DEPARTMENT OF ECONOMIC DEVELOPMENT
GAUTENG PROVINCIAL GOVERNMENT, SOUTH AFRICA

Gauteng Innovation and Knowledge Economy Strategy

April 2012

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List of Abbreviations and Acronyms

BBBEE – Broad-Based Black Economic Empowerment Strategy

CSIR – Council for Scientific and Industrial Research

DED – Gauteng Department of Economic Development

DBSA – Development Bank of Southern Africa

DST – Department of Science and Technology

GEDGS – Gauteng Economic Development and Growth Strategy

GIPF – Gauteng Industrial Policy Framework

GPG – Gauteng Provincial Government

HEIs – Higher Education Institutions

ICT – Information Communications and Technology

IIU – the Industrial Innovation Unit

IP – Intellectual Property

OECD – Organisation for Economic Cooperation and Development

RIS – Regional Innovation Systems

NSI – National Systems of Innovation

R&D – Research and Development

SABS – South African Bureau of Standards

SAINe – South African Innovators Network

TIA – Technology Innovation Agency

TIH – The Innovation Hub, and includes The Innovation Hub Management Company

TUT – Tshwane University of Technology

UP – University of Pretoria

WITS – University of the Witwatersrand, Johannesburg

Executive Summary

Innovation is at the heart of a country's and region's progression along the developmental path. Innovation finds new and more efficient ways of solving the problems faced by every part of society – and a society that does not innovate can never do more, with less.

The idea that innovation drives economic growth is incontrovertible, and governments around the world are broadening and deepening their support for innovation in the private sector and the economy more generally.

Given that innovation plays an important role in driving future growth, the Gauteng Provincial Government will be seeking to accelerate policy efforts aimed at strengthening the national innovation systems.

These efforts include the introduction of broad measures to improve performance in areas like R&D, education, entrepreneurial activity and knowledge flows- -all of which are key determinants for innovative activity.

The Gauteng Innovation Strategy begins by explicitly recognising the importance which must be attached to socially-oriented innovations. At the same time, recognising that communities themselves are the source of innovation, as well as individuals, will provide direction as to how, why and where we should be supporting innovation. It will also help in understanding the benefits that can arise from innovation.

Although many of the important factors such as tax regimes and tertiary education system lie within the scope of national government departments, Gauteng Department of Economic Development and its agencies will be creating and facilitating interactions between universities and private sector organisations as well as establish eco-system based approaches and relationships with national government and its agencies to ensure effective implementation of the strategy. The purpose of the strategy is to ensure that Gauteng becomes a knowledge-driven economy

The Gauteng Innovation Strategy Statement is:

To accelerate innovation in all its forms, in order to bolster and support the broader strategic objectives of employment creation, and sustainable social and economic development.

The most crucial departure that this strategy takes from many other innovation strategies, is the prominence given to social innovation and open innovation, which places the Gauteng Innovation Strategy at the forefront of creating a strategy that is not confined to narrow economic outcomes, and helps to create an inclusive innovation system.

The outcomes achieved through the implementation of the strategy will then be:

- A more efficient use of resources – both public and private – in delivering on the objectives of the various strategies and policies developed by the Provincial Government
- The creation of new and valuable knowledge relevant to the social and economic priorities identified in other policy and strategy documents
- To support the movement towards an advanced, knowledge-based economy by creating appropriate functions and infrastructure.

Flowing from this strategy are **three strategic objectives**:

- To improve the competitiveness of the Gauteng economy, in particular a set of identified strategic sectors ("Economic Competitiveness")
- To improve the efficiency of the public sector in delivering services ("Public Sector Efficiency")
- To promote the sustainable livelihood and quality of life of citizens within the Gauteng City Region("Community-led Innovation")

In order to achieve these, there are specific sub-objectives:

- Economic Competitiveness
    - Improve internal efficiency of organisations
    - Improve external or environmental efficiencies
    - Create new local value and knowledge chains
- Public Sector Efficiency
    - Improve ability of public sector to acquire and drive innovations

    - Use public sector demand to stimulate innovation in particular areas
    - Commercialise public sector-developed innovations
- Community-led Innovation- Improve the livelihood and quality of life of citizens of the Gauteng City Region
    - Establish alternative economic value chains in communities.
    - Catalyze and commercialize community-developed innovation

These must be reflected in a set of specific, achievable projects and interventions. Currently, proposed strategic interventions include:

- The development of specific clusters in priority sectors, focused on driving innovation in a low carbon economy, green technologies, and other sectors as identified by the Gauteng Industrial Policy Framework (GIPF);
- The implementation of an "Industry Innovation Unit" with a specific mandate to address industrial process innovation and design at an industry scale;
- Incentivisation programmes to stimulate appropriate research, development and innovation aligned to the provincial strategies and objectives of the innovation strategy. Some examples include:
    - both direct incentivisations such as 'innovation vouchers' as well as the potential use of government procurement; and
    - Targeted innovation competitions
- The development of an information and knowledge exchange networks, based on open innovation systems; and
- Promotion of high speed Information and Communication Technology (ICT) access at a household level as a means of fast-tracking innovation;

The department will continue to identify and integrate other strategic interventions where possible. Therefore, innovation within the province can be supported actively, promoted and accelerated through these strategic interventions.

1. Introduction

The idea that innovation drives economic growth is incontrovertible, and governments around the world are broadening and deepening their support for innovation in the private sector and the economy more generally. The rising knowledge intensity of the world economy and societies' increasing ability to distribute that knowledge has improved its value to all participants in the economic system. The implications of this are profound, not only for the strategies of firms and policies of government but also for the institutions and systems used to regulate economic behaviour.

The Gauteng Employment, Growth and Development Strategy (GEGDS) placed innovation at the centre to achieve an inclusive and developmental society in Gauteng. The Gauteng Innovation Strategy seeks to promote, support and encourage innovation in all spheres of society in Gauteng Province. This is done to ensure that the needs of citizens, and the demands of consumers, are met in the most efficient and complete way possible. These interventions will also catalyse innovation towards achieving the various strategic priorities of the province.

It is also important to consider the breadth of authority which the provincial government has in influencing innovation. Many of the important factors lie within the scope of national government departments. For example, tax regimes are exclusively the role of national government. Therefore, it is not possible for Gauteng Provincial Government (GPG) to become directly involved in providing income tax relief to companies with regards to research and development. In a similar way, although the tertiary education system is critical in the overall innovation system, provincial governments have no direct say in the activities of these institutions.

However, there are a range of indirect ways in which the GPG may be able to support companies, despite not have direct influence. For example, by creating and facilitating interactions between universities and private sector organisations – a role undertaken by agencies such as The Innovation Hub (TIH). So while direct interventions may not always be possible, there are other secondary mechanisms that may prove just as influential. Furthermore, provincial government and its agencies will be establishing eco-system based approaches and relationships with national government and its agencies to ensure effective implementation of the strategy.

