	Fiscus (GVT Expenditure)				
	Private Sector				
	Donations by Foreign Govts				
	Development Funding				
	Others				
	Total				

3.9	**Project Performance** in Gauteng Province	
	Key Performance Indicators-1	
	KPI-2	
	KPI-3	
	KPI-4	
	KPI-5	
	KPI-6	
	KPI-7	
	KPI-8	
	KPI-9	

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4	QUESTIONNAIRE FIELDS [For Social Projects]

Has your Institution/Organisation previously/currently/future undertaken TO IMPLEMENT ICT Human Development in Gauteng ? | Yes | No |

If yes, please fill in the form

4.1	Organisation/ Institution	
4.2	Project Title as a Public Service Delivery	
4.3	Project Manager of Service provided	
	Name:	
	Telephone:	
	Email:	
	Mobile:	
4.4	Aim of Project	
4.5	Key issues addressed within the service provided	

4.6	Temporal Dimension	Historical	Current	Intended	

4.7	Project Scope		
	Global		
	National		
	Provincial		
	Municipal		

4.8 Input Resources

4.8.1	Project Life in Time	Initiation Date	
		Termination date	
		Project Cycle	

4.8.2 Capitalization

4.8.2.1	Source of Capital	Completed Rands/Cents	Current Rands/Cents	Anticipated Rands/Cents	Total Rands/Cents
	Fiscus (GVT Expenditure)				
	Private Sector				
	Donations by Foreign Govts				
	Development Funding				
	Others				
	Total				

4.9	Project Performance in Gauteng Province	
	Key Performance Indicators-1	
	KPI-2	
	KPI-3	
	KPI-4	
	KPI-5	
	KPI-6	
	KPI-7	
	KPI-8	
	KPI-9	

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APPENDIX 3

POPULATION OF STUDY

Population of Study

0.1 Global Institutions	G-7/8 MINISTERIAL CONFERENCE ON INFORMATION SOCIETY		IDRC	ITU - INTERNATIONAL TELECOMMUNICATIONS UNION	WORLD TRADE ORGANIZATION

1 Government — Govt. Initiatives

1.1 National Ministries

President	Dep. Pres.						
Agric	Arts	Comm	Correctional	Defense	Education	Environ+Tour	Finance
Foreign	Health	Home Aff	Housing	Intelli	Justice+Const	Labour	Min+Energy
Presidents	Provincial	Public Ent	Public serv	Public Works	Safety + Sec	Sports + Rec	
DTI	Trans	Water	Welfare				

1.2 Provincial Gov and provincial ministries

Premier				
Agric	Local Gov	Education	Finance	Health
Housing	Safety	Transport	Soc. Services	Sports+Rec

1.3 Municipalities

Unicities	Joburg	Tshwane	Ekurhuleni
DC's	DC-1	DC-2	DC-3

1.4 Parastatals
Telkom
Eskom
Transnet
SABC
Sentech
SITA
POS

1.5 Private Sector
Content provision
Service delivery
Consumer digital Equipment

1.6 Education (Gauteng)

UNIVERSITIES	RAU
	PRETORIA
	WITS
	VISTA
TECHNICONS	Gauteng North
	Pretoria
	Vaal Triangle

1.7 Developmental Agencies

1.8 Foreign Government

1.9 Donor Agencies
Local
Foreign
Joint Venture

1.10 NGO's

1.11 Social Formation Projects
(Social Groupings formed through voluntary association to address ICT interests)

CATEGORY	Political Parties		Sports Groups	Emergent Groups	Business Groups	Unions	Arts & Culture Groups	Religious Institutions
GROUPS	PAC	IFP	SAFA	SAFCOB	BITF	COSATU	MUSIC	SA Council of Churches
	ANC	DA	SARFU	ABASA	BMF	NACTU	THEATRE	Jewish Faith
	ACDP		NCB		ABASA	NAPTOSA	VISUAL	Islam
			NBC				FINE	Hindu
			SAAA					
			Golf-Group					

APPENDIX 4

POLICY JOURNAL

SECTOR	DEPARTMENTS	NAME OF POLICY	POLICY SCOPE
NATIONAL GOVERNMENT MINISTRIES	**ARTS AND CULTURE, SCIENCE & TECHNOLOGY**	1.Green Paper on Arts & Culture and Heritage	National
	COMMUNICATIONS	2. Children's Media Policy	National
		3. Community Electronic Multi-media Policy	National
		4. e-Commerce Policy and Law of South Africa	National
		5. Digital Broadcasting Policy	National
		6. Disability Policy	National
		South African Content Policy	National
		7. Policy Strategy on Internet	National
		8. Telecommunications Act, 1996	National
		9. Telecommunications Policy Directions (Government Gazette No. 22169 23 March 2001	National
	EDUCATION	11. Education Information Policy	National
		12. South African Schools Act, 1995	National
		13. National Education Policy Act No 27, 1995	National
	LABOUR	14 Immigration Act	National
		15. Green Paper on Skills Development	National
		16. Employment Creation Act	National
	PUBLIC ENTERPRISE	17. Restructuring of State-Owned Enterprises (SOEs)	National
	PUBLIC SERVICE	18 e-Governance Policy	National
		19. Media Policy, Medium-Term Expenditure Policy	
		20. Minimum Information Interoperability Standards (MIOS)	National
		21. Procurement Management Policy	National
		22. Sita Act of 1998	National
		23. Sita Amendment Bill	National
REGULATORY BODIES	**ICASA**	24.Licensing of Value Added Network Service Operators	National
		25.South African Content on Television and Radio Position Paper and Regulations	National
PROVINCIAL GOVERNMENT	**FINANCE AND ECONOMICS**	26. Gauteng Tender 11 (GT-11)	Provincial
	HOUSING	27. Electrification of Informal Settlement	National
MUNICIPALITI	**GAUTENG –JHB METROPOLITAN**	28. Information Technology Policy	Municipal

ES	COUNCIL (GJMC)		
PARASTATALS	SABC	29. Skills Development Act No.97, 1988	National
		30. Broadcasting Act	National
	STATE INFORMATION TECHNOLOGY AGENCY (SITA)	31. Sita Act of 1998	National
	TELKOM	32.Telecommunications Act No.103 , 1996	National
·		33. Telecommunications Amendment Act No.12, 1997	National
	TRANSTEL	33. Telecommunications Policy 18.8.2001	National
RELIGIOUS INSTITUTIONS	ISLAMIC	34.Islamic Centre of South Africa	Provincial
GLOBAL INSTITUTIONS	INTERNATIONAL COMMUNICATIONS UNION (ITU)	35. ITU World Telecommunications Policy Forum	Global
	WORLD TRADE ORGANISATION (WTO)	36. ITU Electronic Commerce for Developing Countries (EC-DC), 1998	Global

