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**The Free State in the 21st century: Critical linkages to the emerging knowledge economy**

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# **The Free State in the 21st century:** Critical linkages to the emerging knowledge economy

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## ACRONYMS

ARC	Agricultural Research Council
AIDC	Automotive Industry Development Centre
CPRM	Centre for Rapid Prototyping and Manufacturing
CSIR	Council for Scientific and Industrial Research
CTP	Committee of Technikon Principals
DST	Department of Science and Technology (national government)
DTI	Department of Trade and Industry
FET	Further education and training
GTZ	German Technical Co-operation (German government donor funding)
HSRC	Human Sciences Research Council
ICT	Information and communications technologies
ICTS	Information and Communications Technologies and Services
LED	Local economic development
MERSETA	Manufacturing, Engineering and Related Services Sector Education and Training Authority
NACI	National Advisory Council on Innovation
NRF	National Research Foundation
NSI	National System of Innovation
R&D	Research and development
SAUVCA	South African University Vice-Chancellors Association
SAIRR	South African Institute of Race Relations
SET	Science, engineering and technology
SETI	Science, engineering, technology and innovation
SOEs	State owned enterprises
TFS	Technikon Free State
UFS	University of the Free State.

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## **THE FREE STATE IN THE 21<sup>st</sup> CENTURY – CRITICAL LINKAGES TO THE EMERGING KNOWLEDGE ECONOMY**

Introduction and purpose of study

*“Innovation is the key process by which products, processes and services are created, and by which businesses generate jobs and wealth. In addition, in the social sphere, effective innovation has a direct impact on the reduction of poverty and the improvement of the quality of life of our people. It is critical, therefore, to increase the rate and quality of innovation in South Africa”.* (DST website, Introduction to the National R&D strategy)

The Premier’s Economic Advisory Council (PEAC) has embarked on a number of cutting-edge projects to increase the rate of economic growth, which has been negative in the Free State for a number of years, and to foster sustainable human development. The PEAC is conscious of the fact that the age of globalisation and the advent of the knowledge economy has brought about a new economic dispensation globally. There can be little doubt that the knowledge economy has come to stay and will have long term implications for the economic development of South Africa in general, and the Free State economy in particular.

In the context of the emergence of a South African knowledge-based and innovation-focused economy, side-by-side with the industrial economy, this research paper uses techniques of literature review, document analysis, interviews and participant observation to explore and define opportunities and initiatives to promote knowledge-economy activity in the Free State province. At this stage of the research, the knowledge-economy activities will be defined as:

- Innovation-focused Science and Technology (S&T) and Research and Development (R&D) activities and outputs
- Application of Information and Communications Technologies (ICT) to business and government for improved operations and services
- Increasing the human capital and the S&T knowledge base of the province
- Deploying S&T for social development and sustainable livelihoods

The significance of the research is to make practical recommendations that the provincial government can adopt or amend in order to move towards early stage knowledge economy development in the Free State, thus opening the way for new directions in economic growth, competitiveness and development.

The main research question is: *“How can the Free State Provincial Government capture the momentum of local and global change to promote the participation of the province in the emerging South African knowledge economy?”*

Related questions are: *“In the knowledge economy context, what can the Free State government do to foster cooperation between government and other role players?”*

*“What are the opportunities to promote structural change in the economy, and to create jobs, given the decline in the mining industry and the agricultural sector in the Free State?”*

*“How can issues of local development in the knowledge economy be linked to the increasing importance of the service industry in the cities of Bloemfontein, Kroonstad, Welkom and other major towns?”*

The PEAC is also aware of the fact that the knowledge economy and globalisation could lead to further marginalisation of the poor, especially in the rural areas and small towns. “What strategies could be designed to combat the negative effects of the abovementioned tendencies?”

## CHAPTER 1 THE FREE STATE ECONOMY - LOCAL AND GLOBAL CONTEXT

*“...the degree of incorporation of knowledge and information into economic activity is now so great that it is inducing quite profound structural and qualitative changes in the operation of the economy and transforming the basis of competitive advantage”.* (Houghton & Sheehan, 2000)

### 1.1 The emerging South African knowledge economy

As South Africa struggles to its economic feet, ten years on from the introduction of democracy, it faces key questions about building a future economy and society to sustain and develop its population. These questions include the challenge of rising unemployment; limited economic growth prospects; the decline of mining and resource-based industries over the past two decades; the challenges of global competitiveness for manufacturing; significant development challenges in meeting the needs of the population; and the social exclusion of citizens from services and jobs.

South Africa has resources – infrastructure, businesses, people with knowledge and skills, institutions at many levels that contribute to building the country, and significant financial resources. However, the current usage of its resources is not producing the annual growth rates needed to move large numbers of people out of poverty and unemployment. Provinces such as the Free State, North West and Mpumalanga – traditionally reliant on mining and agriculture – are rethinking their economic options and priorities to better position themselves for growth and development.

Choices and priorities opted for in Gauteng and the Western Cape epitomise a trend towards sector growth strategies fuelled by increasing knowledge intensity and ICT – Blue IQ in Gauteng, Cape Online in the Western Cape. Government policy is establishing a broad focus on innovation - for competitiveness and growth in the private sector; for major service delivery improvement in the public sector. Current applications of knowledge and resources have not addressed the development divide. South Africa as a country, provincial and local governments, need to take a fresh look at the world to create an environment in which new knowledge can emerge to promote sustainable development.

In the past eight years, South African policy-makers have introduced a number of policy and strategy measures aimed at preparing South African economic sectors and institutions for participation in the global knowledge economy. These include, but are not limited to:

- The White Paper on Science and Technology – “Preparing for the 21<sup>st</sup> Century” (1996)
- The National Research and Technology Foresight Project (1998)
- A Human Resource Development Strategy for South Africa – “A Nation at Work for a Better Life for All” (2001)
- The South African Information Technology Industry Strategy (2001)
- The National Biotechnology Strategy for South Africa (2001)
- The Department of Trade and Industry’s (DTI) Integrated Manufacturing and Industrial Strategy (2001)
- The National Research and Development Strategy (2002)
- The National Plan for Higher Education (2002)
- DTI’s ICT Cluster Strategic Plan (2002)
- DTI Vision 2014
- The Advanced Manufacturing Technology Strategy (2003)



While limited progress has thus far been made in implementing these strategies, early benefits can be seen in, for example, the establishment and achievements of the Science Park and Technology Station at the Technikon Free State and the contribution of the Automotive Industry Development Centre (AIDC) in Gauteng to building competitiveness in the global automotive sector.

## **1.2 The South African knowledge economy in the global economy**

For three decades or more, academics have been discussing the major transformations that are possible through harnessing electronic information processing technologies to the social and economic priorities of industrialised and industrialising societies. In this context, the “knowledge economy” refers to an economy where knowledge (applied information) is used in all industries and sectors to improve productivity and to seek competitive advantage through commercial innovation and – in the public sector – to generate greater efficiency for government services and increased access to services for citizens. Such an economy is based on the production, distribution, and use of knowledge and information across the board, and is facilitated by ICT (Castells, 1996; Houghton & Sheehan, 2000).

The changing global economy has focused the attention of business, policy-makers, and academics on the impact of a number of factors on economic growth. Houghton and Sheehan (2000) list 12 sets of characteristics that “define” the new economy – information revolution; flexible organization; knowledge, skills and learning; innovation and knowledge networks; learning networks and innovation systems; global competition and production; strategy and location; clustering in the knowledge economy; economics of knowledge; systems of creation, production and distribution; convergence or divergence; and lastly, divergence and concentration.

For the purposes of this study, we will focus on five key perspectives that relate to these characteristics: (1) innovation in science, engineering and technology (SET), (2) the impact of these innovations on production and production processes, as well as on trade and services, (3) the particular effects of advances in telecommunications and in information and communications technologies and (4) the impact of human and intellectual capital (knowledge intensity) on adding significant value to products and services (5) promoting social development and sustainable livelihoods.

The benefits and disadvantages of the new era of global capitalism (Castells, 1997 and 1998) warrant debate in the South African context. South Africa along with its provinces confronts the need to formulate appropriate policy to address two fundamental issues:

- (1) how to use existing, and build new, resources to create new products and services that allow us to develop locally and compete internationally, and thus build the national economy, and
- (2) how to ensure that the value and the wealth thus created has a constructive effect on the economies of both cities and large and small towns, as well as on people across all our communities.

## **1.3 South Africa’s growth options**

In a study on sectoral growth prospects for 80 South African industries conducted by the DTI for the period 1997 to 2001, a baseline growth scenario is proposed as a growth rate of 3.8% per annum and a high growth scenario as a growth rate of 5.0% per annum. The study acknowledges that structural change would be required at the sectoral level with a greater share of GDP needing to come from the manufacturing, construction and financial services sectors. This is a very broad perspective on growth. In depth analysis needs to be conducted regarding the particular focus areas in

manufacturing, construction and financial services that various economic regions in South Africa are “fit for”. This strategic thinking and design has already commenced in many provinces.

For example, the Free State Development Plan (FSDP) for the period 2002 to 2005 sets out eight strategic areas to effect economic growth, to create jobs and to build sustainable livelihoods. Projects identified include the promotion of SMMEs; increased development of themed tourism routes and products; diversification of agriculture and value addition through agro-processing; minerals beneficiation; advances and expansion of petrochemicals processing; rejuvenation of the mining industry; and expansion of the transport and warehousing industry. Provincial government departments and a number of PEAC research projects aim to develop detailed strategies on the basis of the FSDP. These strategies will need to be supported by plans, funding flows, and institutional resources to promote their successful achievement.

The Free State Province Economic Strategy, outlined by the Department of Tourism, Environmental and Economic Affairs in March 2003, further elaborates on certain aspects of the FSDP and proposes 13 strategies to develop the Province.

The knowledge economy perspectives raised above are not particularly extensively dealt with in either the FSDP or the 2003 Economic Strategy. This paper will concentrate only on the key drivers of a knowledge economy focus applicable to the proposed economic development strategies. In doing so, it will apply the five perspectives listed above in Section 1.2. It will also consider existing approaches across South Africa and propose the adoption or adaptation of models that work well elsewhere for the Free State environment.

The broad South African policy context is recognised as fundamental to the future development of the province. As per the FSDP: “The Free State therefore needs to incorporate the priority areas highlighted in the listed policies, legislation and keynote addresses, viz economic growth, social and human resource development, urban renewal and rural development and good governance in the priorities set for the Province”.

In a knowledge economy context, the applicable national policies and strategies include those in the broad economics, innovation and science, engineering and technology domains, in particular the National R&D Strategy, the National Biotechnology Strategy, the Integrated Manufacturing Strategy 2014 and the Advanced Manufacturing Strategy 2014. The ICT Roadmapping Study and the Biotechnology Roadmapping Study, which are likely to be finalised in 2004, will also be of great relevance. Another area of strategy design appropriate to the project objectives, and which addresses the issues of social inclusion and sustainable livelihoods, is the design of an e-government strategy for the Province.

#### **1.4 Role of government in designing approaches to knowledge economy activity**

##### **National government**

The Department of Science and Technology has provided a broad framework for innovation through amongst others, the formulation of the National Research and Development Strategy, 2002. In Chapter 5 addressing strategic objectives, three crucial issues are raised with regard to South Africa’s national system of innovation (NSI) that are pertinent to the Free State knowledge economy. While it is acknowledged that there is growing coherence and development of the NSI, it is argued that South Africa does not have the capacity for local innovation in sectors where it is currently competitive (resources, automotive manufacturing) nor does it have significant capacity for local innovation in emerging competitive sectors (biotechnology, ICT). The strategy refers to the fundamental importance of harnessing the resources of the social sciences to better inform the drive

towards increasing innovation outputs and quality. These are clearly areas where national and provincial government will need to collaborate in plotting future direction for innovation.

### **Local government**

It is, inter alia, the responsibility of local governments to develop LED strategies and to provide adequate levels of infrastructure to attract business and industry. Key business infrastructure required for a “knowledge economy” operation includes telecommunications and bandwidth for converged networks and services, electricity and energy supply networks, roads, as well as the economic environment for R&D and innovation. LED strategy should address itself to the interpretation of existing microeconomic strategies and their application at the local and district levels, as well as analyzing options for the emergence of specific strategies that may be appropriate to the local and district context, including promoting local manufacturing strengths, tourism, SMMEs, education and research. Investment in technology infrastructure, continuing education, and research are fundamental building blocks for a shift towards innovation for economic growth and development.

### **Provincial government**

While early efforts at establishing an NSI saw greater focus on building the R&D base of existing institutions, and marginally improved levels of collaboration between the many stakeholder groupings across the system, results were mainly confined to certain provinces eg Gauteng with its Blue IQ strategy and the Western Cape with its Knowledge Economy strategy. A key feature of the Blue IQ strategy is that it is well integrated into existing microeconomic strategies such as the Motor Industry Development Plan through the establishment of the Gauteng Automotive Cluster and the Automotive Industry Development Centre, while at the same time it has taken initiatives to foster new directions such as the establishment of the Innovation Hub, a property development aimed at attracting innovators to establish a base in Gauteng.

The Provincial Government of the Western Cape, in its White Paper: “Preparing the Western Cape for the Knowledge Economy of the 21<sup>st</sup> Century”, proposes five broad categories for supporting growth and development:

- Sectors with high growth potential
- Niche sectors with significant potential
- Sectors with future potential, but which are small and insignificant at present
- Mature sectors with steady growth potential
- Sectors under stress, but nevertheless important in terms of employment
- 

This is a potentially useful strategic architecture for motivating decisions regarding the extent of support to each of the categories.

### Diagram1: Cape On Line Strategy

QuickTime™ and a  
TIFF (Uncompressed) decompressor  
are needed to see this picture.

*Source: Cape Online Presentation, Provincial Government of the Western Cape Centre for Knowledge Economy and E-Government*

A crucial component is the province's e-government strategy aimed at creating "better informed, connected citizens towards a stronger society" and "increased productivity towards a stronger economy" (Cape Online presentation, diagram 1). The diagram above shows the broad strategic outline including attention to electronic access for user communities, strong online content, ICT tertiary level skills, and development of the local ICT sector.