In order for the strategy to contribute towards addressing Gauteng's deep and pressing socioeconomic challenges, the GPG will be seeking to achieve a balanced growth that lays the foundations for continuous prosperity. This balanced growth can only come from one place: the knowledge economy. The challenge is to create a knowledge economy that provides jobs for everyone, both high-skilled and low-skilled, in all regions of the province.

According to Gauteng ICT Strategy 2011, Gauteng is not only the largest contributor of South Africa's Growth Domestic Product (GDP), it also has all the elements required to create a large and successful ICT innovation cluster in South Africa. The province is home to world class institutions of higher learning, has young talented people flocking from all parts of South Africa, incubation centres, a large market and the highest number of ICT multinationals in the whole of South Africa. This point is illustrated in table 1 below.

Table 1: Profile of the two Gauteng Innovation/ICT clusters

Innovation/ICT cluster	Education/ Research Institute	Multinationals	Other Benefits
Johannesburg	Wits, UJ, JCSE, USAASA	MTN, Vodacom, Microsoft, Oracle, hp, Cisco, IBM, Novell, Dell, LG, Sahara, SAP, LG, Alcatel, Unisys and many more.	• Large number of graduates • Most advanced infrastructure • Gauteng is a major commercial centre • Access to capital
Tshwane	UP, TUT, The Innovation Hub, CSIR, Meraka Institute, TIA		

Source: Gauteng ICT Strategy, 2011

While the contribution of mining and resources to South Africa's GDP has fallen in the past two decades, the Gauteng province has historical assets in manufacturing and a large services sector that require research and development (R&D) and innovation in its broadest sense.

The strategy recognises that innovation comes in many forms. These different perspectives all deserve different treatment, and the way they impact on society and the economy is distinct for each. The most crucial departure that this strategy takes from many other innovation strategies, is the prominence given to social innovation, as well as open innovation. This places the Gauteng Innovation Strategy at

the forefront of creating a strategy that is not confined to narrow economic outcomes, and helps to create an inclusive innovation system.

What is Innovation?

Innovation is, put simply, the process by which new solutions are discovered to solve problems facing society at large. Traditionally, it has been generally restricted to "Science, Technology and Process" innovations. However, there has been significant movement towards a much broader understanding of innovation, to include innovation within the social and public arenas as well. According to South Africa's Research & Development Strategy, 2002, *"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."*

At the same time, while innovation has traditionally been thought of as being located within high-end research laboratories and academic institutes, there is an increasing role played by open innovation networks. "*Open innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology" Henry Chesbrough, 2003, Open Innovation.* Although this definition of open innovation speaks about innovation at the level of firms and institutions, and focuses on technological innovation, an important development in the past decade of innovation studies has been the recognition of the role of communities outside of the boundaries of firms in creating, shaping and disseminating technological and social innovations.

Finally, innovation is also often thought to be "ground-breaking". This does not have to be the case; in fact, most innovation occurs through technology and information transfers from one place to the next and incremental innovation. Innovations which are new to an organisation or a country may have just as significant an impact as those which are completely novel according to generally accepted intellectual property (IP) standards.

The Gauteng Innovation Strategy recognises the importance of these three characteristics of innovation: a broad concept of innovation, rather than a narrow one; the potential of open innovation networks; and the importance of innovation transfers encompassing incremental innovation and diffusion.

Systems of Innovation

There are a variety of definitions for the concept of a System of Innovation, some of which are presented below:

"The network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies" Freeman, 1995, The National System of Innovation in Historical Perspective

"The elements and relationships which interact in the production, diffusion, and use of new, and economically useful, knowledge… and are either located within or rooted inside the borders of a nation state" Lundvall (ed), 1992, National Innovation Systems: Towards a Theory of Innovation and Interactive Learning

"A set of institutions whose interactions determine the innovative performance… of national firms" Nelson (ed), 1993, National Innovation Systems: A Comparative Analysis

"The national institutions, their incentive structures and their competencies, that determine the rate and direction of technological learning (or the volume and composition of change generating activities) in a country" Patel and Pavitt, 1994, The Nature and Economic Importance of National Innovation Systems

"… that set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process. As such, it is a system of interconnected institutions to create, store and transfer the knowledge, skills and artefacts which define new technologies." Metcalfe, 1995, The Economic Foundations of Technology Policy

All of the definitions present several common ideas that then make up the basic concept of a system of innovation:

- The system is composed of institutions and entities
- The system acts upon the innovative, technological state of the country through various means including importing, developing, inventing and diffusing new technologies
- The relationships and interactions between the entities is critical to its ability to affect the environment

- The system is located within a common geographic region

By way of example, the South African National System of Innovation (NSI) is shown below in Figure 1.

The following characteristics are evident in the NSI:

1. The importance which is placed on two ministries in supporting the innovation process – Science and Technology, and Education.
2. The importance of the various institutions that result in innovation, and research and development, being the Higher Education Institutes, Public and Private Research Institutes, Business, Enterprises, and Non-governmental organisations

According to the National Advisory Council on Innovation (NACI), the NSI is therefore well-defined in terms of the above common characteristics of an Innovation System.

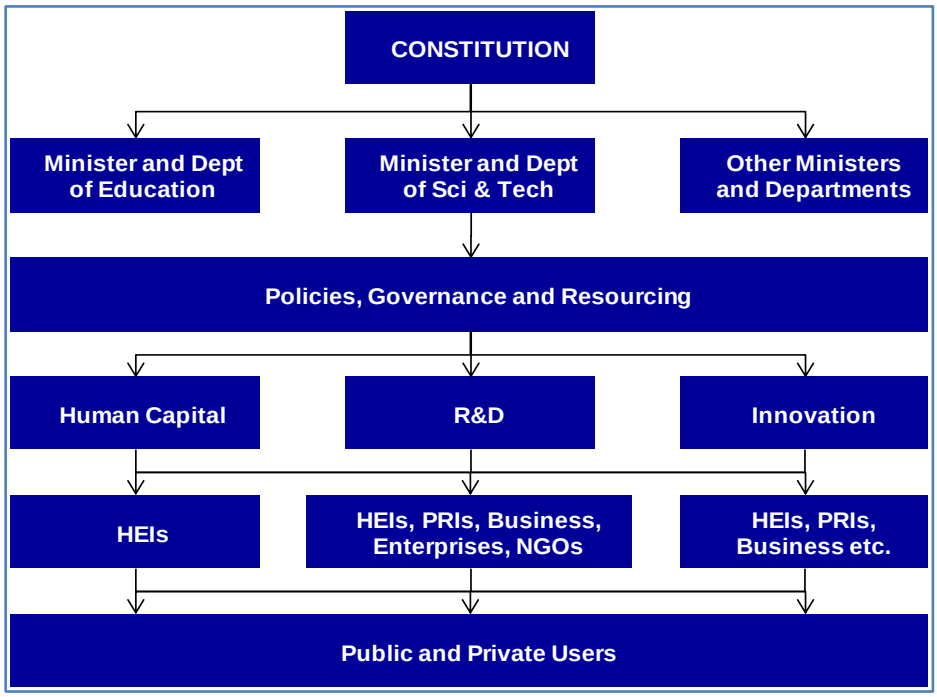

Figure 1: South African National System of Innovation

A more functional depiction of the NSI is also seen in Figure 2 below:

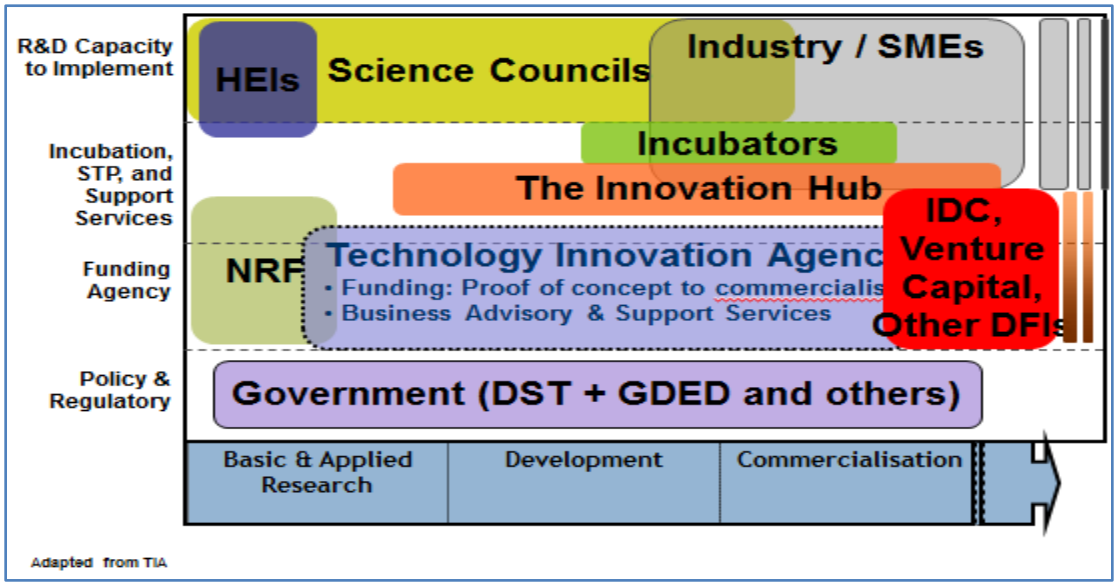

Figure 2: Players within the South African National System of Innovation

A System of Innovation is useful, because, as the one definition states, they "provide the framework within which governments form and implement policies to influence the innovation process". It is therefore critical to develop a robust and comprehensive description of the system which supports innovation within Gauteng, before any Provincial Innovation Strategy can be developed. This is the subject of Section 4. First, though, it is necessary to understand the linkage between Innovation and Development.

2. Character of the Strategy

There are a number of descriptive characteristics which this strategy must be cognisant of, in order to holistically address the primary goal of driving innovation. So while this strategic goal – which is discussed in Section 5 – remains the *purpose* for the strategy, the concepts identified below are contextual opportunities and guidelines which will improve the efficacy of the strategy.

3.1 INNOVATION ≠ SCIENCE

We must recognise and drive all forms of innovation, not simply scientific and technological innovation. This will allow us to support the demands of society at large, and the ability of government to deliver on its mandate.

3.2 SOCIETY IS NOT A PASSIVE RECIPIENT

Society at large plays an active role in driving innovation, especially if they are involved in the actual innovation process. Therefore, the role of society in innovation must be developed further, and mechanisms to strengthen this role must be created.

3.3 COMMUNITY INVOLVEMENT BUILDS PARTNERSHIPS

Society is not just an active participant in innovation, but is ultimately responsible for all demand for innovation. This means that in order to innovate in a relevant fashion, the needs of society must be directly taken into account – and so by bringing communities into dialogue with other agents, partnerships can be built to drive social and economic development

3.4 INNOVATION STRENGTHENS THE SUCCESS OF OTHER POLICIES

By integrating innovation across various other policy documents and strategies, it is possible to continuously improve upon, and support, the delivery of any other strategy. Innovation is therefore a cross-cutting, environmental factor that can help support other strategies in achieving their own objectives.

3.5 INNOVATION CAN BE USED STRATEGICALLY

Although undirected innovation is important in maintaining overall levels of technological advancement, the support and encouragement of innovation within particular areas represents an opportunity to create structural changes, particularly in the priority sectors of the Gauteng economy. This leads to more competitive industries, faster growth and future employment security.

3. An Updated System of Innovation

Before an appropriate set of strategic interventions can be crafted, it is necessary to consider whether the System of Innovation can be expanded to take account of the expanded understanding of innovation, as described in Section 3.

Given Gauteng's dual position as the innovation hub of South Africa, accounting for 52.2% of the total national R&D expenditure in 2008-09, and the host of the largest concentration of informal settlement in South Africa, the innovation system adopted should be the one that meets the needs of low-income earners and supports the small and medium-sized enterprises, especially those in low-income and migrant communities. According to the 2011 OECD Territorial Review for Gauteng, the current innovation system has not adequately addressed some of the key strategic issues affecting the citizens of Gauteng including:

- affordable and environmentally friendly building designs,
- affordable and adequate public transport,
- more extensive services, and
- improved waste management

The Systems of Innovation, for both Gauteng and South Africa, can be adjusted to take account of these changes in the construction of the Innovation Concept. In particular, the Systems of Innovation can be adjusted on the basis of the following:

1. The current innovation system gives overt significance to the role played by Science and Technology within Innovation. Although this is a critical component of innovation, it ignores several areas that are of paramount importance to South Africa in particular. These include:
    - The importance of social and community-based innovations in service delivery
    - The importance of non-technological innovation, such as marketing and process innovations
2. The current innovation system assumes that innovation is performed by institutions and entities involved, for example, in R&D of a particular product. However, as noted in Section 2, there is a significant proportion of innovation undertaken by individuals, communities, and members of society. In the existing description, the individuals, communities, and members of society are viewed exclusively as end-users of technology.

The role of socially oriented innovators and innovations is therefore included, as well as the full role played by communities. An expanded definition of the Provincial Innovation System will then be as follows.

The Gauteng Regional Innovation System (RIS) is the entire system of innovating agents and entities, along with their end-users, which together are responsible for the development, production, and use of new knowledge which is both socially and economically useful. This System will provide the framework within which the Provincial Government is able to catalyse, support and facilitate the innovation process, through policy and targeted interventions.

A graphical representation of this is given below in Figure 3. According to this classification, the RIS is divided into 4 primary areas. These are:

1: The Demand Agents of Innovations

2: The Supply Agents of Innovation

3: Supply-Affecting Factors

4: The overall policy environment

There is a further 'ring' that affects this System, which is the overall global environment. The direction which global society moves will ultimately affect, and influence, the performance and activity within South Africa, and of course Gauteng.