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APPENDIX 5

PROJECTS JOURNAL

<table>
<tr><td rowspan="2"></td><th>DEPARTMENTS</th><th>NAME OF PROJECT</th><th>PROJECT SCOPE</th><th>VALUE</th></tr>
<tr><td colspan="4"></td></tr>
<tr><td rowspan="29">NATIONAL GOVERNMENT MINISTRIES</td><td>AGRICULTURE</td><td>1.Agricultural Geographical Information Systems (AGIS)</td><td>National</td><td>45, 000,000</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="4">ARTS, CULTURE & SCIENCE TECHNOLOGY</td><td>2. Community Arts and Development</td><td>National</td><td>9,036,000</td></tr>
<tr><td>3.GODISA</td><td>National</td><td>Not Available</td></tr>
<tr><td>3. "Music Industry Task Team" (MITT).</td><td>National</td><td>40,000,000</td></tr>
<tr><td>4.Public Understanding of Science & Technology (PUSIET)</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="10">COMMUNICATION</td><td>5.Citizens Post Offices (CPOs)</td><td>National</td><td>Not Available</td></tr>
<tr><td>6. Dedicated Educational ICT Services</td><td>National</td><td>Not Available</td></tr>
<tr><td>7. Doc Portal</td><td>National</td><td>Not Available</td></tr>
<tr><td>8 ICT Education Strategy</td><td>National</td><td>Not Available</td></tr>
<tr><td>9.ICT Incubator</td><td>National</td><td>Not Available</td></tr>
<tr><td>10.Internet and ICT awareness</td><td>National</td><td>Not Available</td></tr>
<tr><td>11.Multimedia Services</td><td>National</td><td>Not Available</td></tr>
<tr><td>12. Multi Purpose Community Centres (MPPCs)</td><td>National</td><td>Not Available</td></tr>
<tr><td>13. Public Emergency Call Centre</td><td>National</td><td>Not Available</td></tr>
<tr><td>14.Restructuring of SABC</td><td>National</td><td>Not Available</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="5">EDUCATION</td><td>15. Annual School Poverty</td><td>National</td><td>Not Available</td></tr>
<tr><td>16. ABET Survey</td><td>National</td><td>Not Available</td></tr>
<tr><td>17. FET MIS</td><td>National</td><td>Not Available</td></tr>
<tr><td>18. School Register of needs</td><td>National</td><td>Not Available</td></tr>
<tr><td>19. Snap Survey</td><td>National</td><td>Not Available</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>ENVIRONMENTAL AFFAIRS</td><td>20.Poverty Relief Programme</td><td>National</td><td>24,000,000</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>FINANCE & ECONOMIC AFFAIRS</td><td>21.Electronic Tendering System</td><td>National</td><td>Not Available</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>HEALTH</td><td>22.Telemedicine</td><td>National</td><td>22,000,000</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>HOME AFFAIRS</td><td>23.Home Affairs National Identification System (HANIS)</td><td>National</td><td>930,000,000</td></tr>
</table>

JUSTICE	24.e-Justice	National	1,052,000,000
LABOUR	25."Indlela"	National	219,000,000
PROVINCIAL & LOCAL GOVERNMENT	26. Departmental Website	National	230,000,000
	27. Integrated Sustainance of Rural Development Programme (ISDR)	National	103,000,000
PUBLIC ENTERPRISE	28. Arivia.com	National	Not Available
	29.Partial privatization of Telkom (1998)	National	Not Available
	30.Second National Operator (SNO)	National	Not Available
	31.Restructuring State Owned Enterprises	National	Not Available
PUBLIC ENTERPRISE/ /ENERGY/TRANSPORT/ DEFENCE AND TELECOMS	32.Alternate Public Service Delivery	National	Not Available
PUBLIC SERVICE	33.e-Governance Project	National	Not Available
	34.Handbook on Minimum Interoperability Standards (MIOS)	National	Not Available
	35ateway Project	National	Not Available
	36.Open Source Software	National	Not Available
	37.Government Information Technology Officers Council (GITO)	National	Not Available
	38.Centre of Public Service Innovation (CPSI)	National	Not Available
SAFETY & SECURITY	39. Law Enforcement (Department's own TV Channel on DSTV)	National	1,700,000
	40. Departmental Website	National	272,000
	41. Law Enforcement through Media	National	700,000
TRADE & INDUSTRY TRANSPORT	42. Arrive Alive	National	750,000
	43.Critical Infrastructure Programme	National	Not Available
	44. Departmental Website	National	35,850,000
	45. Small Medium Entrepreneurial Development Programme (SMEDP)	National	320,000
	46.Strategic Industry Programme (SIP)	National	Not Available
	47.Support Programme for Industrial Innovation (SPII)	National	Not Available
	Video Conference Room	National	Not Available

TOTAL MONETARY VALUE FOR NATIONAL GOVERNMENT INSTITUTIONS			2,483,158,000
PROVINCIAL GOVERNMENT	AGRICULTURE	49.. "DACEL" Website	Provincial	33,000
		37. Agriculture Production Technology & Resource Info System	Provincial	2,380,000
		38. Technological Services	Provincial	2,250,000,000
		39. Transport, Commission & Environment Information Management System	Provincial	Not Available
	EDUCATION	40. Two Computers per school	Provincial	8,100,000
		41. GautengOnline.com	Provincial	500,000,000
	FINANCE & ECONOMIC AFFAIRS	42. " Smart Province" e-GPG	Provincial	34,000,000
		43. Blue IQ, 'The Innovation Hub	Provincial	258,000,000
		44. Blue IQ," Gautrain Rail Link	Provincial	7,500,000,000
		45. Blue IQ, JHB International Airport & the establishment of an Industrial development zone	Provincial	110,000,000
		46. Blue IQ, "Cradle of Human Kind World Heritage Site	Provincial	150,000,000
PROVINCIAL GOVERNMENT	HEALTH	47.Health Information System (HIS)	Provincial	156,000,000
	HOUSING	48.Upgrading of Gauteng informal Settlements "Mayibuye"	Provincial	182,000,000
	LEGISLATURE	49..Information and Technical System and Management Strategy	Provincial	18,000,000
	PREMIERS OFFICE	50.Multi –Purpose Community Centre (MPCC)	Provincial	10,190,000

	SOCIAL SERVICE / POP DEVELOPMENT COMMISSION	51.'Allpay" (pensioners electronic payment)	Provincial	20,000,000
	SPORTS, RECREATION, ARTS & CULTURE	52.Library and Information Services	Provincial	63, 210,000
	PROVINCIAL SERVICE/TRANSPORT /PUBLIC WORKS	53.Maths and Science Projects	Provincial	Not Available
TOTAL MONETARY VALUE FOR PROVINCIAL GOVERNMENT				**9,014,163,000**
	EKURHULENI METROPOLITAN COUNCIL	54.Wide Area Network	Provincial	2,716,889
GAUTENG UNICITIES	GREATER JHB METROPOLITAN COUNCIL	55.Call Centre, CCTV, Libraries	Provincial	1,700,000,000
	TSHWANE MUNICIPALITY	56.Housing, Water, Health Education and Sustainable Service Delivery	Provincial	Not Available
TOTAL MONETARY VALUE FOR PROVITONCIAL GOVERNMENT				**1,702,716,889**
	ESKOM	57. Services Access Point R3 (SAPR3)	National	35,000,000
		58. RDP Commitments (Electrification Rollout	National	Not Available
	SOUTH AFRICAN BROADCASTING CORPORATION (SABC)	59. Take Five Interactive	National	Not Available
		60. Skills Development (Westbury Community)	National	1,517,000
	SA POST OFFICE SERVICES (SAPOS)	61.Public Information Terminal (PIT)	National	15,000,000,000
		62.Multi-media & Broadcasting Services	National	500,000,000

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PARASTAT ALS	**SENTECH**	63.Public Safety Radio Community Service	National	7,500,000
	STATE INFORMATION TECHNOLOGY AGENCY (SITA)	64.SITA (Seven Projects)	National	987,199,500
	TELKOM	65.Rollout Projects	National	20,700,000,00 0
	TRANSTEL	66.Second National Operator (SNO)	National	Not Available
TOTAL MONETARY VALUE FOR PARASTATALS				37,223,716,50 0