#### **1.5 Linkages between local innovation, national systems of innovation and global competitiveness – City of Oulu**

The City of Oulu in Northern Finland, in the largely rural Oulu Region, was until the late 1970's an industrial city with the focus on the paper and chemical sectors. Today the economic base of the Oulu Region is founded on hi-tech growth in the fields of biotechnology, medical technology, computing software, electronics, environmental technologies and telecommunications, while new export markets have been penetrated for traditional industries such as wood processing and paper manufacturing. This follows a decision in the early 1980's to shift towards innovation in production as a basis for economic growth. The population of the region is small at about 200 000 people, with very high levels of education and training.

The Oulu 2006 Growth Agreement is a structured partnership between government, industry, education and training institutions and research institutes to promote economic growth and high standards of living for its communities. The agreement is based on the establishment of five clusters of productive activity: information technology; content production and media; wellness technology; biotechnology; and the environmental sector. This is based on the view that "through joint effort and reciprocal support, the clusters will be capable of achieving much more than by acting alone" (City of Oulu, 2002:9). The agreement has specific objectives to grow the size and turnover of existing companies, to establish new companies, to create new jobs in these companies and in education and research institutions. A Business Development Programme administered by the Oulu Regional

Business Agency, the joint business agency of the City of Oulu and the ten municipalities of the Oulu Region, aims to facilitate the achievement of these objectives.

Finland has a well-structured national system of innovation and a strong innovation value-chain with many supporting agencies. This has been built up since the early 1980's. The City of Oulu is strongly integrated into this national system of innovation. Its economic sectors and innovation-focused institutions benefit from funding and other support measures, through the NSI, and contribute to the competitiveness of Finland.

Over the next 10 to 20 years, South Africa (and the Free State) can draw lessons from countries such as Finland, India and Brazil as it considers directing the availability of existing resources – materials, infrastructure, institutions, finances and people – towards a home-grown innovation strategy as a basis for participation in the global knowledge economy.

### **1.6 Linkages with other PEAC projects**

This “Knowledge Economy” project should draw on the research of six of the eight PEAC projects for 2003/2004. The commencement of research on the Free State in the Knowledge Economy raised, from the outset, the need for a collection of detailed data sets that profile the socio-economic environment of the Free State. A detailed economic profile of the Free State can be drawn from Census 2001 data, from the Labour Force Survey, the IDC study “Sectoral Prospects – Growth Guidelines for 80 South African Industries 1997 – 2001”, and from a wide range of datasets from research undertaken across South Africa. However, a detailed socio-economic and environmental profile for the Free State is necessary to promote easy access to statistical and qualitative information for research and decision-making purposes. The objectives of the PEAC Project 1 – “Economic Profile of the Free State Province” – should go some way towards addressing the need for a key source of economic information.

The other studies that will provide a platform for making recommendations and strategy options in a “knowledge economy” paradigm include:

- Project 3 A strategy outline for SMMEs
- Project 4 Mining and Minerals Beneficiation
- Project 5 Agriculture and its Diversification
- Project 7 Guidelines to enhance the application and benefits of LED
- Project 8 Manufacturing Potential

Where studies have been conducted and recommendations made on the fundamental economic questions relating to key economic sectors (mining, agriculture, manufacturing) and key strategic issues (SMME development, local economic development), these recommendations can then be assessed and considered in terms of particular knowledge economy applications, and the whole woven together to provide a coherent broad-based economic policy framework. Of course, the knowledge economy study can also inform the direction and recommendations of the other studies. This input to the design of a Free State Knowledge Economy strategy therefore aims to guide the other studies with respect to the issues of innovation, science, engineering and technology, ICT and human capital development. The global report of the eight studies should take into account the findings of those studies and provide a comprehensive outline of strategic options for the Free State in the 21<sup>st</sup> century knowledge economy.

## 1.7 Research Objectives

This research project, and the recommendations for economic development strategy that flow from it, aims to present a perspective on:

- The global economy context and its implications for the Free State
- The national and regional (Free State) context
- The Free State in the knowledge economy: opportunities and dangers
- A strategic framework for knowledge-based economic development and growth
- An institutional framework for promoting the knowledge economy in the Free State
- Human resource implications
- Practical proposals for early stage knowledge economy development in the Free State

The main question is: *“How can the Free State Provincial Government capitalise on the momentum of local and global change to promote the participation of the province in the emerging South African knowledge economy?”*

## 1.8 Research Methods

The research was conducted by the Learning, Information, Knowledge, Networking (LINK) Centre at the University of the Witwatersrand. The Centre specialises in research and teaching in the areas of ICT policy, regulation and management. It has three research focus areas: ICT Sector Governance, ICT Driven Institutional Restructuring and Human Capital in the SA Network Knowledge Economy.

The value of the present researcher as participant in government policy and strategy design should be noted as contributing to the research analysis and recommendations proposed. This researcher has participated in a variety of such processes including the review panel for the Advanced Manufacturing Technology Strategy and the Study on the Mobility of R&D Workers. Insights gained from these processes are incorporated here.

The research made use of data from South African national, provincial and local government institutions, from the provincial profiles developed by the Development Bank of Southern Africa, from Census 1996 and Census 2001, from the South African Institute of Race Relations, as well as research already conducted by the LINK Centre available on <http://link.wits.ac.za>.

Primary information was obtained from interviews with senior managers in provincial government, district and local municipalities, and from key knowledge-based institutions such as the University of the Free State (UFS), Technikon Free State (TFS), and FARMOVS – PAREXEL, to understand and explore the areas in which institutions in the Free State currently excel at knowledge-based activities and to ascertain where the weaknesses are from a knowledge-economy perspective.

Primary interviews were employed, using structured and unstructured interview techniques, with a questionnaire designed and used to facilitate interactive discussion rather than merely to elicit answers to specific questions. Interviews were conducted in three of the five districts – Bloemfontein in Motheo, Sasolburg in Northern Free State and Trompsburg in Xhariep district.

Secondary research included a review of relevant aspects of the international knowledge economy literature for the purpose of defining and delimiting the application of knowledge-economy concepts to the study. A desk-top review of published documents and web-sites including government policy and strategy, and tourism marketing materials, was conducted and relevant information included throughout the various chapters. Documents obtained from provincial sources that were

included in the review were:

- The Free State Development Plan 2002 – 2005
- Free State Provincial Growth and Development Agreement, October 2003
- “South Africa’s Free State” - The Official Free State Tourism Guide
- FARMOVS – PAREXEL marketing literature

Practical recommendations for action by the Free State provincial government are included in each chapter and a summary of the most important recommendations is provided in Chapter 8.

## **1.9 Delimitations**

The research project aims to understand the Free State in a knowledge-economy context and to explore ways in which the Free State can prepare the foundations for participation of its key economic sectors and institutions, including government itself, in the emerging South African knowledge economy. The recommendations provide practical ways of preparing this foundation and offer proposals for a strategic framework; an institutional framework; comments on measures to develop and attract human capital; and measures to enhance social development initiatives already underway. The research did not seek to develop a knowledge economy strategy for the province.

## **1.10 Limitations**

The primary research was conducted during the course of a few days in November 2003. The opportunities for interviewing leaders from the private sector during this period were limited and this aspect of the research was therefore confined to secondary sources. It was also intended that the research report would draw on the other PEAC research projects (listed in Section 1.6). However only the reports on SMME development and LED were ready in time for this study. Further development of the recommendations in this research paper would benefit significantly from an analysis of the remaining research projects that were being undertaken

## CHAPTER 2 THE FREE STATE DEMOGRAPHY AND ECONOMY

*“Since 1999, the Free State economy has changed from being dependent on the primary sector to being a manufacturing, export-orientated economy” (DTI, 2003)*

*“Many people will be astonished to discover that fourteen percent of the province’s manufacturing is classified as high-technology industries, which is the highest percentage of all the provincial economies” (Minister Alec Erwin at the NCOP June 2002)*

### 2.1 Demographics and economic indicators

South Africa has a land area of 1.219-million square km and a population of 44.8-million people. The Free State province has a land area of 129 480 square km and a population of 2.7-million people or 6.0% of the South African total (Statistics South Africa, 2001). The province is divided into 5 district municipalities:

Xhariep District (south-west)	with the main town	Trompsburg
Motheo District (central)	“	Bloemfontein
Thabo Mofutsanyane (east)	“	Phuthaditjhaba
Northern Free State (north)	“	Sasolburg
Lejweleputswa (west)	“	Welkom

Of the Free State population, 1.29-million or 47.7% were male and 1.4-million or 51.8% were female, while 1.1-million or 41.9% were below the age of 20 and 134 419 or 4.9% were over age 65. Thus, a little more than 53% of the population are of working age. 47.6% of the population live in the six largest magisterial districts.

The size of the Free State population increased by 73 271 people or by 2.8% between 1996 and 2001, showing an annual population increase of 0.55%, as compared to the South African average population increase for the same period of 2.08% per annum.

**Table 1: Magisterial Districts with the Largest Population (2001)**

District	Population (2001)	% of Provincial Total
Sasolburg	114 450	3.85
Botshabelo	202 661	6.83
Welkom	264 781	8.92
Witsieshoek	348 781	11.75
Bloemfontein	377 968	12.73
Odendaalsrus	104 262	3.51

*Source: Provincial Profile of the Free State, Development Bank of Southern Africa, May 2003*

The major languages spoken in the province are Sesotho, followed by Afrikaans, isiXhosa, Setswana and Zulu, with English as the official language of business and government.



**Table 2: Free State Province population and key economic indicators**

	2000	2001
Population (SA)	40 583 573*	44 819 778*
Population (Free State)	2 633 504*	2 706 775*
Urban population	1 806 651*	
Rural population	826 853*	
Population with tertiary qualifications		99 047*
Unemployment		43%
GDP (SA) (current prices)	R872.54bn	R982.94bn
GGP (at market prices)	R49.2bn	R53.9bn
Agriculture	R3.04bn	R3.5bn
Mining	R5.16bn	R5.67bn
Manufacturing	R5.82bn	R6.47bn
Electricity & water	R1.86bn	R1.88bn
Construction	R0.94bn	R1.01bn
Wholesale, retail, hotels, restaurants	R5.35bn	R5.83bn
Transport and communication	R4.12bn	R4.39bn
Finance, real estate, business services	R8.09bn	R8.99bn
Community, social & personal services	R4.96bn	R5.49bn
General government services	R5.39bn	R5.80bn

Sources: StatsSA, DBSA, \* Census '96 and Census 2001

According to the StatSA data on GDP per region, annual estimates for the Free State for 2001 indicate that manufacturing contributes 12% while mining contributes 10.5% and agriculture 6.5%.

Based on information in the Free State Economic Strategy 2003, interviews conducted in the Xhariep, Northern Free State and Motheo districts, and an analysis of the literature on the Thabo Mofutsanyane and Lejweleputswa districts, the following characteristics of the provincial economy are apparent:

The economic profile of Xhariep district is largely agricultural with tourism potential to be exploited around the Gariep Dam and the Diamond and Wine Route. The Lejweleputswa district relies on gold mining with a contribution to GGP from agriculture and trade and a small contribution from manufacturing. Northern Free State has a largely manufacturing base, with the petrochemical hub at Sasolburg, a significant services sector and a contribution from agriculture. Motheo district relies largely on the services and government sectors, while the Thabo Mofutsanyane district has a high dependence on agriculture with a contribution from tourism that could be further exploited.

A major weakness for the province is the existence of a generally inadequate telecommunications infrastructure for business development and government service delivery. Three of the five district municipalities have been declared under-serviced areas in terms of the Telecommunications Amendment Act 2001 – Northern Free State, Thabo Mofutsanyane and Lejweleputswa. In terms of the Act, under-serviced areas are those with less than 5% tele-density. Furthermore, there is limited application of ICT to enhance productivity in mining, agriculture, tourism and local and international trade. For example, ICT can in theory be used to improve productivity and safety in deep mining, however the infrastructure for such operational models is weak or non-existent.

New research and development (R&D) in science, engineering and technology for application to manufacturing, minerals beneficiation, trade in knowledge intensive services, agro-processing and

poverty alleviation is extremely limited. A few innovation-focused initiatives exist, though the majority are fairly new and the economic impact is not yet extensive.

The FARMOVS-PAREXEL Clinical Research Organisation, a locally established company, is part of the global PAREXEL Clinical Pharmacology Network. In operation for almost 20 years, it is based at the UFS and does highly competitive global trade in knowledge intensive services through its work on drug trials and anti-viral therapy. The Centre for Rapid Prototyping and Manufacturing at the Free State Technikon offers a service to industry and SMMEs to support the development of prototypes and to move products in the direction of volume-based manufacturing in the shortest possible time. A Science Park was established in 1999, also based at the Technikon, to encourage innovation, in particular in support of SMMEs and communities such as the community of the Basotho Cultural Village in the Golden Gate National Park. A gold beneficiation and manufacturing partnership has been opened at Harmony Gold Mining's Virginia refinery with participation from Harmony and advanced technology inputs from the science council, Mintek.

These cases should be studied with a view to analysing their strengths and weaknesses and understanding the lessons to be learnt for the broader application of successful innovation-based activities. Similarly, models such as the Blue IQ project of the Gauteng Provincial Government – a multi-billion rand investment in projects in the tourism, smart industries and high-value-added manufacturing sectors – can be assessed and lessons adopted from these experiences. In particular, the Automotive Industry Development Centre, formed in 2000, provides valuable insights for the constitution of similar agencies focused on other areas of manufacturing production, such as supporting minerals beneficiation, agro-processing start-ups and petro-chemicals processing and manufacturing.

The design of provincial and local economic development strategies should take into account critical dimensions of the knowledge economy perspectives discussed in Chapters Three to Seven. In particular, strategy design should address the weaknesses discussed in Chapter Two.

## **2.2 Government expenditure focus**

The total Free State provincial budget for 2003/2004 was R9.3-billion of which education, health and welfare received the largest allocations. The use of provincial revenues to design an enabling environment for economic and social development are crucial to addressing the challenges of economic growth, poverty and unemployment. A quick overview of selected departments can fuel strategic thinking on how best to use departmental budgets to promote enabling environments.