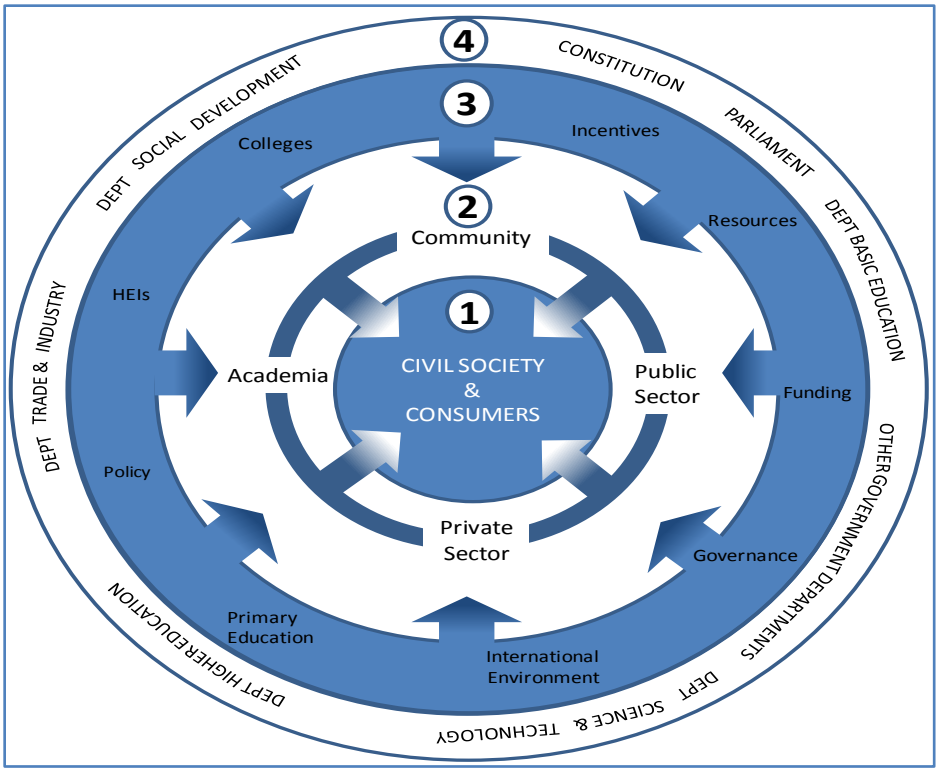

Figure 3: The Innovation System for Gauteng Province

It is important for us to redefine our innovation system, because it directly tells us where, and how, we can begin to implement changes in order to bolster innovation. At the same time, it tells us in which direction we should be catalysing innovation, through the consideration of the overall socio-economic mandate of government. For example, in the previous construction of the National System of Innovation, there was no explicit attention given to the needs of social innovators. Instead, the emphasis placed by the Department of Science and Technology (DST) was such that scientific and technological innovations – which tend to be product and process innovations – were brought to the fore. In the current description, equal attention is paid to the social needs of society, as to the material needs.

Equally, by locating the Community within the group of Innovators (at Level 2) we recognise the importance of individuals, community-based organisations and other groups which do not have a formal affiliation with some research-focussed group. However, these groups are often at the forefront of social innovations, and must be equally recognised.

Furthermore, by recognising the community – ultimately composed of individuals – as a source of innovation, we can begin to identify potential incentives directly to individuals in order to promote and encourage innovation or research-focussed work.

4. Strategic Goal

It is clear that there are a number of pre-existing strategic and policy objectives adopted by both National and Provincial governments, as well as the Gauteng Department of Economic Development (GDED) itself. It is then necessary to align any innovation-related strategy with these, in order to support, and drive, the higher strategic priorities.

The Gauteng Innovation Strategy Statement is:

To accelerate innovation in all its forms, in order to bolster and support the broader strategic objectives of sustainable social and economic development, and sustainable employment

The outcomes to be achieved through the implementation of the strategy are:

- A more efficient use of resources – both public and private – in the achievement of the GDED's overall strategic objectives
- The creation of new and valuable knowledge relevant to the social and economic priorities identified in other policy and strategy documents
- To support the movement towards an advanced, knowledge-based economy by creating appropriate functions and infrastructure

The overall strategic framework is provided in section 6 below. This shows the hierarchy of strategic objectives and interventions planned in order to achieve the overall strategy.

5. Objectives of the Strategy

The strategy statement is founded on the understanding that innovation can drive and assist Gauteng in achieving the global objectives of increased economic competitiveness, improved public sector services, and sustainable livelihood and quality of life of citizens within the Gauteng City Region.

Research indicates that in emerging markets, process innovation creates jobs in low- and medium-tech industries (although destroys jobs in advanced economies), and product innovation which have no substitutes (generally high-tech) lead to increased jobs. Given South Africa's status as a developing country and the nature of unemployment in Gauteng, improving the competitiveness of medium- and

low-tech industries which are dominated by semi- and unskilled workers will stimulate the demand for employment.

A central characteristic of each sub-objective is the mechanism which drives employment creation. Thus, for example, in promoting a green economy, attention will be paid specifically to supporting the labour-intensive aspects of any green economy.

In respect of government services, innovation can address two parallel problems. Firstly, there are a range of new products and services which can help in service delivery; however, procuring innovative services can be difficult within the context of procurement regulations. However, government services can also act as a major demand driver for innovation.

Table 2: Summary of the Strategic Objectives and Proposed interventions

STRATEGIC FOCUS AREAS OF THE GAUTENG INNOVATION STRATEGY		
STRATEGIC OBJECTIVE 1: ECONOMIC COMPETITIVENESS		
AREA	DESCRIPTION	PROPOSED INTERVENTIONS
INTERNAL EFFICIENCY		
Internal Industrial Efficiency	Increase the global competitiveness of local industry through supporting innovation in manufacturing process, industrial design and logistics	Creation of an "Industrial Innovation Unit" (IIU) located at The Innovation Hub, focussing on industrial design and innovation
EXTERNAL / ENVIRONMENTAL FACTORS		
Effortless communication and access to information	Improve communication networks of buyers and sellers of innovation through social networking systems and infrastructure	Innov8 Network, social networking systems and events (e.g. BlueIQ Portal Technology, TED-type events, SAINe)
Innovation Spaces	Create physical and virtual spaces for the encouragement, support and promotion of innovation, e.g. Science Parks and virtual collaboration spaces	The Innovation Hub, virtual-TIH, Johannesburg Science Park, FAB-Labs, Climate Innovation Centre
Public Awareness	Increase the awareness of, and appreciation, of innovation as a driver for social and economic growth through innovation evangelism, partnerships (e.g.	Public awareness campaigns in partnership with like-minded organisations (potential examples include SABS, CSIR, Universities,