REGULATO RY BODIES	**ICASA**	67. Licensing of Value Added Network Services (VANS)	National	Not Available
		68. Licensing of Private Telecoms Network System (PINS)	National	Not Available
		69.Merger of SATRA and IBA into ICASA in 1999	National	Not Available
		70.Monitoring of transformation of telecommunications and the broadcasting industry		Not Available
TOTAL MONETARYBT VALUE FOR ICASA				Not Available

TERTIARY EDUCATIO N SECTOR	**PRETORIA UNIVERSITY**	71.Licensing of Value Added Network Services (VANS)	National	400,000
	WITS UNIVERSITY	72.Licensing of Private Telecoms Network System (PINS)	National	11,035,000
	TECHNIKON SA	73.ICT Based Learning Systems	National	Not Available
TOTAL MONETARY VALUE FOR TERTIARY EDUCATION SECTORS				11,435,000

ORGANISE D COMMUNI TIES	**COSATU**	74. COSATU Online Forum	National	Not Available
		75. Metric Project	National	Not Available
TOTAL MONETARY VALUE FOR ORGANISED COMMUNITIES				Not Available
		76.. Building a Culture of Peace"	Provincial	Not Available

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RELIGIOUS INSITUTES	**SOUTH AFRICAN COUNCIL OF CHURCHES**	76.. Building a Culture of Peace"	Provincial	Not Available
		77. Church Membership & Associate Members	Provincial	Not Available
		78. Special Projects	Provincial	Not Available
	JIREH NETWORK	79. Jireh Debit Card	National	1,000,000
		80. Jireh Air-Time	National	Not Available
	PATIDAR SOCIETY	81.Knowledge Network (K-Net)	National	800,000
	COUNCIL OF MUSLIM THEOLOGENS	82.Radio Islam	National	1,000,000
	MUSLIM WORLD LEAGUE	83. "Ikhwana Islamia"	National	300,000
		84. "Villa Liza"	National	700,000
TOTAL MONETARY VALUE FOR RELIGIOUS INSTITUTIONS				3,800,000
RESEARCH & DEVELOP MENT	**COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH (CSIR)**	85..Innovation Hub – with Dept. of Finance & Economics	Provincial	See Provincial Dept. of Finance
	HUMAN SCIENCE RESEARCH COUNCIL (HSRC)	86.Community Information Resource Centre (CSIR)	Provincial	Not Available
	NATIONAL RESEARCH FOUNDATION (NRF)	87..THRIP	National	88,800,000
		88. Research Support agency (Natural Sciences & Engineering)	National	115,000,000
		89. Social Sciences & Humanities	National	24,000,000
	SA INFORMATION TECHNOLOGY INDUSTRY STRATEGY (SAITIS)	90.Canadian Information Development Agencies (CIDA) Project	National	12,336,900
	SANGONET	91.SBDevNET	National	3,000,000
	SCHOOLNET (Telkom)	92. Thintana I Learn	Provincial	1,699,743
		93. Telkom Supercentres	Provincial	2,370,050
TOTAL MONETARY VALUE FOR RESEARCH & DEVELOPMENT				247,206,693

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GLOBAL INSTITUTI ONS	INTERNATIONAL DEVELOPMENT RESEARCH CENTRE (IDRC)	94..Acacia	Global	4,800,000
TOTAL MONETARY VALUE FOR GLOBAL INSTITUTIONS				4,800,000

TOTAL MONETARY VALUE OF ICT PROJECTS WITH AN IMPACT ON THE GAUTENG PROVINCE	**50,690,996, 082**

PROJECTS WITHOUT BUDGETS

	DEPARTMENTS	NAME OF PROJECT	PROJE CT SCOPE	VALUE
NATIONAL GOVERNM ENT MINISTRIE S	**COMMUNICATION**	95. Public Information Terminal (PTT) with SAPOS	National	Not Available
		96. Internet 2000	National	Not Available
		97. Government Internet Framework	National	Not Available
		98. Telkom Centres of Excellence	National	Not Available
		99. Institute for Satellite and Software Applications	National	Not Available
		100. Policy Strategy of Internet		
		101.Consolidation of Government Networks and Information Services	National	Not Available
		102.Commission for information Technology (CITA) –		
		103. Tele-Medicine with National Department of Health	National	Not Available
		104. Distant Education (with Technikon SA & GoL, delivery in collaboration	National	Not Available