### **2.2.1 Economic Focus – policy and strategy contribution to GDP**

It is sometimes argued that the application of budgeted funds by departments to design provincial level policy and strategy, and to deliver selected services, can either contribute to GDP growth or undermine such growth. It is therefore necessary for the Provincial Government to analyse the application of such funds and to answer two fundamental questions, namely:

“Do current policies and strategies contribute to or undermine GDP growth?” and “Which are the key economic sectors in which the Free State lacks effective policy, strategy, and government support and facilitation?”.

#### ***Economic and environmental affairs and tourism R88.7-million:***

The Free State has a medium-term development plan for 2002 to 2005. The development plan highlights a wide range of social and economic issues that require attention – including working

towards an economic growth rate of 4.5% by March 2005; strengthening competitive advantage; increasing tourism market share; moving into agro-processing; mining beneficiation and petrochemicals value-addition. These are very ambitious targets and, from a knowledge economy perspective, will require (a) significant growth in the science, engineering and technology (SET) base in the province; (b) well structured innovation support systems and measures and (c) attention to developing the size and quality of the human capital base of the province at all levels – secondary schooling, further and higher education graduates and workplace education and training.

The Free State does not currently have a tourism strategy. Nevertheless, there are some parts of the Free State that are well-developed for tourism including the Clarens/Witsieshoek area in Thabo Mofutsanyane district. Marketing literature on tourism in the province is generally available – from tour operators, hotels and other tourism venues. What appears to be lacking is a tourism strategy that focuses on tourism development and tourism communications and marketing.

Black and women's economic empowerment of both investors and workers in all economic sectors and institutions is a vital ingredient to a knowledge-empowered Free State economy.

***Agriculture R150.4-million:***

Agriculture is profoundly affected by fluctuations of demand for agricultural products in the South African and global markets. With disease affecting markets for beef in Europe and the USA, countries like South Africa may gain opportunities to sell their beef and lamb into under-served markets. However, agricultural revenue is also subject to fluctuations on the international financial markets – and of course to the weather. The recent drought resulted in Motheo, Xhariep and Lejweleputswa districts being declared disaster areas. In particular, emerging farmers are hard-hit by negative fluctuations and are often ill-prepared for such challenges.

The proposed moves into agro-processing discussed in the Free State Development Plan and referred to in interviews with senior management in the Free State government will require significant investment in agro-processing infrastructure, and the education and training of a new workforce. The quality management of agro-processing products will require quality management expertise and the training of quality teams in relevant basic science and technology. Marketing of new products is crucial to successful commercialisation and business development and the use of effective marketing content combined with Internet-based marketing strategies can support the growth of agro-processing.

***Sport, arts, culture, science and technology R118.8-million:***

The key objectives and budgeted programmes of the department do not currently include a focus on science and technology development in the province. The aim is to set up a functional Science and Technology Sub-directorate – the Free State was the first the province to be assigned a science and technology responsibility. The Department has a key role in promoting the position of the Free State in the national system of innovation. The work of such a sub-directorate could include, inter alia, promoting selected objectives of the National R&D Strategy, of the National Biotechnology Strategy and of the Advanced Manufacturing Strategy in the province, focusing on institutional development and funding strategies. Further issues are raised, and proposals made, in Chapter Three.

Arts and culture has a major role to play in economic development and the Free State scenery lends itself to many opportunities. For example, the film “The Promised Land”, based on the book by South African author Karel Schoeman and recently screened on SABC TV, was filmed on location in Trompsburg. As South Africa also competes with other destinations as an international filming location, what opportunities might the Free State leverage, given breath-taking scenery at Golden Gate and other parts of the Northern and Central Drakensberg?

### ***Education R3 627.6-million::***

In the knowledge economy context, education is not so much a social service as it is a service to economic sectors and institutions, including government and the broad community development sector. In other words, education is not merely conducted as an end in itself. The primary objective of education in an emerging knowledge economy is to ensure that significant numbers of people will have the highest possible levels of knowledge and skills to promote productivity, quality service and local and global competitiveness.

The Free State could do worse than invest more in increasing the throughput of graduates from Grade 12, further education and higher education programmes. Failure to significantly increase investment in higher education, for example, could negatively affect strategies and plans to increase the size and quality output of the manufacturing and services base, as these economic sectors rely on high level skills to advance their competitiveness. Further issues are discussed and comments made in Chapter Six.

### **2.2.2 Social services focus – policy and strategy contributions to social development**

Health, social development and housing are major contributors to addressing the effects of poverty and unemployment in the Free State province. There are many small towns in the province which are typically, areas where communities require a full range of government social services. In these areas, having to visit different departments for different needs, and to register separately with each department, can cause the rapid depletion of household resources. Many citizens, especially those in the more remote rural communities, may be unable to access government services due to their very limited resources, and the physical remoteness of government offices and staff.

Governments such as that of the United Kingdom have developed the concept of “joined-up government” to develop new institutional approaches to addressing the needs of vulnerable citizens for affordable access to government services. This is achieved by building institutional forms that promote co-operative service delivery whereby a citizen can access all the requisite services at a single point.

Both developed and developing countries are exploring appropriate forms of e-government to promote improved citizen access to services, with shorter waiting times. “Anytime, anyhow, any place” – is the informing ethos. Services are not limited by office hours, by the absence of municipal offices, or by citizens relocating.

### **2.3 Concluding remarks**

In the knowledge economy, government’s policy-making responsibility must include attending to how policy can maximise the participation of citizens in productive activity and minimise the effects of exclusion from productive, income-earning activity. Knowledge economy development will occur side-by-side with continued cycles of growth and decline of industries and services sectors. Throughout these cycles, citizens will be affected by entry into, and exit from, the labour market and, at least for the next ten years, significant numbers of Free State citizens will require social services to ameliorate the effects of poverty, unemployment, failing health and old age.

Towns such as Reitz, Frankfort and Villiers in the Northern Free State, where the prospects of economic growth in the foreseeable future are minimal, and areas such as Maluti-a-Phofung and Botshabelo, which have the lowest per capita incomes in the province, will require the economic and

social services departments to come together to consider combinations of packaged services that increase opportunities for sustainable livelihoods for these citizens.

At the same time, government should pay due attention to facilitating and leveraging additional funding flows to municipalities through development financing institutions so as to focus on new growth areas as proposed – high-value added manufacturing, agro-processing, minerals beneficiation, SMME development, tourism and municipal infrastructure.

Minister Erwin's statement at the NCOP in June 2002, quoted in the Free State Province Economic Strategy, should focus attention on the need to build a sustainable SET knowledge and people base in the Free State.

## CHAPTER 3 THE FREE STATE IN THE NATIONAL SYSTEM OF INNOVATION

*“Science and technology is critical to the future of South Africa. Government recognises the key role it plays in providing an enabling environment for innovation and research and in building the human capital that we require for the future knowledge economy”* (Minister Ben Ngubane, Minister of Arts, Culture, Science and Technology, introduction to the National Research and Development Strategy, August 2002)

### 3.1 SET and innovation

Institutions in the national systems of innovation of many countries, in both the developing and the developed world, have over the past decades invested in building their capacity for innovation and their innovation outputs towards achieving consistent and sustainable levels of local and global competitiveness. Thus countries such as Finland, Japan, South Korea, India, Brazil, Malaysia, Singapore, the United Kingdom and the United States, to name a few, have witnessed significant progress in bringing to market new products and services in the spheres of telecommunications, consumer electronics, computing software and systems, electronic commerce, advanced biotechnology and human genomics. These innovations are in demand in the global market and the firms, countries and regions where innovation currently agglomerates tend to benefit the most from these developments.

South African policy-makers approved the White Paper on Science and Technology in 1996, a National Biotechnology Strategy in 2000, and a National Research and Development Strategy in 2002. All these documents emphasise the centrality of science and technology, research and development and innovation to South Africa’s economic future. Most importantly, the National R&D Strategy highlights the importance of both public and private sector investment in R&D to promote South Africa’s global competitiveness over the coming decades and towards addressing fundamental socio-economic challenges of poverty and health and well-being.

The strategy emphasises the need to focus on the current formulation of science and technology missions:

- Poverty reduction (focus on demonstration and diffusion of technologies to impact quality of life and enhance delivery)
- Key technology platforms (focus on knowledge intensive new industries):
  - National Biotechnology Strategy
  - ICT
- Advanced Manufacturing (linkages to Integrated Manufacturing Strategy)
- Leveraging resource based industries and developing new knowledge-based industries from them (mobilising the power of existing sectors)

However, the implementation of these policies is only slowly beginning to take shape with SET institutions such as the NRF and the CSIR who are gearing their resources towards an increase in innovation activity. The Departments of Science and Technology, and Trade and Industry, are facilitating various innovation-focused programmes including the Tshumisano Technology Stations, the Centre for Rapid Prototyping and Manufacturing based at the Free State Technikon, and the GODISA Innovation and Incubator programme aimed at enhancing the capacity of SMMEs for technological innovation, productivity improvements and competitiveness.

As innovation in South Africa is occurring on a small scale, no major economic effects of these initiatives and programmes have yet been reported. Nevertheless, new strategies are emerging – notably the launch in September 2003 of the Advanced Manufacturing and Technology Strategy which sets South Africa the task of creating a high-value manufacturing base by the year 2014.

The institutions in the South African national system of innovation – the science councils, the higher education institutions, business and industry, government as policy maker and regulator – will need to pay further attention to increasing the quality and focus of their inputs towards the national objectives of competitiveness at all levels of the economy. Free State institutions need to consider their linkages into the national system of innovation and to explore opportunities for contributing to and benefiting from activity within that system.

From the foregoing it should be evident that innovation is the process of transforming an idea, normally generated through R&D, into a new or improved product, process or approach. It relates to the real needs of society, involves scientific, technological, organizational or commercial activities or services, and has market value. (NACI, 2003).

South Africa's policies and institutions support the notion that science and technology should be enlisted in the cause of development to address social developmental challenges such as job creation, poverty and unemployment. The National R&D strategy identifies the following areas to focus science and technology for poverty reduction – HIV/AIDS and other communicable diseases; telemedicine; Internet-supported education or e-learning; ICT-enabled information dissemination for agricultural extension; affordable household-level energy systems; and contributions from indigenous knowledge. There are few programmes in these areas in South Africa and those that exist are in the formative stages of development. The CSIR has a technology for development (T4D) focus and linkages should be made with this programme to explore the potential for collaborative ventures in the province.

In the Free State, the Centre for Rapid Prototyping and Manufacturing (CRPM) and the Science Park based at the Free State Technikon have collaborated with the community of the Basotho Cultural Village in the Golden Gate National Park to develop high quality clay pots for export. The pots bear local patterns and are made using indigenous materials and firing methods. The project, bringing together engineers, arts people and the community, aimed to combine indigenous knowledge and new technology and to apply indigenous knowledge for economic competitiveness and LED.

The Centre offers a commercial service to conduct R&D that will support the commercialisation of innovations for individuals and groups who do not have the resources and specialised technologies to test their ideas and translate them into patented inventions. Successful R&D enables the CRPM to match contract income from clients with government funding through THRIP<sup>1</sup>, thus expanding their R&D funding base. Successful commercialisation of the inventions and innovations opens up new income streams for the 'clients', who may become long-term supporters of the Centre.

In KwaZulu Natal, the Inkosi Albert Luthuli Central Hospital facilities at Cato Manor offer a range of advanced medical and health services to members of the population who cannot afford private hospital care and many of whom come from the rural parts of KwaZulu Natal and the Eastern Cape. The application of advanced medical technologies, information and communication technologies, and highly qualified clinicians, places patients in an environment of care that rivals the best private care in the world. Innovative funding and sourcing mechanisms are being used to build the phases of the programme and to include a wide range of services from trauma, to child oncology and emergency gynaecological and obstetrical services.

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<sup>1</sup> Technology Human Resource Investment Programme, DTI and NRF.

Based on the background information set out here, it can be argued that each government department in the Free State can and should explore opportunities for innovations that could be introduced in their respective spheres or mandates, whether with a focus on promoting a particular economic sector or a particular social developmental mandate.

### **3.2 S&T and R&D related institutions of the Free State**

Diagram 2 illustrates the name, type and location of key institutions in the South African national system of innovation. The University of the Free State and the Free State Technikon are listed on the map with the location shown as Bloemfontein.

The NSI encompasses all institutions that participate in and contribute to building and sustaining R&D and innovation in South Africa. It consists of government departments and agencies such as the national Department of Science and Technology; the National Advisory Council on Innovation; the eight science councils including the CSIR, HSRC, NRF, and ARC; all the higher education institutions; those FET institutions that are active in the fields of science and technology (there are relatively few); as well as R&D units and programmes in the private sector and in state owned enterprises.

Based on this composition, the Free State has a number of institutions that function within the broader South African NSI. They include the Department of Sports, Culture, Science and Technology, the HSRC, the University of the Free State, Free State Technikon, FARMOVS – PAREXEL, and others. R&D capacity also exists at the Free State Botanical Gardens in Bloemfontein and at the Small Grain Institute, the Agricultural Research Council at Bethlehem and the National Cooperative Dairies at Heilbron. However, science councils such as CSIR with their focus on a broad range of fields in science, engineering, technology and innovation, have limited presence in the province.

Although not strictly part of the NSI, attention should be paid to economic marketing and promotions institutions such as the local chambers of commerce and tourism bodies (Kroonstad Chamber of Business and Tourism, Ladybrand Chamber of Commerce and others), and agricultural bodies. These are the institutions that can promote the development of innovative businesses, greater application of science and technology for competitiveness, and support initiatives to strengthen the Free State's human capital base and therefore its innovation base.



QuickTime™ and a  
TIFF (Uncompressed) decompressor  
are needed to see this picture.