	with Design Institute), and science education campaigns (e.g. Smart Young Mindz)	DBSA)
Standards and Regulations	Support the establishment of rigorous standards, criteria and regulations for innovative products; further, to assist organisations in meeting these standards for both local and international production	For strategic industries (e.g. solar water geysers) understand and make representations to SABS regarding international standards and support local industries through IIU
PRODUCTION OF LOCAL KNOWLEDGE AND IP		
Local Value Chains	Create local knowledge and local value chains to promote higher local value-added production, rather than importing IP	Facilitate the commercialisation of relevant knowledge through incubators and entrepreneurship
Promote Business Research and Development	Increase the level of business R&D amongst small and medium enterprises through partnerships and subsidisation schemes	Investigate mechanisms such as Innovation Vouchers to stimulate business-led innovation; Enterprise Development Pillar of BBBEE
STRATEGIC OBJECTIVE 2: PUBLIC SECTOR EFFICIENCY		
Generic innovation procurement	Identify and implement mechanisms for public sector to acquire novel or innovative solutions, in order to accelerate service delivery with the best and most efficient solutions possible	Understand and evaluate public regulations regarding the procurement of innovations and novel products, and suggest amendments for transparent procurement
Strategic innovation procurement	Create and implement a mechanism for government to stimulate innovation to address specific service delivery challenges across all spheres and departments	Evaluate the possibility of a Small Business Innovation Competition to be used in strategically addressing specific government demands
STRATEGIC OBJECTIVE 3: COMMUNITY-LED INNOVATION		
Inclusive Socio-Economic Innovation	Recognise and support the dynamics of indigenous knowledge and enhance the capacities of communities to adjust to change, develop their own innovations (including the use of appropriate traditional medicines) and appropriate mechanism of resource management so as to achieve food	Identify alternative economic value chains that will provide innovative solutions to address social challenges in communities (for example food security and job security)

	security, sustain livelihoods and safeguard the environment.	
Community Innovation Commercialized	Create a platform that supports start-up or expansion income generating activities implemented and managed directly by the communities.	Identify community developed innovative solutions and foster the massification of those solution through replication and incubation particularly in the townships

5.1. Improved Economic Competitiveness

Innovation allows economies to function more efficiently, and to utilise resources more effectively. There are three sub-objectives in this section. All of the various sub-objectives have a general focus in "green" technologies. "Green" is not simply a stand-alone industry; instead, it is a cross-cutting way of doing business. The Gauteng Innovation Strategy has been developed so that there is a strong intersection between it and the Green Economy Strategy – the Gauteng Innovation Strategy is applied in the areas of focus for green. For example, under standards and regulations that promote innovation and technology transfer, one of the first areas to be looked at are those for solar water geysers – a key feature within the Green Economy strategy.

The knowledge economy that is being advocated must not be misrepresented as favouring services over manufacturing, as destroying jobs. In fact, the knowledge economy is as much about manufacturing as services, and is the most productive and valuable part of Gauteng economy. The Gauteng Industrial Policy Framework (GIPF) identified number of the medium-tech and labour intensive manufacturing industries as having strong backward linkages and employment multiplier effects. The aim of the GIPF is to move the economy towards higher value-added and more advanced technological development where knowledge plays a greater role.

Internal Industrial Efficiency

Innovation provides the competitive advantage to those firms and entrepreneurs who act boldly and imaginatively with diligent purpose and focus. The primary objective for this is to improve the competitiveness of local industries, strategically identified through the GEGDS and GIPF. By assisting companies to innovate in areas such as logistics, design, and manufacturing processes, industries will

ensure that the province focuses on innovation-driven policy to foster skills upgrading, enhance industrial growth and produce world-class exports, as well as produce goods for local consumption more efficiently.

Research is currently underway regarding the establishment of an Industrial Innovation Unit, located at The Innovation Hub. This unit will, in partnership with relevant organisations (such as the SABS Design Institute, the AIDC, TIA and others), engage sectors identified through the GIPF, in innovating around their own specific needs and challenges. This component specifically seeks to accelerate the aims and goals of the GIPF.

Effortless communication and access to information

Innovation is stimulated through the interaction of ideas and challenges. Without a clear understanding of the specific challenges requiring solutions, it can be difficult to innovate effectively for those challenges. At the same time, the greater the number of people looking at a problem, the easier it is for that problem to be solved. However, this can only happen if there are easy and non-threatening channels of communication between the "buyers" of innovation (i.e. those with the need) and the "sellers" of innovation (i.e. those who can deliver a solution).

Therefore, additional communication and networking structures will be investigated. Existing structures include the Innov8 network at TIH and other local innovation communities, such as the Mobile Monday network, or the South African Innovators Network (SAINe). By supporting and encouraging these networks, increased information flow will lead to increased innovation.

One of the key ideas within the Gauteng ICT Strategy is for households to have access to high-speed internet connections. Therefore, this component is heavily reliant on the successful implementation of the ICT Strategy, which includes household broadband as specific intervention for fast-tracking innovation. One of the strategic focus areas of Gauteng ICT Strategy is the Gauteng Broadband Initiative which seeks to consolidate resources and capabilities of both public and private sector into a combined and seamless broadband network infrastructure to be delivered for the benefit and access of all stakeholders.

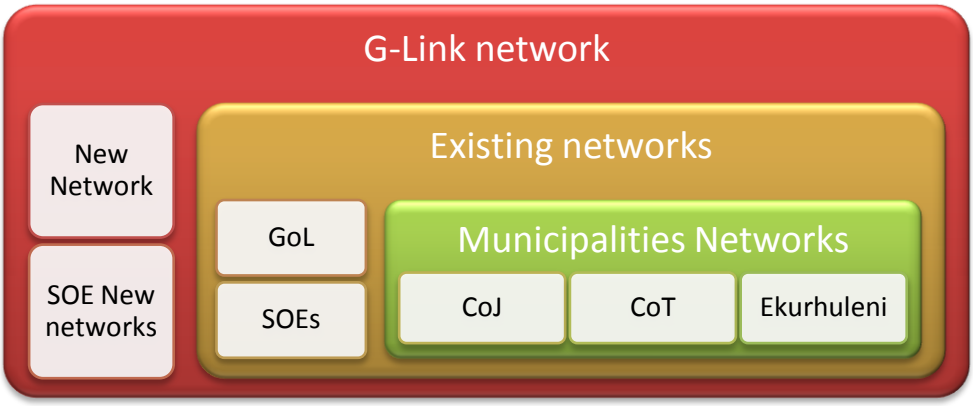

Figure 4: Illustration of the orchestrated G-Link Network

Source: Gauteng ICT Strategy, 2011

Provision of Innovation Spaces

The purpose of this component is to provide neutral, catalytic environments in which innovation can be safely and efficiently undertaken. These environments can take numerous different forms, from electronic social networks, to physical clusters of infrastructure such as The Innovation Hub. This can extend even further to entire manufacturing hubs and precincts using innovative manufacturing techniques, logistic systems and so on.

Importantly, by creating this kind of environment, local innovation (as well as foreign-driven but locally executed innovation) becomes promoted, thus driving local knowledge production. This allows Gauteng create value based on its own intellectual property, rather than acting as a 'middleman' for imported intellectual property.