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APPENDIX 6

INSTITUTIONS THAT DID NOT RESPOND

Government Departments

Presidents Office

Department of Deputy President

Correctional Services

Department of Intelligence

Department of Defence

Department of Finance and Treasury

Department of Housing

Department of Minerals and Energy

Department of Public Works

Department of Sport and Recreation

Department of Welfare

Political Government

Department of Safety and Security

Political Parties

African Christian Democratic Party

Inkatha Freedom Party

Democratic Alliance

United Democratic Movement

Pan-Africanist Congress

Foreign Governments

European Union

USAID

Universities and Technikons

Technikon Gauteng North

Rand Afrikaans University

University of Pretoria

Vaal Triangle Technikon

APPENDIX 7

TELKOM PROJECTS IN GAUTENG

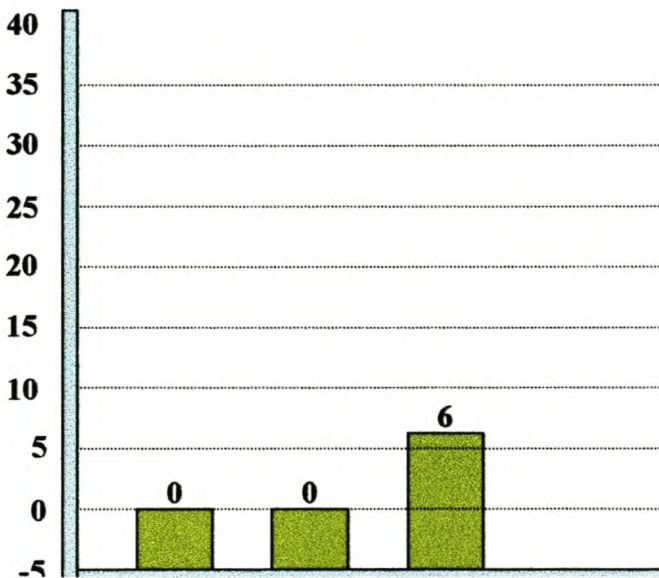**Total Number of Subscribers Lines in Gauteng Province**
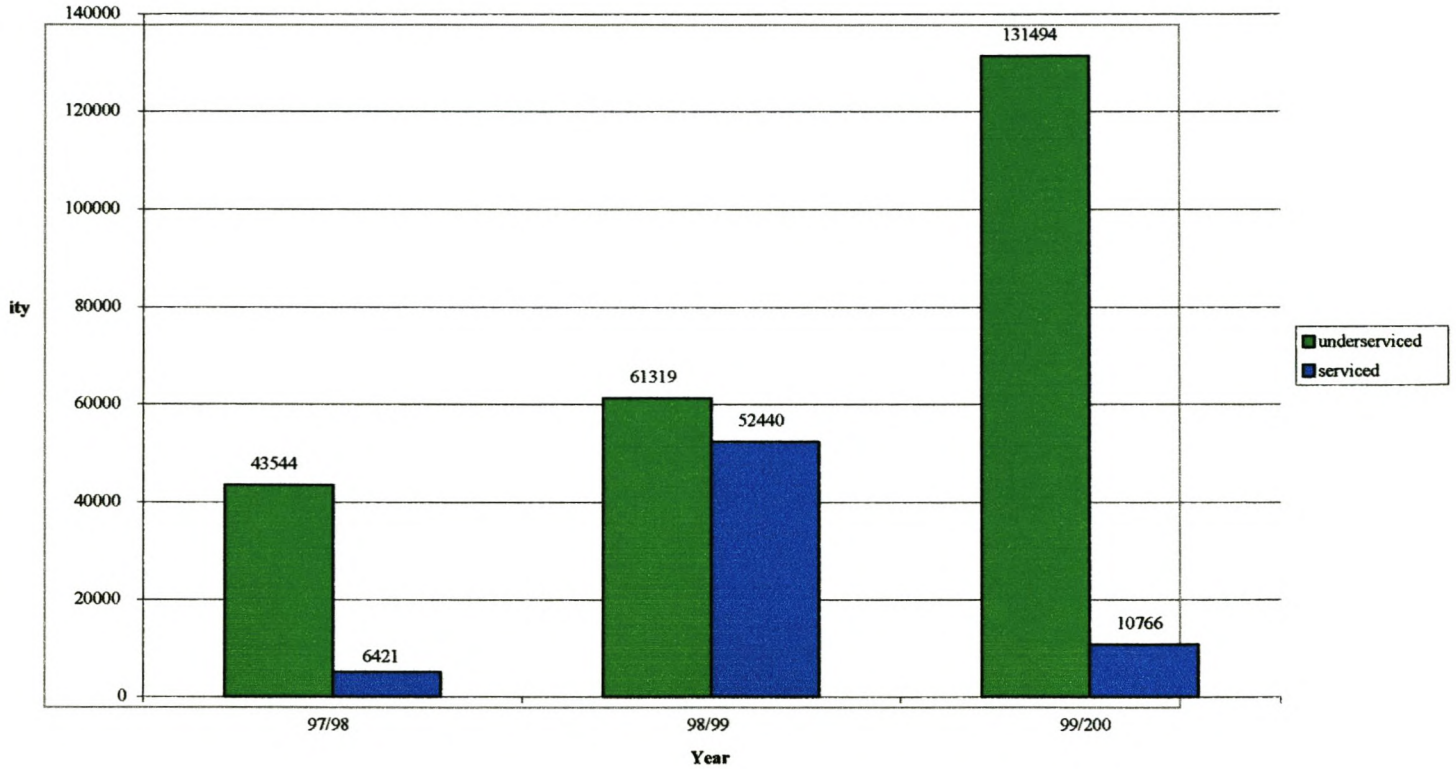
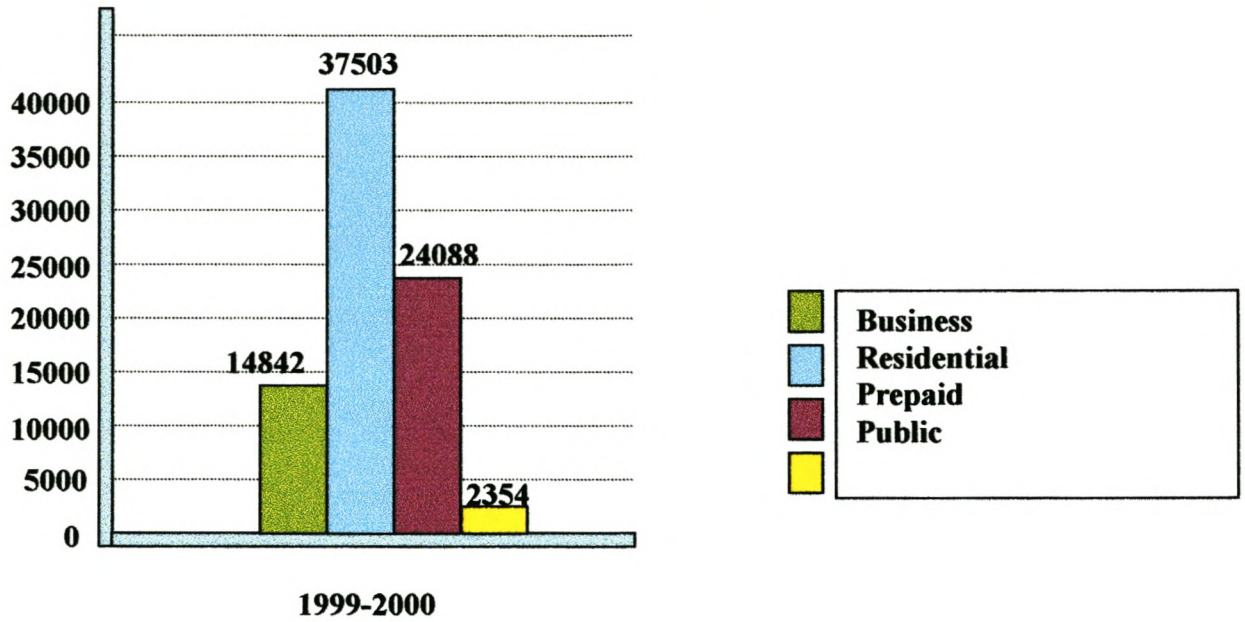## PRIORITY CONSUMERS SERVED IN GAUTENG

Priority customers including schools, hospitals, local authorities, and libraries

Year	Value
1997-1998	874
1998-1999	718
1999-2000	1868
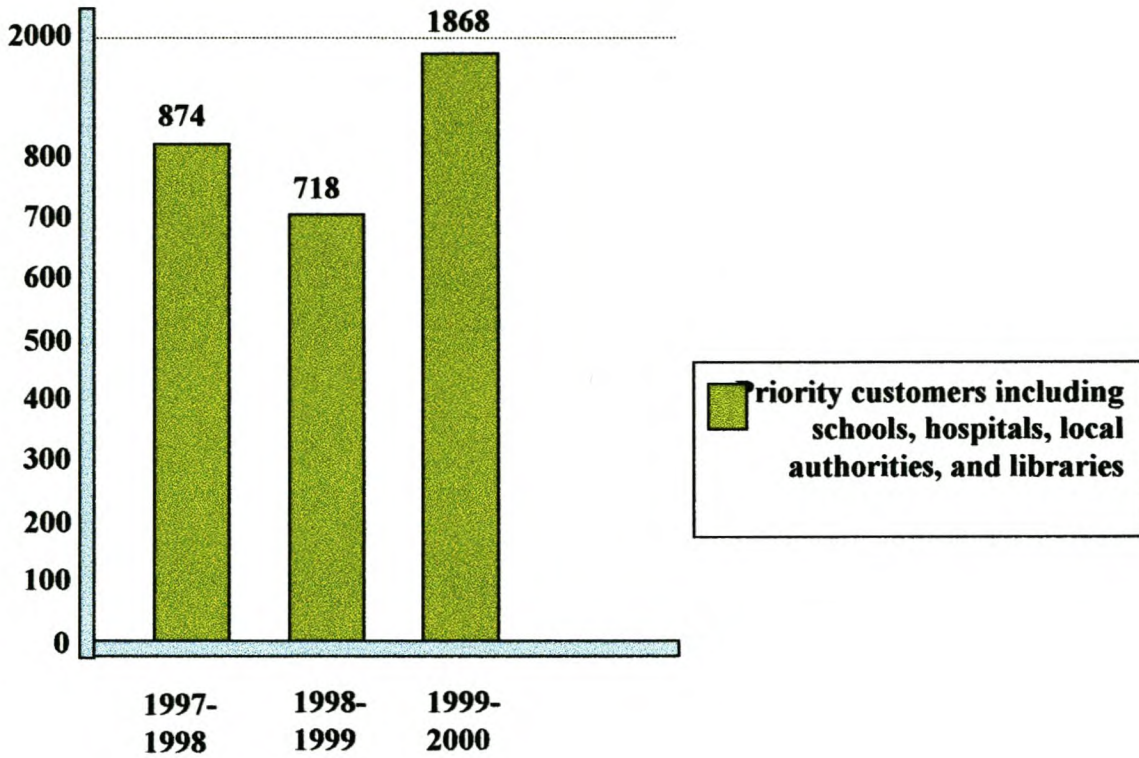
Villagers Roll Out in Gauteng