### **3.2.1 Department of Sports, Arts, Culture, Science and Technology**

The Department is involved in the following science and technology projects:

- Financial support to the Communal Information Technology Centre, Welkom of R500 000 per annum. CITC is an IT training centre for young people which aims to empower them for the job market.
- Support of annual SET Week: R60 000 in 2003/4 contributing to creating an awareness of SET.

The Department's science and technology component has not been fully established yet. It is planned that a manager will be appointed in the 2004-5 financial year. In 2004 the Department planned to commence drafting a science and technology policy document.

### **3.2.2 Institutions of Higher Education**

The Free State has two higher education institutions and four FET colleges. The higher education institutions are University of the Free State (incorporates the UFS Bloemfontein, QwaQwa and Vista Bloemfontein campuses), Technikon Free State (incorporates TFS Bloemfontein, Welkom, Kroonstad, Kimberley, Qwaqwa and Vista Welkom campus).

The FET colleges are Maluti College (incorporating Bethlehem, Bonamelo, Itemoheleng in Phuthaditjhaba, Kwetlison, Lere-La-Tshepe and Sefikeng), Flavius Mareka College (at Kroonstad and Sasolburg), Motheo College (Bloemfontein and Thaba Nchu) and Goldfields College (Welkom).

#### **University of the Free State, Bloemfontein**

The University of the Free State profiles itself as “a university of excellence, equity and innovation” ([www.uovs.ac.za](http://www.uovs.ac.za)). It celebrates its centenary year in 2004. The UFS has six faculties, a number of research centres and more than 20 000 students.

UFS research covers a broad range of fields including conservation and biodiversity, sustainable livelihoods, economic growth and international competitiveness and indigenous knowledge systems. In the interview with the then Acting Vice-Rector Academic Affairs, Professor Gerrit van Wyk referred to the biotechnology research project currently being conducted by the Department of Microbial – Biochemical and Food Biotechnology (Faculty of Agricultural and Natural Sciences) as one example of highly competitive research conducted at the University. The research focus is on understanding the behaviour of enzymes from extreme environments, using biological material found in ancient geological formations from environments up to 3 000 metres underground. This research falls under the economic growth and international competitiveness theme and is appropriate and interesting work as South Africa searches to develop an economic niche in the highly competitive global biotechnology industry. The work benefits from access to Princeton University's Witwatersrand site, demonstrating the value of international R&D networks.

UFS Academic Affairs focuses on effective faculty functioning in relation to such matters as academic teaching and research, and will focus on innovation in both these areas. UFS has a good science and technology base that can contribute to growing the science and technology knowledge base for the Free State province – both for government and business. Utilising these existing resources for much needed research into identifying opportunities for local economic development and applications of science and technology to agriculture-agriprocessing, manufacturing and mining, and government service delivery can unlock greater value in the utilisation of this knowledge and innovation potential. Conversely,

identification of under-utilised research and innovation potential at UFS and Free State Technikon can inform government as to the establishment of appropriate provincial government support measures for Free State R&D, including possible R&D financing and marketing.

### **Technikon Free State, Bloemfontein**

The Technikon markets itself as “a quality institution of higher learning and on the forefront of the world-wide technological explosion”. It offers graduate and postgraduate level programmes in the engineering, applied natural sciences, economic sciences and management, and the humanities disciplines. In 2003, total student enrolments were in the order of 8 778.

The Technikon Free State, like other higher education institutions, can participate in the upcoming national innovation competition, organized by the NRF to promote entrepreneurship through the commercialisation of the innovative ideas of young entrepreneurs. Competitions such as these create opportunities for the Free State province to leverage the NRF infrastructure and related funding stream to encourage the growth of innovative activity in the province. Successful local innovation outputs and networks can encourage young people to remain in the Free State in order to contribute to and benefit from the new economic activity. A Free State government award could be added to the Innovation Fund awards for any Free State winner.

Amongst other areas of interest, the Free State Technikon has an operating Science Park. This operates as a network of technology and development focused entities based at the technikon including the Science Park unit, the Centre for Rapid Prototyping and Manufacturing (which is a technology station framed within the DST Tshumisano programme of national government R&D support measures and is supported by funding from DST, DTI and GTZ), the Centre for the Built Environment, the Hotel School and the School for Entrepreneurship and Business Development. For any project then, the Science Park will consider the knowledge and skills needed and draw on the relevant knowledge from each of the Centres (or from outside) to establish a project team. For example, the Science Park network and the CSIR Boutek have implemented a poverty alleviation project to build a school, thereby developing local skills in construction management in the community. In another project, the Science Park and the School for Design Technology and Visual Art utilised their combined knowledge to develop wrap-around coffin handles for manufacturing company Polyflora.

Technical officer for the Science Park, Ms Edith Sempe, says that, despite the numerous achievements of the institutional network, it has many future challenges. The Science Park would like to become a regional Science Park with partners at the UFS and other universities, local government and the Development Bank of Southern Africa to focus on LED and with business including Sasol, Eskom and Telkom. The Free State economic strategy has a strong focus on growing the province’s manufacturing base. However, she points out that the Free State does not have a Manufacturing Advisory Centre (MAC) and is the only province that does not have one. The Science Park could be instrumental in establishing a MAC as part of the science and innovation network. This could give significant impetus to assisting the Free State private sector to making appropriate choices for effective manufacturing growth and new business.

With greater resources, both human and financial, possibly through directed funding from the provincial government for selected objectives such as the manufacturing focus, the Science Park could move to address these challenges and achieve these objectives more rapidly.

The Technikon Free State will present its second Innovation Summit in November 2004. This is an important biannual event in which government, business and higher education institutions and other innovation-focused institutions in the Free State and from other provinces can participate to explore potential synergies and ways of supporting R&D and innovation. Free State provincial government should encourage participation by other spheres of government including Free State local governments, key national government departments and institutions such as the Gauteng-government Automotive Industry Development Centre.

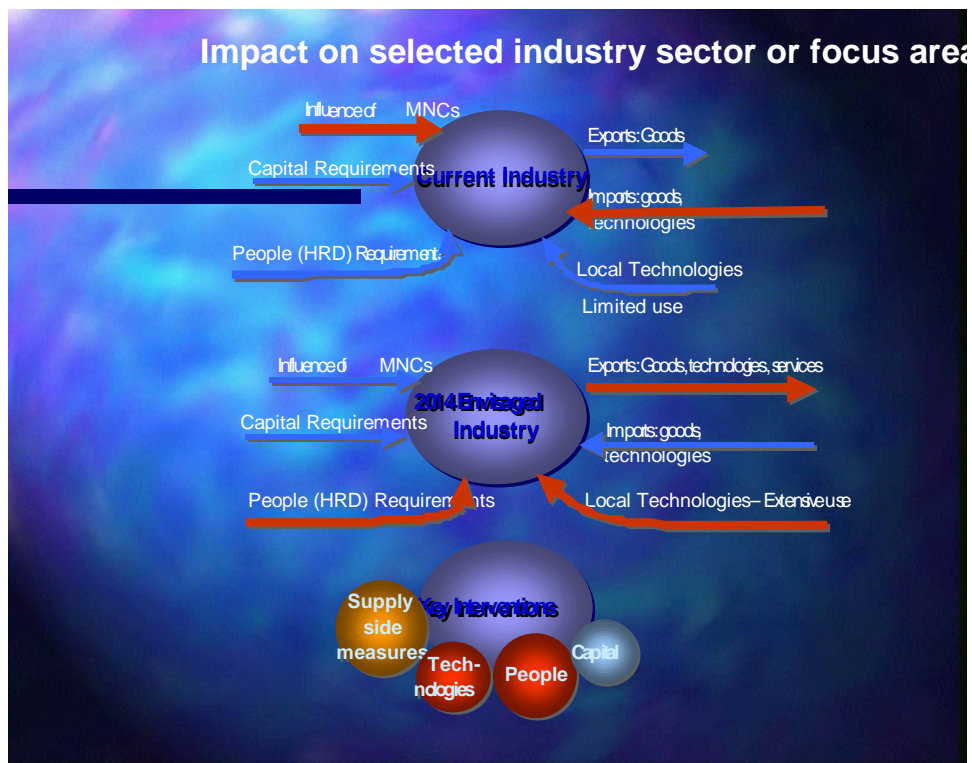
### **FET Colleges**

While the education and training focus at FET colleges is typically vocational – a review of potential for building high quality skills at post-matric level, with the focus on vocational skills eg jewellery craft is an important step into the future. However, this will not provide a home for those needing education and training in establishing small or black-owned enterprises, for example in the proposed petrochemical hub around Sasolburg. Attention to creating new education and training programmes at the FET level in order to advance skills in creating small enterprises is a necessary step towards building people skills for the ‘new economy’ across the services sector and industrial and commercial sectors.

### **3.3 Current versus future positioning of the Free State in the South African NSI**

The Free State has only limited linkages to science councils such as the CSIR and the National Manufacturing Advisory Centre. As a province it has few institutions with the necessary S&T and R&D capacity for innovation. The fact of this also limits capacity for innovation in the field of social development, as much social innovation requires some input from science and technology. The province has only a modest human capital and knowledge base, with low numbers of higher education graduates per annum in districts such as the Northern Free State, Xhariep and Thabo Mofutsanyane. This makes it extremely difficult to pursue tourism development, SMME development and the realisation of local economic strategies, such as the petrochemical hub, in these areas. The province’s position in the South African National System of Innovation is consequently weak and this restricts the development of revenue-generating innovation and economic activity in the province.

**Diagram 3: Objectives of the AMTS 2014**



Source: NACI/CSIR presentation to stakeholders workshop, 2002

A key future focus for the Free State – both government and industry – is the National Advanced Manufacturing Technology Strategy (AMTS). The strategy aims to build a strong South African manufacturing base with a stronger export than import focus, extensive use of local technologies and highly developed people skills. The objectives of the AMTS are supported by the activities of the Manufacturing and Materials Technology Business Unit at the CSIR.

The Automotive Industry Development Centre is already working towards the realisation of an advanced manufacturing base in the automotive sector. The AIDC is establishing an automotive supplier park, developing automotive industry learnerships for the MERSETA in collaboration with tertiary institutions, promoting an HIV/AIDS workplace programme, a tertiary level human resources development programme and an SMME programme in collaboration with Ntsika Enterprises (AIDC, 2003). The AIDC programmes are well-oriented to promote emerging knowledge economy activity. This is evidenced by the strong focus on promoting human capital skills in engineering and technology at tertiary level and investment in promoting local innovation through, inter alia, the Light Metals Development Centre. The relevant departmental structures of the Free State provincial government should enter into discussions with the AIDC and the CSIR to develop an advanced manufacturing technology roadmap for the province.

**Diagram 4: AMTS focus - industry and technology matrix**

<b>INDUSTRY SECTORS AND TECHNOLOGY FOCUS AREAS</b>									
<b>INDUSTRY SECTORS</b>	<b>TECHNOLOGY FOCUS AREAS</b>	<b>Advanced Materials</b>	<b>Advanced Product Technologies</b>	<b>Advanced Production Technologies</b>	<b>ICT &amp; Logistics</b>	<b>Cleaner Production</b>		<b>Metrology (Laser)</b>	<b>Industry &amp; Enterprise Technology</b>
<b>Automotive (Transport)</b>									
<b>Cultural/Craft Industries</b>									
<b>Clothing &amp; Textiles</b>									
<b>Metals (&amp; Minerals)</b>									
<b>Chemicals (&amp; Biotech)</b>									
<b>Agro-Processing</b>									
<b>Tourism</b>									
<b>Knowledge Intensive Service</b>									

Source: NACI/CSIR presentation to stakeholders workshop, 2002

Diagram 4 illustrates the industry sectors and technology focus areas that are addressed by the AMTS. The Free State already has:

- Niche sectors with significant potential (eg. chemical sector)
- Sectors with future potential, but which are small and insignificant at present (automotive manufacturing, tourism, biotechnology).

In collaboration with, and based on the lessons of the AIDC and the CSIR, the Free State should formulate structured arrangements to invest in the promotion of the AMTS in selected industry areas.

### **3.4 Recommendations**

The Free State Provincial Government should be seen to participate in the emerging South African knowledge economy and these activities should be made known to businesses countrywide, the national government, Free State local and district municipalities, and other roleplayers. Important steps would include:

3.4.1 The science and technology base of key institutions such as the University of the Free State and Technikon Free State is significant and could be explored to identify ways in which the existing knowledge base can be applied to shift government and the private sector into innovation-oriented activities in the emerging South African knowledge economy.

Acting on this identification, government could support the establishment of a basic R&D and innovation network in the Free State, possibly using the Science Park as the hub for co-ordinating and facilitating the network.

- 3.4.2 The Free State government should develop strong linkages with institutions in the National System of Innovation throughout South Africa, including the Science Councils, the broader South African higher education sector and the development financing sector.

In particular, strong relationships with the CSIR (industry R&D and advanced manufacturing focus), the NRF (innovation financing focus), the AIDC (automotive industry focus, but also providing general lessons on supporting advanced manufacturing), the Centre for Public Service Innovation (innovation in public service delivery), the Development Bank of Southern Africa (innovative development financing models for small towns) and the Land Bank (strategy for supporting emerging farmers) should be developed.

- 3.4.3 Consideration should be given to supporting existing fledgling innovation-focused institutions such as the Science Park and the Technology Station at the Technikon Free State, based on agreed outputs, outcomes, targets that would support industry and manufacturing growth.

- 3.4.4 Provincial government could encourage local support for innovation through, inter alia, contributing a government-sponsored award to the NRF Innovation Awards.

## CHAPTER 4 INNOVATION AND THE FREE STATE ECONOMY FOCUS

*“The quest for accelerated economic growth, job creation and service delivery to break the vicious circle of poverty and unemployment remains the overall objective of the department [of Tourism, Environmental and Economic Affairs]” (DTI, 2003).*

### 4.1 Impact of SET and innovation on production and services

The value created through innovation is two-fold:

(a) value is created through the commercialisation and business development of new innovations such as computing software or new pharmaceutical drugs and

(b) value is created as a result of the impact of these innovations on existing business processes for example by generating value through services such as secure electronic banking, electronic global trade networks, or on-line shopping. Innovations in medical technologies and in pharmaceuticals are highly sought after for providing ever more sophisticated services.