Studies are underway both in existing sites such as The Innovation Hub to expand the service offering, as well as for the development of new sites in Johannesburg, such as the Johannesburg Observatory. In addition, other initiatives will be explored over and above the pilot project with the World Bank infoDev programme on the design and establishment of a Climate Innovation Centre in Gauteng.

Public Awareness

Innovation is still largely seen as the preserve of scientists, engineers and inventors. Although they play an important role, innovation can and is undertaken by anyone who identifies a more efficient solution

to a problem. While this new solution sometimes requires technological expertise to bring to fruition, it is not a pre-requisite. Furthermore, the importance of innovation cannot be underestimated in addressing social and public challenges – the difficulty lies in getting these ideas to society. Many ideas are in fact discarded, not because they are bad ideas, but simply because people do not know how to take them further.

This component will therefore seek to publicly promote both the importance of innovation within society, as well as the channels by which individuals and organisations can get support and assistance in taking their ideas to market and society. This will be achieved through public awareness campaigns, innovation competitions (e.g. Smart Young Mindz) and partnerships with similar organisations (e.g. SABS Design Institute, CSIR, Universities), and communication frameworks such as Innov8.

Standards and Regulations

One of the challenges in innovation is that there are no existing legal standards by which they can be accredited. This is especially difficult for small organisations that are capable of innovating, but cannot afford the long process of waiting for SABS approval and standardisation. This has already affected the ability of local industries such as solar water geysers, construction material and others who are unable to obtain any sort of accreditation. This can severely restrict innovation, especially if potential returns are delayed by several years – thus negating the benefits of first-to-market innovations.

This area will therefore identify mechanisms by which innovative products can be appropriately accredited and sanctioned by the relevant organisation. This may possibly include support in international accreditation, and subsequent recognition by local authorities.

Local Value Chains

The South Africa's innovation chasm between the domestic market for medium-high technology products and services and local research has been identified as a major weakness inhibiting the country from effectively mobilising innovation in support of economic growth. This has resulted in an extensive importation of technology and IP, impacting negatively on a technology balance of payments. This is especially painful given that many of the underlying resources are in fact mined in South Africa and exported for value-add reprocessing. It is therefore critical to ensure that more IP is localised, so that we do not have to import IP in the same goods that were exported.

The aim therefore is to incrementally increase local IP and local value chains within the manufacturing industries to ensure that we move upwards along production value chains. In addition to the current research into industrial strategy, further research will be required to identify potential industries where innovation and local IP can achieve significant success.

Promote Business Research and Development

While the creation of local value chains (as above) is strongly focussed on promoting research and development, this is restricted to specific sectors identified by the GIPF which comprises sectors that have strong forward and backward economic linkages. This excludes a wide range of potential innovations that local businesses might identify in other sectors. While there do exist certain mechanisms to support this at a national level, these mechanisms are restricted to scientific innovation only. This can exclude a wide range of innovations including organisational, process and social innovation that are just as critical in meeting the needs of society at large.

Therefore, a mechanism that will be explored is the establishment of "Innovation Vouchers", which effectively subsidise research into new product and service lines with accredited research organisations. These vouchers allow organisations to undertake research (which is generally not the main focus area of the majority of business and non-government organisations) into create better solutions, products and services.

Countries such as Singapore and Ireland are leaders when it comes to innovation and competitiveness, particularly relating to technology. As part of its national effort to increase R&D activity to account for more than 3% of its GDP, Singapore actively targets foreign investment as an essential part of its strategy.

An alternative which will also be explored is to provide participating organisations with Enterprise Development points, within the framework of Broad-Based Black Economic Empowerment Strategy (B-BBEE). The focus will be on two of the priority interventions for enterprise development in the B-BBEE Strategy identified by Gauteng Provincial Government (GPG), which includes:

- Partnerships with business in priority sectors to establish enterprise development infrastructure such as incubators or supplier development parks, and

- Partner with private sector to establish enterprise development capacity where GPG is making substantial capital and infrastructure investment.

This may provide alternative incentive mechanisms for larger organisations that have the resources to undertake innovative activities, but do not necessarily do so.

5.2. Public Sector Efficiency

Although provincial government does not have a direct role in funding research and development projects (in the sense of the National Research Foundation and TIA) it can still bring a massive demand into the market for innovation. At the same time, identifying innovative solutions to existing problems can drastically improve the ability of government to deliver services with limited budgets, particularly if the innovations are around more cost-efficient solutions (such as in housing).

Generic Innovation Procurement

Citizens, private business and non-governmental organisations often identify potential mechanisms for government to improve its ability to deliver services. However, there currently exist limited means to explore these options. The primary reason for this restriction are the regulations put in place by the Public (and Municipal) Finance Management Acts. These Acts are in place to ensure transparency and accountability in public organisations; however, their implementation at present can act as a deterrent for government to procure optimal solutions. One of the biggest challenges in South Africa is that there is no agreed-upon approach or strategy for the implementation of performance management across all spheres of government. The promulgation of the PFMA for departments and the MFMA for local government has resulted in isolated implementations of aspects of performance management, but with no integration within the various spheres of government.

Therefore, research will be conducted to understand how other regions and governments have maintained financial accountability, yet still promoted innovation and the procurement of innovative solutions. Examples include the US, UK, Ireland, Australia, New Zealand; all have similar rigorous financial controls, but have nonetheless stimulated innovation through government procurement. A specific focus will be given towards development of provincial procurement regulatory framework that supports local innovations, including SMMEs and technology start-ups.

Strategic Innovation Procurement

In delivering services, the provincial government is faced with a range of delivery and environmental challenges. This may include resource constraints, technology constraints, manpower shortages and others. By redirecting a small portion of government expenditure into researching and developing better solutions to these challenges, service delivery can be radically improved and quickened.

A business case is being developed for the establishment of a Provincial Government Innovation Competition (PGIC), to be located at The Innovation Hub. The PGIC will collect innovative responses to specific government challenges, and support the development of these innovations to a commercialised state.

5.3. Community-led Innovation

It is an obvious statement that the best solutions respond in full to the problems they are designed to solve. However, particularly in respect of socially-oriented challenges, these problems are often not fully understood. But involving community members in the innovation process itself, they are able to provide direct and immediate feedback into the appropriateness of a given innovation.

The creation of open innovation networks between innovators and communities will be researched and evaluated in order to create an inclusive innovation system within Gauteng that addresses the needs of society at large.

Although this area still needs to be explored in terms of targeted interventions that seek to acknowledge the importance of innovation at community level to bring about sustainable livelihoods, a concerted effort will be given to community-driven projects that improve the quality of life of citizens within the broader GCR concept. A focus will be given to the demand-driven innovation projects that will be implemented and managed directly by the community. For example, GDED's envisaged Township Enterprise Initiatives which includes Industrial Hubs (Metal works & Carpentry); Automotive Hubs; and Enterprise Hubs (Car Wash, Laundromats, Hair Salons & Internet Cafes), all qualify as community-developed innovation that have a potential to increase employment opportunities once formalised.