	Value
	0
	0
	6

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New Services Provided in Gauteng 1999-2000

APPENDIX 8

SAARF SURVEY REPORT

CELLPHONE USAGE [% Comparison between National and Gauteng population]
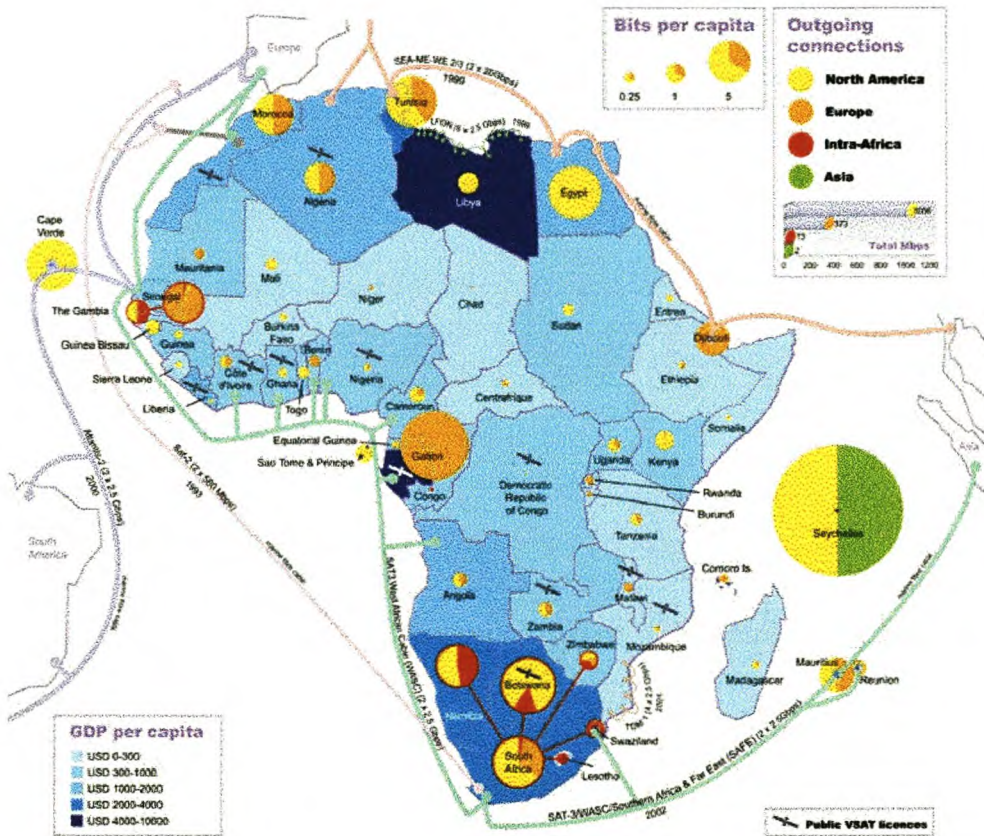Data available as courtesy of South African Advertising Research Foundation

CONSUMER PREMISE EQUIPMENT [CPE]
[% Comparison of CPE National Vs Gauteng]
Data available as courtesy of South African Advertising Research Foundation
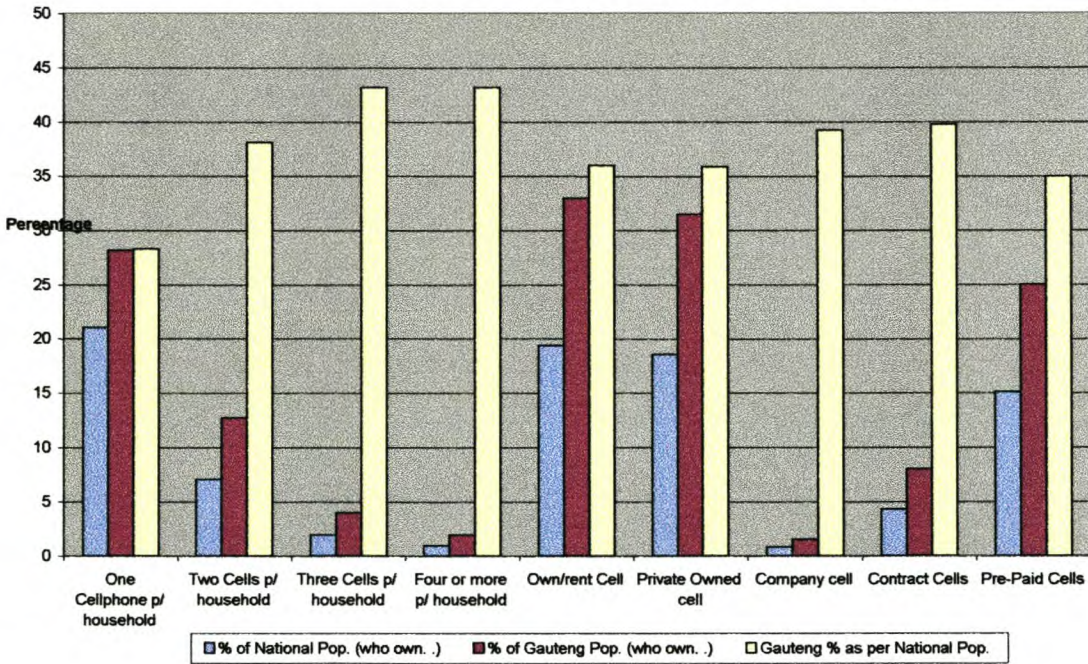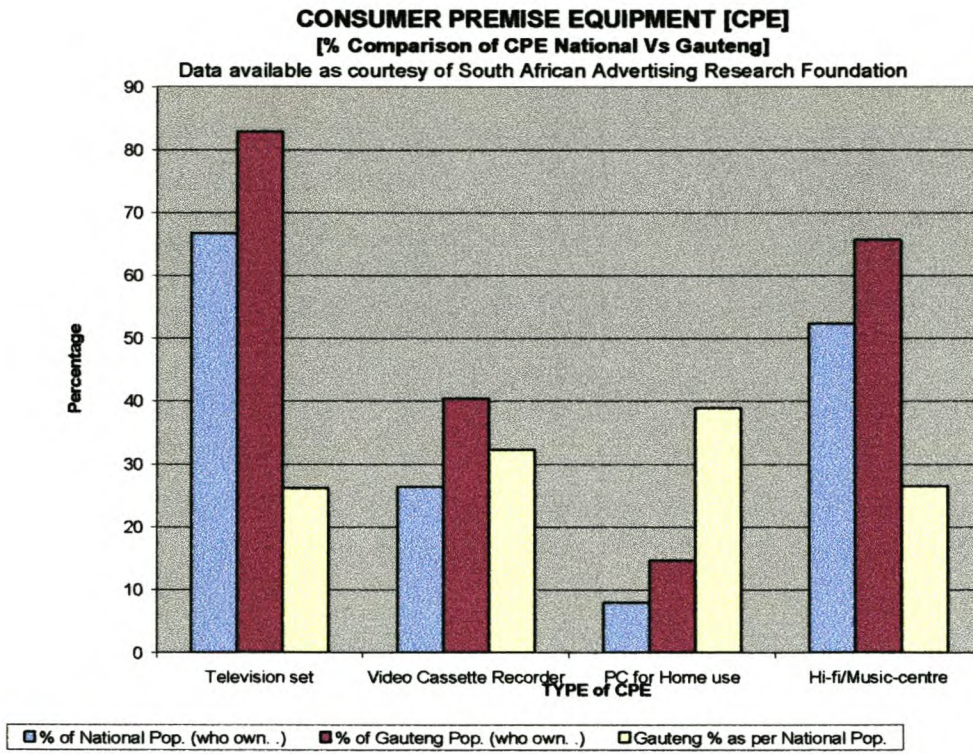
APPENDIX 9