As a case in point – while in the past many South Africans only had access to the highest quality medical services through private health care, this is changing. The 850-bed Inkosi Albert Luthuli Central Hospital in Cato Manor, just outside Durban, offers services comparable with, and in some cases better than, many private health care facilities to patients from KwaZulu-Natal and parts of the Eastern Cape, irrespective of their ability to pay. The hospital claims to be at the forefront of technology in terms of medical equipment, information technology and service delivery.

This case presents a model of a public institution that is having a major impact on the real needs of South African society, and one which relies on scientific, technological, organizational and managerial innovation in order to deliver services that have both market and social value. It fits well with two of the technology missions expressed in the national R&D strategy:

- Poverty reduction (focus on demonstration and diffusion of technologies to impact quality of life and enhance delivery)
- Key technology platforms (focus on knowledge intensive new industries such as ICT).

To increase the positive impact of SET and innovation for the Free State economy requires attention to a range of micro-economic reform strategies and their effective application in the provincial setting, as well as to micro-economic adaptation strategies that may be specific to the Free State context. The DTI discussion paper, “A Guide to the Micro-Economic Reform Strategy”, raises a few fundamental questions where specific answers are required in the Free State knowledge economy context. In discussing the micro-economic constraints to growth, the paper argues that: “There is also technological underprovision: per capita expenditure on information technology (IT) is low compared to South Africa’s competitors, investment in research and development is inadequate, public science and technology infrastructure is weak, and there are low levels of public science awareness”.

Two questions emerge from the discussion thus far:

“Which areas of micro-economic activity should the Free State focus its efforts towards?”. This question is partially answered by the eight strategies proposed in the Free



State Growth and Development Plan 2002–2005 and will be more comprehensively answered by detailed departmental and sector strategies and the outputs of the PEAC research projects.

The second question is: “What fundamental infrastructure and resources are required to support these identified areas of microeconomic activity?”. We will attempt to present some critical contributions for discussion concerning these questions in subsequent sections of this report.

#### **4.2 Free State Development Plan 2002 – 2005, Economic Strategy 2003, Free State Provincial Growth and Development Agreement 2003: comment and analysis**

The Free State Development Plan and the Economic Strategy are very ambitious proposals. The identification of four sectoral thrusts for building the Free State economy, (tourism, petro-chemicals downstreaming, agro-industry and gold jewellery manufacturing), and the ten cross-cutting focus areas detailed in the Growth and Development Agreement, are well suited for moving towards high technology, knowledge-intensive production and services.

In order to achieve a relative measure of success with these thrusts, government and private sector investment will be required to promote R&D and innovation outputs, marketing of innovation and new business, and increased human capital development at the technical training and higher education levels. FARMOVS – PAREXEL Director, Dr Gerhard Groenewoud says that the institution needs more experienced, professional scientific staff. He states that the race and gender profile of the institution is skewed and that young, black graduates are in demand. However, black graduates and scientific personnel in general, and R&D staff in particular, are in high demand throughout South Africa and internationally. Thus, in addition to investment in high-level human capital development, the Free State government should design a strategy to attract and retain knowledge workers.

While higher education is crucial, promoting literacy, communications and numeracy skills across the provincial workforce is equally important. These skills are in great demand in the mining, manufacturing and services sectors internationally. As production processes increase their technology quotient, greater levels of knowledge and skills are needed to optimise the value of these technologies. These investments will require a shift from existing expenditure patterns and will be accompanied by the stresses of organizational change. Failure to make this shift will lead to increasingly negative consequences for the province, as local firms become less competitive and international firms are deterred from investing by the low level of skills.

The Growth and Development Agreement should provide clarification of the roles and responsibilities of government, public institutions, the private sector and the development sector. This clarification is needed to establish an enabling environment for knowledge-economy activity, so that each stakeholder group’s contribution can be measured against pre-defined goals and targets. Clarification is also necessary to ensure that the stakeholders do not duplicate activities or omit to carry out crucial tasks.

The DTI (2003) reports that the province is geared to a 3-pronged development process – beneficiation, empowerment and capacity building, and competitiveness. The vision of the Free State government is to:

“develop a sustainable, growing, accessible, affordable, broadly-based and structurally interdependent economy through maximum use of human, financial and other material resources and to mobilise and manage all resources of the province to support activities that would provide a better life for all its citizens, in harmony with the environment.”

But what further practical steps can be taken to achieve this vision? According to the report, the Free State economy has shifted from its dependence on the primary sector to a manufacturing and export orientation. Achievements in this regard include the production of world-class machinery at competitive prices for export markets in Africa, Latin America, Eastern Europe, Australia, North America and elsewhere; floriculture exports of approximately 1.2-million cut-flowers per year; production of 100 000 tons of vegetables and 40 000 tons of fruit per annum with a growing export focus; production of hides for export and manufacture of automotive upholstery; manufacture of jewellery for export; and the development of the downstream chemical industry, ChemCity, in Sasolburg.

These are all highly competitive ventures with significant challenges for sustaining the Free State's current position in the local and global markets. Challenges include volatility of exchange rates, fluctuations in global demand, rate of application of technologies to improve competitiveness, and demands for an increasingly well-educated S&T knowledge base and workforce. Competitors in the developing world such as India, China and Brazil are strongly focused on these desiderata.

#### **4.3 Local economic development - key towns and municipalities and small towns**

Based on discussions with senior managers in provincial and local government, it is apparent that the major institutions involved in facilitating LED are local municipalities and the Free State Development Corporation (FSDC).

Mr Bennet Molotsi, District Manager for Northern Free State, indicates that municipal government and industry do not relate as closely as they might. In promoting petrochemical downstream processing, the Northern Free State faces significant challenges including the lack of, or difficulty in obtaining, access to higher education for the local population. A practical proposal therefore is that government facilitate an "indaba" of higher education institutions from the Free State and nearby Gauteng to identify a programme for higher education support of the petrochemical processing hub.

In relation to small towns, LED strategy needs to take into account the particular circumstances of each town or groups of towns. The rationale for grouping or clustering towns is as follows: the LED possibilities of a particular town may be limited but when combined with LED possibilities in other nearby towns, economic opportunities may be identified that were overlooked when assessing the towns in isolation. This clustering and analysis of potential new economic activity will require initial focused research, supported by ongoing review and analysis at the district municipality and provincial level, so that careful, well-informed choices are made for towns like Reitz, Frankfort, Villiers in the Northern Free State and Trompsburg, Philippolis, Jagersfontein, Koffiefontein in Xhariep. A further critical measure to support economic growth in small towns is efficiency of government operations.

The provincial government has various powers in terms of approvals of land-use for commercial and residential purposes. While balancing the range of environmental, financing and economic development concerns, government needs to speed up processes of approvals in order to create an enabling environment for new businesses, particularly in the areas of environmental tourism and new residential markets, which are becoming popular in small towns in the Free State, for example, the Mount Horeb residential development at Clarens or the Gariep Dam development. These are locally competitive developments as the South African property market booms with people investing in second and third homes outside of the major cities.

#### **4.4 Key sectors – automotive manufacturing, petrochemicals, tourism, mining, services sector**

The existing economic strategies identify the mining and petrochemical sectors as remaining crucial to economic growth. The PEAC studies on the future prospects for the manufacturing industry and mining beneficiation will detail what measures are likely to promote economic growth in these sectors.

There are a few important aspects of future economic growth to focus on in a knowledge economy context:

The tourism and services sectors require much greater attention than they have received to date. Tourism and services can become major generators of revenue and jobs, since the Free State can potentially attract significantly larger numbers of local and foreign tourists to its domains of natural beauty and relaxation. In particular, tourism and related services should be aimed at the Xhariep and Thabo Mofutsanyane districts where mining, industry and commercial services make an insignificant contribution to the district economies.

In a knowledge economy, professionals and other knowledge workers have significant disposable income to spend on holidays, travel and leisure. Tourists and persons conducting business in the province expect high quality services including accommodation, recreation, and business services such as access to Internet and e-commerce facilities. While there are many services available in the Free State, marketing appears to be a major weakness. In the time this researcher spent in Bloemfontein, for example, several attempts to access marketing materials on the city's tourism and business services were frustrated with materials only being available at the tourism kiosk at the bus station. A visit to the Free State Tourism Marketing Board revealed several problems – the offices are in an area of Bloemfontein city centre away from the hotels and shopping malls, the entrance is unattractive with poor signage, the interior bespeaks a poorly organized and unprofessional environment with almost no tourism literature on display other than the Free State Tourism pamphlet.

While there are many local tourism structures, initiatives and ideas, most of the persons interviewed expressed the view that tourism is not well-organised, or co-ordinated and that marketing is costly due to the absence of a structured tourism promotion agency for the province. Tourism and services marketing should be significantly upgraded, to encourage higher spending on the “delights” the Free State has to offer residents and visitors.

The services sector, in particular personal and government services, could develop a new or improved range of offerings. Suggested improvements in government services are addressed in Chapter 7 below. As regards personal services, there is a gap in the market for personal services companies. These are companies that can provide a full range of services including shopping, childcare, opening mail, paying bills, filing important household documents, booking annual holidays, making personal appointments, etc. Such services would be attractive to middle-to-high income households and represent a market opportunity for small and micro business ventures. The commercial services sector is reasonably well developed in many parts of the Free State. However, black and womens' economic empowerment is weak and the Free State government should actively promote national empowerment strategies in the provincial and local context.

Greater attention should be given to encouraging *appropriate technology diffusion and local innovation* in the province's economic strategies. Significant investments should be made to *attract people with the necessary skills profile* to build a Free State knowledge economy.

## **4.5 Recommendations**

- 4.5.1 Accelerated growth will contribute to higher GGP targets (between 3,8% and 5.0%) in selected sectoral thrusts if the development of these sectors is accompanied by technology- and ICT-based productivity enhancements, combined with the ongoing development of workplace skills.
- 4.5.2 The Free State government should focus on promoting R&D, innovation, and technology incubation activities (of which there are already a few examples in the Free State), through financing, marketing and promoting innovation networks.
- 4.5.3 A knowledge economy focus is by definition a long-term focus. Thus a knowledge economy job creation strategy should aim to build the necessary knowledge and skills for emerging industry sectors over the next 10 years as well as upcoming generations of human capital.
- 4.5.4 The Free State government should promote linkages to the range of institutions in the South African National System of Innovation to increase its participation in innovation-focused activities.
- 4.5.5 Local economic development, particularly in small towns can benefit significantly and relatively soon from greater access to telephones and the Internet. A “Small Towns Research Project” and a “Small Towns Investment Fund” should be established jointly by provincial and local government.
- 4.5.6 Stronger linkages between government and industry and business must be built to promote the achievement of the objectives listed in the Free State Growth and Development Agreement. These linkages should be built at the provincial level, as well as at the local and district municipality level. For example, in the Northern Free State, linkages with Sasol and other small manufacturing companies and SMMEs should be formed with a clear agenda for the development of advanced manufacturing capabilities.

The National Advanced Manufacturing Strategy provides a useful guide to issues for an agenda for advanced manufacturing and attention should be paid to developing a strongly enabling environment for greater technology diffusion and innovation in selected sectors. Institutions such as the CSIR, the NAMAC and the AIDC can play a critical role in promoting advanced manufacturing opportunities and outcomes for the Free State.

- 4.5.7 The promotion of advanced manufacturing, technology diffusion, local innovation and higher education throughput, is key to building black economic empowerment in Free State commerce and industry.

## CHAPTER 5 ICT AND THE FREE STATE ECONOMY FOCUS

*“ The primary forces driving the transformation of national, regional and global economies are dramatic changes in technologies, policies and markets – the combination of the development and increasingly pervasive applications of ICTS on the one hand, and the worldwide movement to market liberalisation and deregulation on the other.”* (William H. Melody, 2003)

*“If one were to believe the ‘blue sky’ speculation and industry promotion about the technological and service possibilities in this field, one would quickly conclude the new ICTS will solve all of society’s problems. A more realistic assessment of the process of transformation to an information economy may provide a little deeper understanding and help fashion more realistic policies by governments and market decisions by industries.”* (William H. Melody, 2003)

### 5.1 ICT as a driver of economic activity

ICT is widely recognised as a driver of knowledge generation (computer applications mapping the human genome), knowledge exchange (web-based learning and teaching networks and research databases), economic value (applications in supply chain management, computer-aided design and manufacturing), international communications (electronic commerce, trade and global financial transactions) and government services (electronic government services).

South Africa does not have well developed ICT strategies to support knowledge intensive activity. Despite the passage of the Electronic Commerce and Transactions Act in 2002, the existing telecommunications regulatory environment is a significant impediment to the integration of ICT services into the business domain. This is as a result of:

- large increases in business telephone tariffs (50% increase over the 1996 to 2000 timeframe and continued large annual increases between 2001 and 2003) making access to electronic services for both large and small businesses expensive;
- restrictions on the Value Added Network Services (VANS) market which requires service providers to acquire their facilities from Telkom rather than offering competitive services and competitive prices;
- the absence of public policy allowing for future growth of a network of converged ICT technologies and services as a foundation for an effective digital economy. Government and economic sectors must work within these constraints to address their innovation objectives.

In November 2003, government announced a review of telecomms tariffs following advice from the President’s International Advisory Council that the current levels of telecomms pricing in South Africa present a barrier to the establishment of international businesses such as call centres and other business communication processes. While Telkom has proposed a tariff increase of 2.7% for 2004, this assumes efficiency gains in Telkom of only 1.5% for the year. If this key assumption is reviewed and Telkom is found to have produced greater levels of efficiency, it is conceivable that telecomms prices should be reduced as they have been elsewhere in the world. A lowering of telecomms prices could provide a lowering of the threshold for greater use of ICT and Internet-based applications in key economic sectors and for SMMEs.

An e-Strategy and a National Convergence Law are being developed by the Department of Communications aimed at creating an effective infrastructural base and policy environment for business and community access to ICT and a basis for future economic growth and social development. The Department of Science and Technology is conducting an ICT Roadmapping Exercise aimed at identifying future ICT technologies that will constitute the basis of innovative activity. These strategies are likely to be finalised in 2004 and 2005 and will give further guidance to the implementation of innovation strategies and knowledge economy strategies.