There also are a number of major societal challenges facing South Africa and Gauteng in particular, such as the food security and climate change, which require a new set of approaches and innovative solutions

to ensure the province's long term sustainability. Currently, the province's export growth depends on mineral and automotive goods which presents serious challenges as mining is a depleting resource and the automotive sector is a carbon-emissions contributor – affecting their long-term sustainability. This threat and challenge needs to be addressed with economic opportunities in mind. A 2008 study on green jobs led by the United Nations Environment Programme (UNEP) estimated that millions of new "green jobs" could be created in coming decades as a result of the impact of the emerging global "green economy". According to the study, changing patterns of employment and investment due to efforts made to reduce climate change and its effects are already generating new jobs across various sectors and economies.

While it is important to focus on the promotion of the green economy for low carbon future, innovation addressing climate change cannot depend entirely on the innovation of new technologies. A concerted effort will be made to include communities and refine their local innovations to form part of the solutions for clean technologies. This will be done through the establishment of the Flow Networks, where communities, individuals and organizations are brought into contact with each other, to ensure public participation throughout the process.

6. The Repositioning of The Innovation Hub to delivering the Gauteng Innovation Strategy

The Innovation Hub was established by the Gauteng Provincial Government to foster socio economic development through innovation. However, the Innovation Hub has had limited success, with significant focus having been put on infrastructure and facilities and less so to innovation programs. TIH will therefore be positioned at the centre of implementation of the innovation strategy, and be recapitalised and supported to deliver on the R&D and innovation mandate. In this regard, in order to deliver on the objectives of the Innovation Strategy, in as far as the Innovation Hub is concerned, greater will be placed on:

- strengthening the collaboration amongst R&D undertaking institutions in Gauteng as well as industry;
- strengthening entrepreneurial activities with particular emphasis on ensuring a vibrant incubation program that provides a conduit for R&D from universities and state owned enterprises in Gauteng;

- ensuring appropriate innovation enabling skills in ICT, Industrials (including advanced materials and manufacturing, nanotechnology), green economy and biotechnology, to ensure that innovation contributes to the socio-economic development of the Gauteng citizenry;
- full development of the Innovation Hub beyond its current state;
- provision of value added services that not only support tenant companies at the Innovation Hub but also contribute to creation of business opportunities to existing enterprises.
- to address service delivery and local government priorities; and
- provision of seed-financing to bridge the gap in respect of small amounts of funding required by entrepreneurs to get their innovations to the market or to develop their innovations to the stage where they can attract the required funds to get them to the market.

A coherent structure must be in place to deliver the strategy appropriately, along with timelines for the development of the various research areas and business plans. A Strategy Delivery Office (SDO) will be established at the Innovation Hub to ensure the completion of the various business cases and research areas identified in this strategy. This SDO will be primarily a programme management office; primary responsibility for the strategic direction will remain with the GDED. Therefore, the outputs of the SDO will be:

Table 3: Strategy Delivery Office

AREA	ITEM	NOTES
Internal industrial efficiency	Industrial Innovation Unit concept document	Underway at TIH
Effortless communication	Social and communication network map	Extension of existing activity at TIH
Innovation Spaces	Observatory Science Park concept document Climate Innovation Centre	Underway at BIQ Design phase already underway with infoDev
Public Awareness	Campaign concept document	New proposal
Standards and Regulations	Report on relevant standards in target sectors	New proposal
Inclusive Innovation	Open Innovation network rollout	New proposal

	concept document	
Local Value Chains	Research report on priority sectors	New proposal
Promote Business R&D	Innovation Voucher Concept Document	Underway at BIQ / TIH
Generic Government Procurement	Research report on regulatory options for innovation procurement	New proposal
Strategic Government Procurement	Business Case for Provincial Government Innovation Competition	Underway at BIQ / TIH
Inclusive Socio-Economic Innovation	Research report on indigenous solutions for socio-economic challenges	New proposal
Community Innovation Commercialized	Township Enterprise Hubs Document	New proposal

For those items which are new proposals, the SDO will cost and develop appropriate project management structures for the development of the research outputs. This will be taken through the appropriate channels within DED for approval.

This list is not exhaustive, and represents initial interventions identified for the support of innovation within Gauteng. Additional interventions may be added (or these removed) as and when appropriate.

7. Expert Panel for Innovation

A successful strategy in Singapore and Ireland for attracting foreign investment and strengthening domestic innovation often includes the active participation of countries' economic development boards. Both countries recruited top local business talent for their boards, ensuring a depth of expertise and knowledge that have earned the respect of the international business executives who influence capital investment decisions.

The final component of the Gauteng Innovation Strategy is to adopt a similar approach by establishing an Expert Panel for Innovation comprising a group of advisors with expertise in the field of innovation,

to provide regular guidance on the appropriateness of the strategy given local and global environmental factors. This will allow the strategy to evolve in time to continuously meet the needs of the province, and keep abreast of the latest developments in innovation thinking. It should be noted that community involvement in the development of the strategy will be maintained, ensuring that both experts and the community are involved in the strategy development process.

The advisory panel is to be constituted by appropriate members selected from the various stakeholders listed below.

- The Provincial Department of Economic Development
- All major Gauteng-based tertiary institutions
- The Gauteng Department of Education
- The Gauteng Department of Social Development
- The Gauteng Department of Local Government and Housing
- The Gauteng Department of Sport, Arts, Culture and Recreation
- The National Department of Science and Technology
- Chambers of Commerce
- Organised Labour movements
- Metropolitan and District Municipalities
- International organisations, including embassies and foreign missions
- Other innovation experts

The primary role of the Panel will be to provide expert guidance on the Gauteng Innovation Strategy itself and its implementation; this is expected to be an annual revision process. Members of the panel will further be required to provide support for the Gauteng Innovation Strategy mechanisms, as and where they are more directly involved (for example, in collaboration efforts between universities and government departments around innovation, both Panel members will be expected to provide support).

Details of this panel are to be finalised and established once approval has been given for the implementation of the Gauteng Innovation Strategy.

8. The Role of Municipalities in implementing Gauteng Innovation Strategy

A culture of innovation is seen as essential if local government organisations are to effectively manage and survive in ever-changing environments and provides an opportunity for municipalities to respond to pressing local needs within legislative and financial constraints. Gauteng municipalities will be important stakeholders in stimulating innovation and growth of identified industries, improving public sector service delivery, and promoting indigenous knowledge and community innovation.

The Innovation Hub through GDED will be establishing the Inter-Governmental (IGR) Forum with provincial municipalities targeting Research & Knowledge Management Units/Departments to create awareness about the importance of innovation in economic growth and employment. The IGR Forum will also identify and implement a range of innovation-related initiatives/programmes at community-level.

Appendix A: Defining Innovation

An unofficial definition of innovation can be stated simply:

Innovation is the process by which new and valuable knowledge is produced and utilised within society

Although this definition is suitable for a basic understanding of the concept of innovation, it is necessary to expand this definition significantly, in order to identify mechanisms to promote innovation. It will also be necessary in order to better understand the role which innovation plays within society.