INTERNET OUT OF AFRICA, IDRC REPORT MAP

Bits per capita is a relatively new measure of Internet use. The size of the Internet in a country indicates an element of its progress towards an information-based economy. International Internet bandwidth provides a measure of Internet activity because many people share accounts, or use corporate and academic networks along with cyber cafes and business centers. Outgoing bandwidth also takes better account of the wide range of possible use, from those who write a few emails each week, to users who spend many hours a day on the net browsing, transacting, streaming, and downloading. Because of this, the often used 'Number of Internet Users' indicator may have less relevance in the developing world than in other places.

The coloured circle in each country on the map shows, to exact scale, the international bandwidth in bits per capita (BPC) available in Mid 2002 from publicly accessible IP networks.

Bandwidth availability in Africa varies tremendously, but it is generally very low compared to developed countries. Although there are few intra-African links, the marine fibre cables shown are now all operational and should provide faster and cheaper routes within and out of Africa. (Source: IDRC-*www.network.idrc.ca).*

BIBLIOGRAPHY

Abrahams Gemey & Goldblatt Michael March 1997. *Report on Poverty and Inequality Access to Urban Infrastructure by the Poor.* Progress in the Public Provision of Infrastructural Assets: Department of Social Services and Welfare

Acher J. 1997. Special Interest: *How lobbyists influence legislation:* Millbrook Press Inc, Connecticut.

Ackoff Russell L 1981. *Creating the Corporate Future:* John Wiley & Sons Inc.

Adam Hoebel. *Material Culture and Society* :New York: Oxford University Press.

Adam H. Slabbert van Zyl, F. Moddley, K. *Comrades in Business.* Tafelberg: Cape Town.

Ahmed Akbar S. 1992. *Postmodernism and Islam*: London.

Anderson James E. 1984. *Public Policy-Making.* Third Edition: CBS College Publishing.

Andre' Roux 6th Edition, Everyone's Guide to South African Economy.

Anderson JE. 1984. *Public Policy-Making* Third Edition: Simultaneously in Canada

Anne C Leer. December 1998. *Masters of the Wired World.* Financial Times Pitman Publishing: London.

Avineri S. and Shalit de Shalit 1992. *Communicatarianism and Individualism* Oxford University Press: Oxford.

Ayer AJ. 1936. *Language, Truth and Logic.* Victor Gollancz, Viking Penguin Inc. New York.

Babbie E. 1998. *The practice Social Research:* Wadsworth Publishing Company

Bellis I. 2000. Skills Development. *A Practitioner's Guide to SAQA, the NQF, and the Skills Development Acts.* Knowledge Resources (PTY) Ltd: Randburg.

Berki RN. 1995. *The history of politics through a short introduction:* JM. Dent and Sons Ltd: London.

Bolton L. 2002. *The everything classical mythology book.* Adams Media Corporation: U.S.A.

Brokensho D, Sukkerveer J and Warren O Michael.1995. *The Cultural Dimension of Development: Indigenous knowledge systems.* Intermediate Technology Publications Limited: London

Cadwell D. 1989. *The Resolution.* Free Market Foundation: Saxonworld. South Africa.

Campbell J. 1959. Oriental and Primitive Mythology. *The Mask of God.* Viking Penguin Inc: New York.

Castells M. 1996. *The Rise of the Network Society Volume i, ii, iii.* Blackwell Publishers Inc: Massachusetts.

Cilliers Paul. 1998. *Complexity & Postmodernism, Understating complex system:*

Rouledge *London.*

Clark Ian and Louw Eric. 1991. *Small Business opportunities in South Africa.* StruikPublisher: Cape Town.

Clark G. 1994. Canto Edition. *Space, Time and Man. A Prehistorian's View.* Press Syndicate of the University of Cambridge: Australia.

Clark Carol Lea. 1999. *The Wired Society.* Harcourt Brace & Company:Orlando

Cleary T. 1988. *A Handbook of Strategy Making for Business, Political, Social and Religious Organisation:* The Tao of Organizations: Massachusetts.

Cloete F, Wissink H. 2000. *Improving Public Policy and Public Management.* Van Shaik Publishers: 104 Arcadia Street. Hatfield, Pretoria.

Cluver R. 1989. *Consumer Power in a Free Market.* Juta and Company Limited: Kenwyn.

Cohan PS. 2001. *E-Stocks, finding the hidden Blue Chip among the Internet imposters* John Wiley & Sons Ltd: England.

Coote Belinda 1992. *The Trade Trap.* Oxfam UK and Ireland: Oxford.

Cornish W.R. 1999. Intellectual property: *Patents, Copyright, Trade Marks, and Allied Rights*: Sweet and Maxwell Limited: London.

Davies P. 1986. *The last Election.* Penguin Books Ltd: England.

Davies R.B, Payne C. J, and J, Heath A. Micklewright J. Bynner J. Plewis I. Tumo N.,Langeheine R., Van der Pol F., Sanders D. and Ward H. 1994. *Analysis Social and Political Change.* A casebook of Methods. Sage Publications: India Private Ltd.

Davies Z. 2001. E-business Essentials. *Successful e-Business Practices from the experts at PC Magazine*: U.S.A.

De Bono Edward. 1993. *Water Logic.* Mcquaig Group Inc. Penguin Group-Penguin BooksLtd: England.

Dictionary Unit for South African English. 2002. South African Concise Oxford Dictionary: Oxford University Press Southern Africa: Cape Town, South Africa.

Drucker PF. 1980. *Managing in Turbulent Times.* Harper and Row Publishers Inc: New York.

Dundes A. 1965. *The study of Folklore Prentice-Hall Inc*: New York.

Dunn N William. 1994. *Public Policy Analysis*: Prentice Hall Inc.

Esselaar Philip et al. January 2000. South African Information Technology Industry. Strategy Project. *SAITIS Baseline Study*, Executive Summary: A

Survey of the IT Industry and Related Jobs and Skills in South Africa: SAITIS Project: Pretoria.

Fernandes-Armesto F.1995. *A History of our Last Thousand Years Millennium* Transworld Publishers Ltd: London.

Friedman T. 2000. *The Lexus and the Olive Tree.* Entertaining Reading on excellent Birds-eye view of Globalization Financial times: Harper Collins Publishers London.

Fourie LJ, Falkena HB, and Kok W.J. 1999. *Student Guide to The South African Financial System:* Second Edition. Oxford University Press Southern Africa: Cape Town.

Galbraith John Kenneth. *The World Economy since the Wars*. Sinclair Stevenson and imprint of Reed Consumer Books Ltd. Michelin House: London, Auckland, Melbourne, Singapore and Toronto.