A key issue in providing telecomms access to poor and rural communities is the policy on under-serviced area licences or USAL policy. The Minister of Communications has proclaimed 10 districts to be addressed in terms of this policy. These include three districts in the Free State province viz. Northern Free State, Thabo Mofutsanyane and Lejweleputswa districts. The policy is aimed at bringing more cost effective services to towns with less than 5% teledensity and creating opportunities for the growth of small businesses and jobs. The bids have been submitted for the first phase of the awarding of licences and adjudication was planned for March 2004.

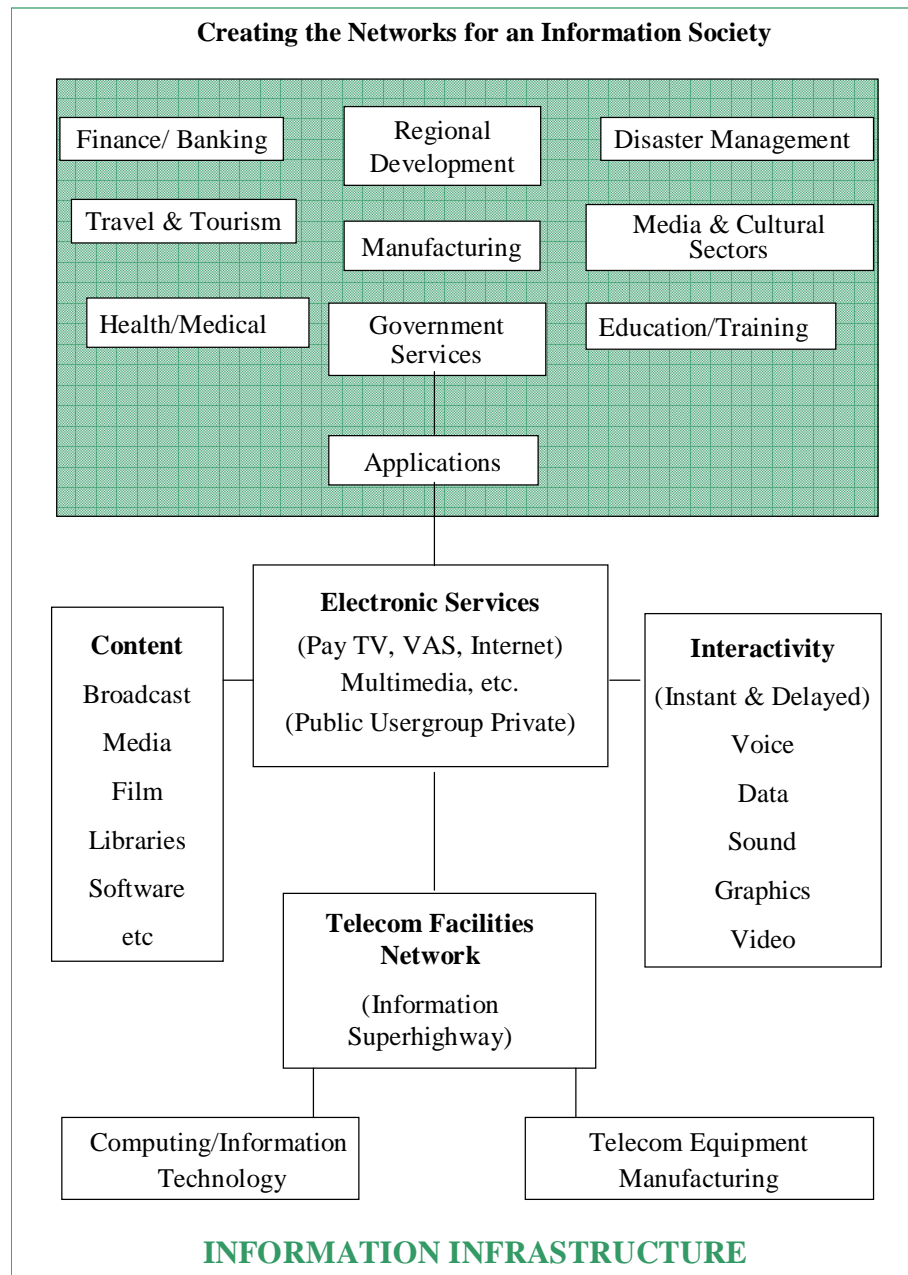
The issues listed above are crucial to the Free State's attempts to integrate itself effectively into the national and global knowledge economy. Recommendations on the role of ICT in social and economic development are incorporated throughout the chapters in this research paper.

## **5.2 Using ICT to build the Information Society, E-Economy, Knowledge Economy**

The diagram below illustrates the role of information infrastructure in creating the networks for the information society/knowledge economy. Interactivity (voice, data, sound, graphics, video) and content (broadcast, media, film, software, etc) are combined and transported across the telecommunications facilities network to provide multi-media electronic services (Pay TV, e-mail, Internet) that form the basis for applications in e-commerce/e-business (electronic banking, supply chain management in manufacturing, Internet-based bookings and transactions in travel and tourism, etc) and e-government (health applications and telemedicine, e-learning and disaster management, etc).

A recent study, "ICT Diffusion and Applications in Eight Industry Sectors in South Africa" conducted for the DTI ([www.tips.org.za/research/dtipsp](http://www.tips.org.za/research/dtipsp)), reviews applications in the automotive, biotechnology, clothing, cultural tourism, deciduous fruit, health, multimedia and platinum mining sectors. The study found that there was "disappointingly slow diffusion of ICT into major industrial sectors in South Africa". This writer proposed that the relatively slow diffusion thus far presented many opportunities for South African organizations and sectors to use ICT for greater efficiency, effectiveness, innovation and customer service. The question we must address is "Why is diffusion of ICT in key economic sectors so slow?"

**Diagram 5: The role of information infrastructure in creating networks**



*Source: William H. Melody (2003)*

A study conducted by Sagren Moodley ( 2002) on B2B E-Commerce in the South African manufacturing sector suggests that the reasons for slow diffusion include:

- The size of the challenge of building e-commerce is significant
- Single organizations cannot build e-commerce as there is a transaction chain in which many or all of the institutions in the transaction chain need to have similar levels of technology use and common standards for e-commerce interaction

- A technology-focused approach is not useful, the major changes required in firms are at the level of organization-wide changes in business processes to adapt to the introduction of technology

### **5.3 Recommendations**

5.3.1 The Free State government should design an e-commerce strategy that focuses on measures to support the growth of e-commerce and e-business in selected sectors, in particular in the sectoral thrusts stated in the Free State Growth and Development Agreement 2003, with due attention to the reality that e-commerce in South Africa is likely to evolve over time, as technology adaptation occurs and business process change is introduced.

5.3.2 The Automotive Industry Development Centre model, establishing a government agency to facilitate focused development in a particular sector, should be reviewed and could be applied to facilitating e-commerce and e-business in the selected sectors. Such a model would use a combination of government-funded consulting to industry and commerce and consulting commissioned and paid for by commerce and industry.

5.3.3 The Free State government should formulate and implement an e-government strategy borrowing from the lessons of, amongst others, the Provincial Government of the Western Cape, the City of Cape Town, the City of Johannesburg, and with the support and assistance of the Centre for Public Service Innovation of the Ministry for the Public Service and Administration.



## CHAPTER 6 HUMAN CAPITAL AND THE FREE STATE ECONOMY FOCUS

*“Human capital – foundation resource for the network knowledge economy”*  
(William H. Melody, 2003)

*“Innovation needs people - well-trained, effective scientists, engineers and technologists. There is increasing evidence that our progress in producing scientists, engineers and technologists is not yet satisfactory. We therefore need a number of interventions to strengthen the transformation of our science and technology capacity to achieve increased numbers of people working in key fields that are of importance to the future”.* (Introduction to the National R&D strategy - DST)

### 6.1 Human capital in the ‘network knowledge economy’

The quantum leaps in the generation of new knowledge demonstrated in the innovations of the last century - in the natural and applied sciences, as well as in the arts, politics and the humanities - suggest that the application of human knowledge to the challenges and demands of the new century will continue to be the fundamental driver of human productive activity for as long as we can foresee. It has been argued that “..the knowledge economy is expected to be an era of human capital with investment in skills, competencies and capabilities of people being the central activity. This suggests that the knowledge economy will provide for a considerably higher level of human development than the industrial economy..” (Melody, 2003).

A brief overview of changes in the South African labour market in the last 20 years reveals that the majority of jobs lost have been unskilled jobs, while there is increasing demand for labour with higher levels of knowledge and skill, team work capability and problem-solving capacity, the ability to work with minimal supervision in a team or self-managed environment. In particular, there is demand for labour skilled in the areas of financial services, science and technology applications, management and entrepreneurship.

South African schools and education policy-makers have acknowledged the need for a renewed focus on language communication and basic maths and science as a foundation knowledge set for future generations. It is also well understood that basic skills in the use of electronic technologies should be taught at school.

Institutions of higher education are grappling with the challenges of promoting greater efficiencies within the system; increasing the number and quality of graduates and post-graduates; promoting race and gender equity within the higher education system; producing greater numbers of researchers across the natural and social sciences; and curriculum redesign to ensure that course content stays abreast with the latest developments. New disciplines are emerging based on multidisciplinary foundations. For example, kinesiology is a multidisciplinary science constituted from three primary areas of study - Biomechanics, Exercise Physiology, and Psychomotor Behavior. Kinesiologists study human movement through the application of these three primary sciences ([www.lifeextensions.com/about\\_kinesiology.htm](http://www.lifeextensions.com/about_kinesiology.htm)).

Similarly, while some courses may be ICT specific, as a cross-cutting technology and infrastructure ICT thrives within a multi-disciplinary context. Graduates and practitioners with sets of multidisciplinary skills are increasingly in demand for innovation projects and ventures, as it is often the integration of varied disciplines that gives rise to new inventions, discoveries and applications of knowledge and theory. Higher education institutions need to

be responsive to these demands and developments in order to produce the calibre of graduates needed for South Africa to compete in the knowledge economy.

Innovation is the ability to engage in activities that generate high volumes of new knowledge (often in the form of patents, licences, prototypes and research published in accredited journals), and then to commercialise new inventions, products and services. Since the generation of new knowledge occurs at an early point in the innovation value chain, it is unsurprising that institutions of higher education should be key players.

In South Africa higher education's role is recognised and supported by public funding for research published in accredited journals, the Technology and Human Resource in Industry Programme (THRIP), and the Innovation Fund. All of these channel public funding flows to universities and technikons. In addition, government-funded programmes recognise the key role played by higher education institutions in the national system of innovation through, inter alia, the Tshumisano Technology Stations Programme which establishes these stations at higher education institutions such as the Centre for Rapid Prototyping and Manufacturing at Free State Technikon. In certain cases, the HE institutions focus on producing R&D outputs as independent institutions, while in other cases they form linkages with industry to deliver on industry's specific needs.

South Africa faces significant challenges in the human capital arena, not least in increasing the number of R&D personnel as a foundation resource for science and technology innovation and improved productivity. As per the World Bank most universities in developing nations function at the periphery of the international scientific community, unable to participate in the production and adaptation of knowledge necessary to confront their countries' most important economic and social problems.

“Our human resources in science and technology are not being adequately renewed. We have an ageing scientific population – currently about 50% of scientific output is due to scientists over the age of 50, as opposed to a mere 18% in 1990...In the private sector there has been a drop of 16% in the number of researchers over the past four years. Currently, there is less than one researcher for every thousand members of the workforce, as compared with five in Australia and ten in Japan. Although there has been some progress in developing black managers in the science and technology system (up from 4% in 1994 to 30% today), there are far too few black researchers. The percentage of our scientific publications authored by black scientists rose from 3.5% in 1990 to only 8% in 1998...The figures for publication participation rates by women have not improved over the last decade. Women produce less than 15% of publications. These areas clearly require strategic attention” (RSA, 2002:54)

The principle of life-long learning is provided for in the National Skills Development Strategy. If we aim to promote SMME growth as a fundamental component of tourism growth, manufacturing growth and black economic empowerment, then clearly investment in high quality education outputs at all levels of society is vital.

Greater collaboration of all institutions across the NSI including HE, industry, science councils and government, is not yet a feature of the South African innovation landscape, though these collaborations are fundamental to economic turnarounds, as the example of the Oulu Region mentioned earlier illustrates. To address the issues listed above this collaboration will have to be fostered, nurtured and consolidated.

## **6.2 Educational levels**

The number of people with tertiary level qualifications in the Free State in 2001 was 99 047 or 6.3% of the provincial population aged 20 and over, compared to 12.6% for

Gauteng, 11.2% for the Western Cape and 8.4% for South Africa as a whole. The gender breakdown for tertiary level qualifications was 47 063 males and 51 983 females.

Attendance at an institution of higher education in 2001 was as follows – college 10 272, technikon 6 642, university 8 667. As per the national profile, there are relatively low numbers of students, particularly women in S&T disciplines.

**Table 3: Educational profile for the Free State province**

	<b>2001</b>
Attending pre-school	31 773
Attending school	765 166
Attending college	10 272
Attending technikon	6 642
Attending university	8 667
Grade 12/Std 10 qualification	274 843
Tertiary qualification	99 047

*Source: StatsSA: Census 2001*

### **6.3 Employment Profile**

Census 2001 reports a significantly higher rate of unemployment (strict definition) for the province, viz 43.0% as compared with the official labour market statistics reported in the Labour Force Survey of September 2001 of 29.1%.

**Table 4: Occupational profile for the Free State province**

	<b>1996</b>	<b>2001</b>
Total employed	701 175	591 002
Total unemployed	299 948	43%
Legislators, senior officials and managers	18 068	19 802
Professionals, technicians and associate professionals	75 727	73 848
Service workers (financial services, tourism, hospitality, other)	54 491	50 571
Skilled agricultural and fishery workers	39 906	28 719
Craft and related trades workers	92 949	71 246
Plant and machine operators and assemblers	65 161	62 725

*Source: StatsSA: Census 2001*

**Table 5: Employment in selected economic sectors**

	<b>2001</b>
Agriculture, hunting, forestry & fishing	102 791
Mining & quarrying	44 280
Manufacturing	48 301
Transport, storage and communication	21 307
Financial, insurance, real estate and business services	32 921
Community, social and personal services including government	111 297

*Source: StatsSA: Census 2001*

It is noted that the aggregated data do not give a sufficiently clear profile of occupations that are critical to building the knowledge economy. More detailed study is required to analyse the SET knowledge and skills base of the province. However, interviews conducted with Farmovs indicate that the availability of people with the necessary levels of science education, training and experience is low, and that the availability of black professionals is particularly low.

Interviews with district and municipal managers in Xhariep and Northern Free State districts also reveal that opportunities for post-secondary study are extremely limited and that this creates major obstacles for the growth of SMMEs and local BEE in agriculture, agroprocessing and tourism (Xhariep) and in the petrochemical processing and manufacturing value chain (Northern Free State). There are hardly any higher education institutions in close proximity to these districts and they rely, respectively, on Bloemfontein and Gauteng/North West Province, though not many can afford to study at these institutions. The UFS campus at Phuthaditjhaba has significant limitations while the UFS main campus in Bloemfontein, though well-resourced in many areas, does not have an engineering faculty.

#### **6.4 Attractiveness of the Free State**

The Free State seems to have difficulty attracting those seeking innovation- and technology-focused jobs with high personal growth and income potential. Both the public and private sectors need to apply their minds to addressing this state of affairs. Building institutions to support the growth of a knowledge economy should help to create the environment that knowledge workers will seek out.

Publicising the Free State's intentions to promote local innovation, local technology diffusion, and to invest in human capital development at tertiary level, could spark interest in the Free State as a work destination. This will be a medium- to long-term project.

#### **6.5 Recommendations**

- 6.5.1 The human capital development infrastructure will require significant investment to establish a local knowledge and skills base appropriate to the demands presented by the proposed strategies for economic growth and development. A strategy for attracting knowledge workers to the Free State will be a critical success factor.
- 6.5.2 Education in mathematics, the natural and applied sciences, medicine and engineering is pivotal, as is the application of this knowledge to the economic demands of local firms and industries.
- 6.5.3 Marketing and management oil the wheels of economies and business and government need professionals in these fields.

- 6.5.4 In addition, investment will need to be made in the development of a growing pool of researchers in the natural, applied and social sciences in order to build the R&D capacity of the province as a foundation for an innovation-focused, high-value-add manufacturing economy.
- 6.5.5 Given the Free State's challenges as regards rural poverty and community development, the province will need significant numbers of people who can apply their knowledge to the current and future development challenges.

## **CHAPTER 7      SOCIAL DEVELOPMENT AND SUSTAINABLE LIVELIHOODS FOCUS**

### **7.1      Innovation in government service delivery – social change and sustainable livelihoods**

*‘An inclusive society must be based on respect for all human rights and fundamental freedoms, cultural and religious diversity, social justice and the special needs of vulnerable and disadvantaged groups, democratic participation and the rule of law.’ (United Nations, Social Development Summit 1995)*

*‘Social inclusion is the term used to describe the process by which efforts are made to ensure that everyone, regardless of their background, experiences and circumstances, can gain access to the services and facilities they need to achieve their own potential in life.’ (Edinburgh Youth Social Inclusion Partnership)*

There can be little disagreement that a knowledge economy strategy that restricts itself to the needs of business and industry is not appropriate in the South African context. While industry and economic growth is vital to building a sustainable economic base for the country, South African communities will continue to experience relatively high levels of unemployment and poverty for the next decade at least. At the same time as actions are being taken to redirect the economy towards economic growth and job creation, attention should be given to how science and technology in general, and ICT in particular, can be applied to support social development, poverty alleviation and sustainable livelihoods. Attention should also be given to disseminating existing knowledge and creating new knowledge and new services in a wide range of spheres including development finance, health and well-being, and youth development. The Umsobomvu Youth Fund has developed a set of resources ([www.youthportal.org.za](http://www.youthportal.org.za)) for young people which provides access to a combination of information services and practical resources that can assist them in securing employment, or starting their own enterprises.

### **7.2      Government services, health and well-being**

The Free State Department of Health runs health programmes for the roughly one million people who live in rural and deep rural areas. It is keenly interested in the application of ICT for development, although thus far it has focused mainly on tele-radiology. The system has been well-tested and has ‘sending stations’ at Senekal and Zastron and a ‘receiving station’ at Universitas Hospital. In order to introduce other telemedicine applications, training will be required for the people transmitting data from the outlying areas. High mobility of medical workers presents the risk, however, that investment in training is lost when staff quit the Free State public health system.

The Department uses ICT to promote human capital development in the health sector. Its interactive distance learning system broadcasts from Bloemfontein to 50 classrooms in the Free State every day. Using a satellite dish and decoder and keypad system, staff are required to punch in their PERSAL number, so that the session manager can monitor who has attended the session. Staff participation can be monitored by having staff members punch in their PERSAL numbers every time they ask a question or make a contribution. The current satellite footprint stretches as far as the Congo, lending the Free State the competitive edge in being able to provide a limited range of tele-health services to countries throughout southern Africa. The model is an emulation of aspects of the commercial banking environment’s IT architecture.

The Department of Health provides bursaries for 150 first year students to study at UFS in a wide range of medical applications and disciplines. Its partnership with UFS aims to produce more black graduates. Bursary students are required to work for the Department for the equivalent number of years for which they held a bursary.

### 7.3 Electronic Government and Electronic Service Delivery

Access to electronic government services requires some form of telecommunications access. The start-up costs for e-government infrastructure can be significant and careful planning should be undertaken. Statistics on telecommunications access indicate the presence of a basic infrastructure which can be developed into a network for the provision of e-government services. Collaboration with national government agencies such as the Centre for Public Service Innovation could advance pioneering efforts in this field, thus supporting efforts at promoting greater social inclusion of poor and rural communities.

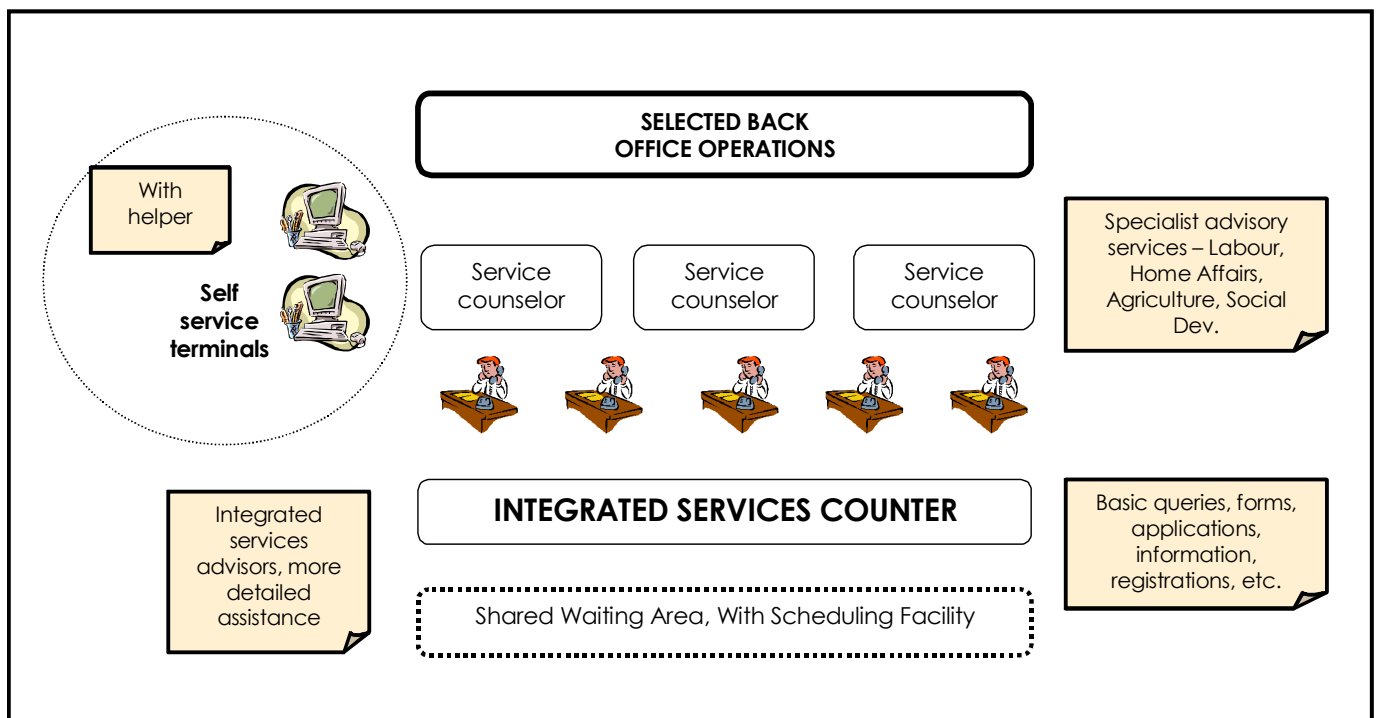
**Table 6: Access to Telecommunications**

	<b>2001</b>
Population	2 706 775
Telephone in dwelling and cellphone	72 606
Telephone in dwelling only	76 946
Cellphone only	109 196
At a nearby location	399 697
Not at a nearby location	19 965
No access	54 891
Radio	553 991
Television	394 736
Computer	36 156

Source: StatsSA: Census 2001

The Centre for Public Service Innovation (CPSI) and the Department for Public Service and Administration are on a major drive to launch Government Service Centres (GSC) at selected sites in South Africa, some in rural municipalities. The aim is to improve access, quality and efficiency of government services through a combination of physical and ICT-based access facilities, as presented in the diagram below.

Each GSC will be established within a particular municipality and will therefore, more than likely, primarily serve the citizens residing within that municipality. In terms of the access strategy, the target is to have a minimum of one GSC for each municipality.



Government sees the municipality determining the location of the GSC such that it accords with its development and spatial plans. Depending on the size of the municipality, there may be more than one GSC, or satellite centres.

*Source: CPSI, 2003*

### **Diagram 6: Model for a Government Service Centre (GSC)**

With the current pilot sites, another interesting possibility is emerging, ie. that of the GSC becoming a repository of information on the needs of the community. This information can be combined with other sources of information to inform municipal IDPs. Implementation of the GSCs will have to be evaluated on an ongoing basis.

The Namahadi multi-purpose community centre (MPCC) in Thabo Mofutsanyane district municipality is scheduled to become the first GSC initiative in the Free State. The process for transforming the Namahadi MPCC along integrated service delivery lines has commenced. A detailed site evaluation, where government identifies the services to be delivered and maps these services with a view to restructuring them on the basis of integrated service delivery, was planned for 2003.

The CPSI, an agency falling under the Ministry for Public Service and Administration, is involved with the first phase of the GSC implementation, in which it is attempting to demonstrate the modalities of integrated service delivery sites. The long-term plan for the establishment of GSCs still needs to be determined. In all likelihood, the establishment of GSCs will become the mandate of the proposed Government Gateway company. In addition, there are discussions underway to make sure that GSCs are provided for in municipal IDPs. Whether this will be accepted and exactly how it will work still needs to be determined.

The CPSI sought a variety of settings in order that they could evaluate the robustness of the GSC model. Namahadi was prioritised as one of the first four sites based on an assessment that was conducted earlier in 2003. The pilot GSC projects are designed to give CPSI and the relevant municipalities a better sense of the benefits that can be achieved. Based on the current planning, citizens can expect of the Namahadi MPCC that it provide information on public services. GSC clients will be able to get information every working day, instead of having to depend on the relevant government official being available. They should also be able to access information on the services of departments who are not MPCC tenants. There are plans to introduce same-day service for issues such as birth and death registrations. It is proposed to have a fairly well-functioning integrated services counter with access to the Gateway portal.

Any municipality can establish a GSC if they believe the need exists and have the wherewithal to establish one. They can contact the CPSI for the GSC model and implementation framework. The GSC may be key to getting better quality services to more people. However, an options analysis and feasibility study should be conducted in order to establish which e-government models and options are best suited to a particular municipality.

While government can provide services using ICT, citizens may be unable to access these services if they have no access to a telephone, the Internet or a government service centre. A recent e-government access study found that a number of models for access and the provision of e-government services should be considered:



**Table 7: E-Government options**

	<b>AFFORDABILITY</b>	<b>APPROPRIATE TECHNOLOGY</b>	<b>MAXIMUM REACH</b>	<b>ECONOMIES OF SCALE</b>	<b>DEVELOPMENT IMPACT</b>
<b>SMART SERVICE (Using existing ATM and financial transaction networks)</b>	Cheaper than going it alone – gearing ratio to be determined. Will involve budget re-prioritisation - challenge is the cost of migration. Affordable to customers.	ATMs most proven technology in terms of customer acceptance, but debit cards used at point of sale devices could become popular	High in cities, towns and townships – best reach of any technology or business model	Volumes needed, but significant economies of scale can be achieved	High – Application in early Phase 2
<b>SMART PLUG-IN (Plugging a government terminal into existing networks)</b>	Relatively expensive for government – capital investment in infrastructure. Should be no cost to the citizen.	Information service only terminals untested in SA	May be useful to pilot and test “client” behaviour, interest and demand	Dependent on number of terminals	Low – Application in CPSI Phase 1
<b>M-GOVERNMENT (Services over the cellular networks)</b>	Relatively high user costs but SMS messaging could be viable	Level of comfort with cellphones for information, communication, but transactions untested	14m subscribers could access basic services	Dependent on business models	High – in the long-term Phase 3
<b>GOVERNMENT ONLINE (Internet)</b>	Inexpensive for those with access at the home, café, information dissemination thro’ community radio	High availability of landlines in factories and commercial undertakings	Could reach more if workplace Internet access established	Employer may be concerned re costs of access – consider incentives	Low to medium – dependent on success of workplace access initiative
<b>CENTRE SERVICES (GSCs, MPCCs, telecentres, mobile vans)</b>	Must be free to the user. Requires major investment from government	WLAN, GPRS, satellite and fixed lines, and mobile technology or wireless in some areas	Wide distribution of centers across the country. Mobility can ensure greater reach than stationary centres	No apparent economies of scale	High
<b>TALK TO GOVERNMENT (IVR)</b>	Must be free to the user IVR requires significant investment from government	IVR widely used in commercial & entertainment space	Wide reach across all areas of SA Particular focus for rural users	Low cost model	High
<b>COMPUTERISED COUNTER SERVICES (Computers at the government counter – virtual + face-to-face)</b>	Budget reprioritisation required to enhance service delivery and service quality which is a key policy objective of government	Level of functionality and applications development will determine whether this model is successful	Will be limited to government and postal counters	No notable economies of scale	High – but restricted to government offices, low levels of self-service

Source: CPSI E-Government Access Study, April 2003

Government departments and agencies can provide the necessary information and services to promote real benefits through e-government. For example, the Umsobomvu Youth Fund has developed a telephonic information and advice service for young people to facilitate their participation in the labour market. Promoting telephonic access and other e-

government access channels for citizens in the rural districts of the Free State province is important for the Free State government in its attempts to foster social development and sustainable livelihoods.