Gardner H. 1995. *Leading Minds*: *An Anatomy of Leadership*. Basic Books: New York.

Giddens Anthony. 1984. *The constitution of Organisation.* University of California Press:Berkeley.

Goldstuck Arthur. *The Hitch Hickers Guides to the Internet*, A South African Handbook Second Edition. Zebra Press a division of Struik Book Distributors (PTY) Ltd: South Africa.

Greenfield Susan. 1997. *The Human Brain*. Weidenfield and Nicholson, Orion Books Limited: London.

Gruen Victor. 1964. *The Heart of our Cities*. Simon and Schuster Inc: New York.

Gustavus Susan O. Nam Charles B. 1976. *Population. The Dynamics of Demographic Change.* Oxford University Press.

Fletcher Richard. 2001 / 2002. Second Edition. *Impumelelo. South Africa's Top 300 Black Empowerment Companies*. Top Companies Publishing: Cape Town. South Africa.

Hammer Michael, and Steven A.1995. *The Re-engineering Revolution*. Harper Collins Publishers: London.

Hampden-Turner Charles. 1994. *The Seven Cultures of Capitalism*. Judy Piatleus

Limited: London.

Hanrahan H F.1999. *Evolution and Convergence of Telecommunications Technology:* Department of Electrical Engineering: University of Witwatersrand.

Harrison Paul.1979. *Inside the Third World*. The Penguin Books Limited Great Britain.

Heibroner Robert & Milberr William.1988. T*he Making of Economic Society:* Tenth Edition: New Jersey.

Held David, McGrew Anthony, Goldblatt David and Perraton Jonathan. 1999. Global *Transformations: Politics, Economics and Culture*, Cambridge: Polity.

Howard Michael C. 1989. *Contemporary Cultural Anthropology*. Third Edition*:* Scott, Foreman & Co.

Hunt John and Lascaris Reg. 1998. *The South African Dream*. Zebra Press. A Division of the New Holland Struik Publishing Group (PTY) Limited: South Africa.

Jayram Shastri. 1999. *Telecommunication Technologies & Applications Developing*

Africa's Communication infrastructure: Speakers Papers, Telecom Africa 2000 10th Conference & Exhibition on Telecommunications in Africa.

Keegan Timothy J. 1986. *Rural Transformation in Industrializing South Africa*. Raven Press: South Africa.

Khumalo Linda Leonard and Sibanda Jabu. 1998.*Telecommunications Made Easy*. Raven Press (PTY) Limited: South Africa.

Kristoferson LA. and Bokalders.V. 1991. *Intermediate Technology Publications Renewable Energy Technologies*. Their Application in Developing Countries. Renewable Energy Publications: London.

Kubler Jean K. 2000. UNCTAG, Executive Forum. *Export Development in the Digital Economy*: Trade Division United Nations Commission for Trade and Development:jean.kubler@unece.org.

Kurtz Howard. 1995. *Inside the Clinton Propaganda Machine*: Spin Cycle. The Free Press A Division of Simon and Schuster Inc: New York.

Langen Albert, Miller George 1995. *God's Secret Formula*: F.A. Herbig

Langschidt T. 2nd Edition. *Living Standard Measures*: SABC Integrated Market Research.

Lascaris R. and Lipkin M.1993. *Reveling in the Wild, business Lessons out of Africa.* Hillman and Rosseau (PTY) Limited: Cape Town.

Leer Ann C.1999. *Masters of the Wired World:* Person Education Limited.

Lyons J. 1977. *Semantics* Vol.1. Press syndicate of the University of Cambridge.

Lyons J.1977. *Semantics* Vol.2. Syndicate of the University Press of Cambridge.

Lyons Michael.1 March 2000. *The Journal of the Institute of British Telecommunications Engineers.* Volume 1, Part One

Mallaby Sebastian. 1992. *After Apartheid*. Faber Limited: London.

Mandela Nelson Rolihlahla. *Long Walk to Freedom*. Little, Brown and Company: London.

Martin Graham Dunstan. 1990. *Shadows in the Cave.* Penguin Group: London.

McGregor Robin & Ann.1992. *Education Alternatives*. Juta & Company, Limited: South Africa.

Melody William H.: 1997. *Telecom Reform, Principles, Policies and Regulatory Practices*:

Den Private Ingeniorfond.

Meyer RS.and Pauw JC. 1972. *First Steps in Logic:* Academic a division of Human and Rousseau (PTY) Limited: Pretoria.

Miles Mathew B. and Haberman M. *An Expanded Sourcefood*. Qualititative Data Analysis. Sage Publications Inc: California.

Mitchell DG. 1968. *A Dictionary of Sociology*. Rouledge & Kegan Paul.

Morgan Gereth.1986. *Images of Organization:* Sage Publications, Inc: California.

Morton Johan. 1996. *Understanding Social Research:* Pretoria.

Moschella DC.1997. *Waves of Power. The Dynamics of Global Technology Leadership 1064-2010:* Amacon.

Moss Glen and Obery Ingrid. 1992. *South African Review: From Red Friday* to Codesa and Ravan Press (PTY) Limited: South Africa.

Mowlana Hamid. *Global Information and World Communication.* 2nd Edition. SAGE Publications.London

Murray Hugh. *Leadership.* Churchill Murray Publications: South Africa.

Newton Harry. 1999. 15th Edition. *Newton's Telecom dictionary.* The Official Dictionary of Telecommunications & the Internet. Technical University of Denmark: Lyngby.

O'Meara Dan.1996. Forty lost years: The apartheid state and the politics of the National Party, 1948-1994. Ruvan Press (PTY) Ltd: South Africa.

O'Sullivan Tim, Hartley John, SAUNDERS Danny, MONTGOMERY Martin, FISKE John. 1994. *Key Concepts in Communication and Cultural Studies.* Second Edition Routledge: New York.

Paul Rouledge and Kegan.1968. *A Dictionary of Sociology*. Routledge and Kegan Paul Ltd: London.

Pauw BA. 1962. *The Second Generation.* Oxford University Press: Cape Town.

Peters Thomas J, Waterman Jr, Robert H. *In search of Excellence*. Lessons from Best Run Companies. Harper and Row, Publishers Inc: New York.

Phillips Caryl.1987. *European Tribe.* Faber and Faber Inc: Winchester.

Pinker Steven. 1997. *How the Mind Works*. Penguin.

Plant Robert. 2000. *e-Commerce Formulation of Strategy:* New York.

Preston Anton. 1995. *Pictorial History of South Africa*. Bison Books Ltd. Kimbolton House.

Rifkin Jeremy. 2000. The age of access. *How the shift from the ownership to access is transforming capitalization*. Penguin Group, Penguin Books Limited: England.

SABA Foundation. 1988. *A Future South Africa, Visions, Strategies and Realities*. Human & Rousseau (PTY) Limited: Cape Town: South Africa.

Schuitema Jerry.1990. Econosense. *Understanding your economic environment* Southern Book Publishers (PTY) Limited: South Africa.

Smith Adam. 1967. *The Money Game.* Michael Joseph Limited: London.

Steward Thomas. A. 1999. *Intellectual Capital.* The New Wealth Organizations. Currency Books, a division of Bantam Doubleday Publishing Group Inc.

Steyn Mellisa E. and Motshabi Khanya B. *Cultural Synergy in South Africa*. Knowledge Resources (PTY) Ltd: Randburg.

Telotte J P. 2001. *Science Fiction Film.* Cambridge University Press: UK.

Toffler Alvin. 1970. *Future Shock*. Pan Book Limited: London.