#### **7.4 Recommendations**

- 7.4.1 The Free State government should promote networked or “joined-up” government, especially for those districts where towns have poor or limited access to government services. Such networked government should develop packages of combined health, social development, safety and security and education services and deploy small cross-governmental teams to small towns to promote improvements in the quality of services.
- 7.4.2 Government training should begin to focus on teaching selected groups of civil servants a range of skills across these service areas, so that the teams can deliver a packaged service irrespective of their departments of origin.
- 7.4.3 Government should collaborate closely with the CPSI and with knowledge-based institutions such as UFS and TFS to develop innovations in public services. These innovations are most likely to occur where strong partnerships are built with non-governmental organizations and the private sector, as in the case of the Inkosi Albert Luthuli Central Hospital.
- 7.4.4 Government should develop an ICT for Development strategy that incorporates plans for e-government.

## CHAPTER 8 COLLECTED RECOMMENDATIONS AND CONCLUSION

The following recommendations should be reviewed in the context of the full portfolio of PEAC research papers and revised accordingly.

### 8.1 A strategic framework for knowledge-based economic development and growth



#### **Recommendation 1: Economic development and innovation focus – Free State Growth and Development Agreement 2014**

To build on the Growth and Development Agreement 2003, the Free State Provincial Government should pursue the establishment of a formal multi-stakeholder structure bringing in all the major economic players from the five districts that have the capacity, resources and desire to foster innovation – including industry partners, further and higher education institutions, science councils and provincial and local government players – and pursue their backing for a Free State Growth Agreement aimed at shifting the economic base towards high-value-add manufacturing and local innovation, initially on a small-scale, but with plans to grow the size and scope of innovation output over the next ten years.

In particular, attention should be given to the strategic directions for innovation proposed in the Advanced Manufacturing and Technology Strategy and the Integrated Manufacturing Strategy, both of which focus on the year 2014 as the beginning of the third decade of democracy. Attention should also be paid to promoting successful biotechnology ventures and to the establishment of small-scale biotechnology launch sites in the design of the growth agreement.

The Growth Agreement should address commitments to growth targets in the innovation sphere and the promotion of efforts across the entire innovation value chain including knowledge intensive human capital development; R&D; funding flows; technology incubation and transfer; intellectual property rights; and support for commercialisation and business development. It should also address, in some detail, plans to promote black economic empowerment in the knowledge economy. Young, black innovators and entrepreneurs should be major contributors to building the South African knowledge economy. Such a Growth Agreement could serve to attract further funding flows to the province.



#### **Recommendation 2: Science, engineering, technology and innovation focus – collaborative networks of HEs, science councils, local industry and other agencies**

The Free State provincial government should encourage, foster and directly facilitate the establishment of strong collaborative networks among knowledge-based institutions across South Africa, in particular with the institutions in the National System of Innovation. The key objectives of these collaborative networks should be to:

(1) produce significant numbers of high quality graduates in the disciplines of science, engineering, technology, social science, innovation management and entrepreneurship, with the curriculum and key outputs being focused towards building the knowledge and skills base to foster local innovation and to resource the partner institutions.

(2) encourage the growth of multi-disciplinary academic programmes that bring together the scientific, analytical and managerial disciplines in order to develop cohorts of science and technology researchers and entrepreneurs.

(3) promote R&D in the higher education environment in support of early innovation initiatives and in particular invest resources in postgraduate programmes at Masters, doctoral and post-doctoral level to supply a new generation of young researchers and thus replenish the declining pool of R& D workers.

(4) promote R&D across the institutions engaged in the system of innovation in the Free State province for mutual benefit and put together collaborative bids for R&D and innovation funding flows, eg. THRIP and the Innovation Fund.

(5) collaborate on, and foster, the production of research outputs including patents, licences, prototypes and articles in local and international accredited journals.



### **Recommendation 3: LED and small towns**

A “Small Towns Research Project” should be conducted on an ongoing basis to identify the particular activities that will best promote increased economic activity in each small town. Generalised recommendations applicable to many small towns are not appropriate or meaningful.

In addition, a “Small Towns Investment Fund” could be established, possibly in collaboration with the development financing sector including the Development Bank of Southern Africa, the Land Bank, the Industrial Development Corporation, Khula and Ntsika to support local entrepreneurs in infrastructure development, agriculture and agro-processing, small-scale industry development and SMME development.



### **Recommendation 4: Human Capital focus – collaboration of provincial and other South African institutions**

Given the low levels of access to further and higher education for many people and communities in the province, special efforts should be made to strengthen the availability of FET and HET infrastructure in the province. For example, communities in the northern Free State rely largely on institutions in the provinces of North West and Gauteng for access to higher education. In reality, there is limited access to these campuses, which, although nearer than UOFS or FST, do not necessarily offer courses tailored to local needs. This access is in any event generally unaffordable to the majority of the Free State’s population.

LED projects in each of the five district municipalities could focus on facilitating the provision of clearly identified further and higher education services by either (1) establishing partnerships with the full range of FET and HET institutions within a reasonable distance, including institutions in other provinces or (2) inviting competitive bids from consortia of education and training institutions to provide specified services in line with the objectives stated in Recommendation 2 above.

In particular, stronger collaboration should be fostered between the University of the Free State and the Free State Technikon.

Increasing higher education throughput and post-graduate, post-experience education, particularly in science, engineering and technology are key components for building black economic empowerment in Free State commerce and industry.



### **Recommendation 5: Social Development focus – advances in telemedicine, e-government and ICT for development**

The early work of the Free State Department of Health in promoting general health services and in particular tele-radiology services is highly commendable. Given the high levels of knowledge and expertise in the medical field in the Free State, detailed plans should be developed to promote the development of a hybrid face-to-face/telemedicine network over the next ten years to reach out to communities in towns and rural areas that currently have access to only the most basic health services.

The extension of mobile services to communities on farms, on mines, in small towns and in national parks can support the growth of a rurally-biased tele-health approach. The combination of mobile tele-health services and the further establishment of multi-purpose community centres in collaboration with the Department of Public Service and Administration and the Centre for Public Service Innovation can provide the necessary infrastructure to promote the rural focus of the Department of Health in terms of health education, disease prevention, referrals and a more extensive range of health services.

The wide range of social services within the social development and social care environment can be supported through the promotion of an electronic network for sharing information, ideas, lessons and experiences across the broad network of government, non-governmental and community based organizations engaged in this sphere of service delivery, whether addressing the needs of the aged or of young people or of women and children. A simple electronic communication system can be built, perhaps by first linking in through the health satellite network and negotiating a cost –sharing arrangement.

Alongside the central government initiative to establish a Government Service Centre (GSC) in each municipality in the country, the Department of Social Development could leverage the infrastructure to design an online service and networking project as a means to enabling NGOs and CBOs across the province to learn from each other in addressing challenges such as poverty alleviation, HIV/AIDS, child abuse and other matters within its mandate.



#### **Recommendation 6: ICT focus – ICT and E-Government strategy**

The Free State provincial government should work with local and district municipalities to design an e-government strategy that will, over time, ensure that every citizen and every business can interact with government online. This infrastructure base could, within a period of ten years, create an environment whereby citizens, government and business are fully interactive – using ICT as a functional tool to support learning, communication, entrepreneurship, trade and innovation. The CapeOnline initiative (provincial government) and the SmartCape initiative (local government) provide interesting models for a possible future.



#### **Recommendation 7: Public service innovation focus – partnership with CPSI, SA Cities Network and DPSA Learning Network**

The focus on public service innovation, (with key institutions being the CPSI, SA Cities Network and the DPSA Learning Network), covers a wide range – most notably the area of integrated service delivery. Both Free State provincial and local government should participate in these activities to contribute to and benefit from the general innovation drive occurring in the public service.

The introduction of innovations, such as those proposed in recommendations 1 to 5 are by definition high risk. Participation in innovation and learning networks can help

to minimise the risks as the participants share their experiences and can learn what works and what does not from those who have taken earlier initiatives. Risk is spread throughout the group as not all participants will take on risk on the same issues at the same time.

## **8.2 Institutional framework for promoting the knowledge economy in the Free State**

It is often argued that the establishment of new structures, organizations, committees and institutions can present a drain on resources without any significant value being forthcoming. Yet many of the existing structures, organizations, committees and institutions may not be effective in achieving innovation outputs. The challenge therefore is to design an institutional framework that progressively downsizes or eliminates those institutions that are not producing value and fosters new institutional arrangements better designed for the specific purpose.

Given the intention to build the Free State knowledge economy, the following basic institutional matters will require attention:



### **Recommendation 8: Networks to overcome barriers of distance, time and space**

Assuming adoption of Recommendation 1 above, the parties to a Free State Growth Agreement 2014 could communicate regularly and conduct much of their interaction online, as the geographic distances which they would be required to cover to meet at a single venue could militate against regular deliberations and decision-making. This networking could be managed by an existing organization such as a local business development agency or university-based research centre.



### **Recommendation 9: Provincial, national, global networks**

The establishment of a Manufacturing Advisory Centre (MAC) for the Free State as proposed by the Department of Economic and Environmental Affairs and Tourism and the Science Park, is a vital component of building the institutional framework for the knowledge economy. The linkages into the national MAC or NAMAC, based at the CSIR in Pretoria will create key opportunities for learning and promotion of manufacturing activity. Due attention should be paid to ensuring that the “FSMAC” has the necessary capacity to advise on the issues raised in this paper viz. SET and innovation, ICT applications and knowledge-intensive human capital development. The CSIR and NRF are integrated into global knowledge and R&D networks and can, where appropriate, facilitate global linkages for innovation activities in the Free State.



### **Recommendation 10: S&T networks**

The Free State provincial government could play an important role in providing an enabling environment for the formation of S&T networks in the province, where firms and SMMEs throughout the province can benefit from clustering their innovative activity. Models such as Gauteng’s Automotive Industry Development Centre, which acts as a facilitator bringing together industry with FET and HET institutions to promote achievement of automotive industry productivity and export targets, and to build a sufficiently large human resource base in automotive engineering, can be applied in the Free State in ways which

promote local agribusiness, mining and manufacturing. The AIDC is keen to share its experiences with other provinces and can provide consulting services or advice.

This facilitator-driven model is usually necessary, as South African industry has not yet evolved to the stage of strong collaborative activity, though collaboration is often vital to leverage knowledge and minimise the costs of R&D and commercialisation, while still promoting competition.

Networks should also be built with the CSIR, the HSRC, the NRF and other science councils. The Science and Technology component in the Free State government, in collaboration with its Economic Affairs counterpart, must make significant progress in promoting science, technology and innovation in the province.



### **Recommendation 11: Importance and contribution of local government sphere to promoting innovation for development**

Local economic development is a fundamental component of the mandate for local government. This implies that, in a knowledge economy context, local government has a major role to play in promoting innovation. A forum where leaders of all the district- and local municipalities meet already exists. This structure could be tasked with adopting an innovation and growth, or knowledge economy, paradigm in its work and deliberations.

#### **8.3 Human resource implications**

The implementation of the above recommendations may require a range of employment practices including (1) refocusing the work of existing staff or agencies towards the stated objectives, (2) employing a limited number of new staff with the appropriate background and experience in key components of government to develop the knowledge economy thrusts for the provincial government, (3) requesting temporary secondment of staff with the appropriate background and experience from science councils, and other bodies, to create a knowledge base inside government capable of promoting the knowledge economy thrusts. In the case of establishing a MAC, there will be recruitment and employment implications.

Whether introducing new staff or refocusing existing staff, an orientation and education programme should be commissioned to support the knowledge economy programmes and investment strategy.

The public and private sectors should make significant investments in fostering and attracting people to build a Free State knowledge economy.

#### **8.4 Practical proposals for early stage knowledge economy development for the Free State**

The recommendations listed above include a number of practical proposals for early-stage knowledge economy development. The single most important recommendation is the following:



### **Recommendation 12: Institutional Centre - Knowledge Economy Research and Investment Unit**

The Free State government should establish a **Knowledge Economy Research and Investment Unit** to guide progress towards application of the strategic framework and institutional mechanisms and networks proposed above and, in particular, to consider

opportunities to drive an investment strategy. A dedicated team is needed to give effect to any recommendations adopted. Such a unit would work closely with the various structures and networks proposed in the recommendations above.

This unit could be established under the auspices of the PEAC, with the reporting line to the Premier in the Executive Council, or in the Department of Finance and Expenditure, because the knowledge economy cuts across all government departments and economic sectors.

## **8.5 Conclusion**

The Free State province has a sufficiently diverse economy, as well as institutions with a reasonably good knowledge base, to build its participation in the emerging South African knowledge economy. But it cannot make this shift alone. It will need to build linkages to the National System of Innovation and to network with all those agencies in the Free State capable of producing innovation outputs.



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