Toffler Alvin.1980. *The Third Wave*. Pan Books Limited: London.

Turner Berry. 2000. *The World Today Essential Facts in an ever Changing World.* Macmillan Reference Ltd: London.

Singh Indu B. Speakers Paper, 4th regional Africa Forum. *Strategies for Sustainable Development:*.ITU

Soros Foundation Network 1999.*Building Open Society.* Soros Foundation Networks.

Vaughn Charles. 1997. *The Promise and Challenge of a New Communication Age*. Morino Institute. Smart City, San Antonio: Texas.

Watkins Kevin. 1995. *The Oxfam Poverty Report.* Oxfam (UK and Ireland): Oxford.

Weiskamp Keith. 2000. *Windows 2000 Network Design*. Steve Sayre, the Coriolis Group: Arizona.

Willcocks Leslie and Sauer Christopher. 2002. *Moving to Business*. Random House Business books: London.

William Frances.1980. *Who owns whom in South Africa?*. McGregor Publishing: Auckland Park.

William Terrel G. 1984. Consumer Behaviour. *Fundamental and Strategies*. St Paul, Minnesota 55165: West Publishing Company.

William Trevor.1978. *A History of Technology*. Volumes V, VI, VII: Claredon Press: Oxford University.

William Walters. E.1989. *South Africa's War Against Capitalism*. Juta & Co. Sponsored by Free Market Foundation: South Africa.

INSTITUTIONAL AND ORGANISATIONAL REPORTS, JOURNAL, AND PUBLICATIONS

American Anthropological Association and Computing Association. *Culture Society and Advanced Information Technology Report.*

Blue IQ. 1997. *The plan for a Smart Province-Gauteng*: Gauteng Provincial Government.

BMI-TechKnowledge Communication Technologies. *Handbook 1997.*

BMI-TechKnowledge Communication Technologies. *Handbook 1998.*

BMI-TechKnowledge Communication Technologies. *Handbook 1999.*

BMI-TechKnowledge Communication Technologies. *Handbook 2000.*

Center for Education Policy Development, Evaluation, and Management *(CEPO) 2001.*

Education and Equity. *The impact of State Policy on South African Education*. Heinemann Publishers (PTY) Ltd: Sundown, South Africa.

Corporate Research Foundation. 2001. *Top ICT Companies in South Africa:* Zebra Press, a division of Struik Book Distributors (PTY) Ltd: South Africa.

Department of Economic Affairs, Agriculture, and Tourism. May 2000. Green Paper. *Preparing the Western Cape for the Knowledge Economy of the 21st Century*: Provincial Administration for the Western Cape.

Department of Public Enterprises. 2001/2002. *Abridged Business Plan:* South Africa.

Department of Communications & Department of Education. November 2001. *Strategy for Information & Communication Technology in Education.*

Department of Finance & Economic Affairs. 1997. *Trade and Industrial Strategy.*

Department of Finance. : 2000. *National Expenditure Survey.*

Department of Land Affairs. May 1997. *Rural Development Framework*. Compiled by the Rural Development Task Team.

Department of Public Enterprise. *Abridged Business Plan.*2001/2002: Government Printers.

Department of Public Service. *Handbook on Minimum Interoperability Standards (MIOS)*

Gauteng Provincial Government Department. 2001-2002. *Budget Speech.*

Gauteng Provincial Government Department. *Development Planning & Local Government*, Second Draft.

Gauteng Spatial Development Framework-Phase III.

Gauteng Provincial Government. *Briefing Document Blue IQ:*

Government Communication and Information System, GCIS. 2002. *MPCC Business Plan.*

Government Relations and Regulatory Affairs. 8 May 2001. *Telkom Report to the Gauteng Legislative:* Telkom.

H.S.R.C. Barnard David.1996. *The South African Development Directory. Programme for Development*, (PRODDER) Human Science Research Council (H.S.R.C.): Braamfontein, South. Africa.

ICASA. 2001. *Vans / PTN Regulatory Framework.* Explanatory Memorandum

ICASA. 15 February 2002. *South African Content on Television and Radio Position Paper and Regulation:* ICASA.

IDRC. 2000. Internet out of Africa. www.network.idrc.ca.

International Smart Cities Institute. 1996. *Leading the development of an Information Oriented Waterfront for the 21st Century:* Tokyo Teleport Center.Inc.

National Crisis Committee 1987. *What is History;* New approach to History for Students, Workers and Communities. Skotaville Publishers: Braamfontein.

Smart Growth Network. 2000. *Development that Serves Economy,* Community, and *Environment*: Washington, DC.

South African National Treasury. 2002. *Regional Economic Review Southern Africa Economic Summit 2001 & 2002.* National Treasury: South Africa.

Statistics South Africa, 2000 (Mid-year estimates).

Telkom. 1997 / 1998. *Annual Reports.*

Telkom. 1998 / 1999. *Annual Reports.*

Telkom. 1999 / 2000. *Annual Reports.*

Telkom. 2000 / 2001. *Annual Reports.*

Telkom. June 2000. *Convergence.* The Quarterly Journal for the Telkom Leader.

Telkom's corporate Communication Department: Pretoria.

Telkom. May 8 2001. *Telkom Report to the Gauteng Legislature* .Thami Nxasana,Telkom Government Relations and Regulatory Affairs.

The World of Information.1995. *Africa Review.* Kogan and Walden Publishing Printed by Unwin Brothers Ltd: Working Great Britain.

SALGA. South African Local Government Association Strategy 2001.

World Markets Research Centre. 2001. *South African Ratings and Country Regulatory Analysis*: London. Email: world.markets@wmrc.com

UNDP. July 2001. *Creating a Development Dynamic.* Final Report of the Digital

SEMINAR, LECTURES AND UNPUBLISHED PAPERS

American Anthropological Association and Computing Research Association. *Culture, Society and Advanced Information technology Report.*

Breytenbach WJ 1997. The New Global Hierarchy based on World development Report 1997. Stellenbosch University unpublished report.

Cohan Tracy. 1999. *Lecture on Telecommunications Policy and Regulation Module.*
Graduate School of Public & Development Management: Wits University.
ISAD http: www.wn.apc.org/nitf/ppch4.htm

Le Blanch Jamal & Anderson R. 2000, http://www.benton.org/DigitalBeat/db031000

Shastri Jayram: March 1999, "Telecommunication Technologies & Applications"
Singh Indu B, 4 May 1998. *Strategies for Sustainable Development:* Speakers Paper, 4th
Regional Africa Forum.

Nxasana Thami.1999. The Examination of Hurdle Factors on the Growth of Convergence *in the Global Communication Industry. (*Unpublished dissertation): Graduate School of Public & Development Management: University of Witwatersrand

Yeung Wai-chung Henry.2000. *Globalization and World Cities Study Group and Network.* Annual Lecture 2000. GaWC

ACTS, LEGISLATION AND REGULATION.

Immigration Act No.13, 2002: Republic of South Africa.

Promotion of Access to Information Act No. 95 of 2000.

Government Gazette: Department of Communications. No. 17984, 15 -16 March 1997.

Green Paper on Electronic Commerce for South Africa Draft Version 0.5: Department of Communications. RSA.

Green Paper on Science & Technology. 1996. *Preparing for 21st Century.*: Department of, Culture, Science & Technology.

Telecommunication Act of No.103 of 1996, Section 59 (1) (b) (ii).

The Constitution of the Republic of South Africa, 1996 annotated Version Constitutional Assembly.

The White Paper on Telecommunications Policy Notice 291 of 1996: Government Printers.