The Organisation of Economic Co-operation and Development (OECD) has, since 1992, invested significant amounts of time and energy into the measurement and understanding of Innovation, and how it relates to economic development.

The *Oslo Manual* represents the OECDs guidelines on this measurement, and provides some insight into firstly, a definition of Innovation, and secondly, the understanding of Innovation within the South African government context.

Since 1992, the definition of "Innovation" has gradually expanded. The first two editions of the manual (1992, 1997) used what is termed the *Technological Product and Process (TPP)* definition of Innovation. This was to indicate the focus on the technological development of new products, as well as new production methods.

Subsequent versions of the Oslo Manual have then referred to an expanded definition of the term "Innovation" – specifically expanded to take account of other forms of innovation, such as marketing and organisational innovation. According to the 2005 Oslo Manual,

*"An **innovation** is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations."*

Closely connected to this, however, are the notions of "Innovation Activities", and the "Innovative Firm":

"*Innovation Activities are all scientific, technological, organisational, financial and commercial steps which actually, or are intended to, lead to the implementation of innovations…"*

"The Innovative Firm is one that has implemented an innovation within [a particular time frame]"

These concepts provide a solid basis from which to expand and modify our understanding of innovation, and how it is possible to influence the innovation process to achieve social and economic benefits.

South African Definitions of Innovation

According to the National Advisory Council on Innovation (NACI), "innovation" can be defined as

"…implemented technologically new products and processes as well as improvements in such products and processes"

This is closely related to the TPP definition of Innovation of the first and second Oslo Manuals, but excludes the expanded forms of innovation such as marketing and organisational.

An Expanded Definition of Innovation

The OECD's Oslo Manual recognises that its analysis is limited, in that:

- The Manual covers innovation in the business enterprise sector only
- It deals only with innovation at the level of the firm
- It covers only four types of innovation – product, process, organisational and marketing
- It covers diffusion up to the level of the firm

This is perfectly acceptable for the purposes of the manual. It is critical, however, for any government strategy or policy to move beyond these limitations to a wider understanding of innovation. Doing so will allow for a more complex and appropriate set of interventions to stimulate innovation in all its forms. It should be noted that the South African definition of Innovation is closely related to that of the 2nd Oslo Manual.

This document now outlines several proposed adjustments to the concept of "Innovation" which should be adopted as part of the Provincial Gauteng Innovation Strategy.

Innovation encompasses all forms of knowledge

Innovation is ultimately the production and diffusion of new and valuable knowledge. This knowledge is not restricted only to technological products and processes. More generally, this knowledge is not necessarily limited (at least initially) to economically valuable knowledge.

Instead, any form of knowledge or idea which is demanded by any part of the community, and which is subsequently created to meet that demand, can be understood as an Innovation. Assuming that innovation can only ever meet a market demand presumes that markets exist for the product prior to said innovation. This is, however, not the case for so-called "disruptive" innovations which create their own markets post innovation.

Furthermore, the assumption that product-related innovation (whether in the form, function, production or management) is the most important form of innovation, excludes critical types of knowledge production such as social innovation.

Social innovation is related to organisational innovation, except instead of restructuring firm-level processes to achieve greater efficiencies – and thus profits – social innovation relates the ability of community structures and members to implement new social structures in order to achieve social benefits. This concept requires significant further work to clarify and detail, however, some examples should provide a working definition.

- Safety & Security: Numerous communities throughout South Africa have, initially at a community level, implemented various forms of security measures to protect against the prevalence of crime. These include concepts such as "security villages", protected or restricted access to neighbourhoods, and community policing forums. Although certain of these may have evolved out of, for example, "community watches" they represent innovation at a social level, for social benefit, rather than for economic profit motives
- Community Welfare: The Community Works Programme being piloted in South Africa is an example of an innovative mechanism for which ensures a variety of benefits accrue to society. It functions as an employment safety net, thus ensuring that at least some income is generated by communities. It also achieves provides various 'public goods' in a limited fashion, thus supporting the work already performed by government in a number of areas

- Education: The Open University in the United Kingdom was the first institution that combined several different items – distance education, technology adapted for education, and minimal entry requirements for degrees. The result was a properly innovative mechanism for providing hundreds of thousands of citizens with access to high-quality education, using technology wherever possible to support the education process. This directly responded to social needs of education and self-development

Where product-related innovation satisfies the demands of consumers, social innovation meets demands for public good which are not necessarily satisfied through current structures. There is a strong argument that South Africa is more in need of solutions to the latter problems, than the former; trickle-down effects from economic growth are not having a sufficient impact on the social challenges of the country, and so new social processes and initiatives must be conceptualised to deal with these challenges – in other words, social innovation may be of more importance to the South African environment than product innovations, at least in the short- to medium-term.

The Community as Innovators

The structures put forward by the NACI (detailed in Section B: Systems of Innovation) put forward the idea that innovation (understood by the NACI as product-type innovations) is performed by various institutions, including

- Higher Education Institutions
- Public Research Institutions
- Private Sector Organisations
- Enterprises
- Non-government Organisations

While all of these institutions do, in fact, perform innovative activities, there are additional innovative actors that should be considered.

Firstly, innovation – whether within an institution or not – is ultimately performed by individuals. The benefits arising from that innovation, may rest with the firm (or other entity, but for simplicity this document will only refer to the "firm") but it is performed by an individual, or at least groups of

networked individuals. Therefore, it is important to explicitly recognise that innovation is an individual activity.

These networks may be either formal (e.g. within a company) or informal (such as self-organising communities). Although inventions are almost inevitably achieved by single individuals, innovations result from multiple skills and disciplines, partnerships and collaborative work.

Secondly, and through the recognition that innovation is performed by individuals, it is clear that there are significant amounts of innovation that is not co-ordinated or performed within the constraints of either firms, or government policy. The clearest example of this is the open source software movement, in which individual programmers contribute time and energy, with no specific personal benefit in mind, to produce goods that are used by a greater community. There are a range of other multi-billion US dollar industries which have evolved through the dedication of a small interest group, with little to no interest from either the private sector or government[1].

Thirdly, social innovation is often driven by members of a specific, but potentially small, community. There is therefore no economic incentive for firms to develop appropriate solutions; at the same time, depending on the nature of the community, it may be difficult for innovators to even be aware of the demands of that community. In the South African environment then, while various communities may face a range of challenges, these challenges are not communicated to the wider social network. It is then difficult for groups that may have existing solutions to connect to those demanding solutions. The result is that the communities themselves ultimately begin crafting their own solutions, which may be similar in nature, but are developed in isolation.

The fourth and final characteristic that should be recognised is the increasing collaboration that occurs between firms and the community in the final development of products and solutions. Although this is currently most obvious in certain product-oriented innovations, it can be extended outwards into social innovations with the appropriate tools. Examples of this would include Microsoft's (and other IT firms) use of Beta-testing a product before final release. In this process, a "beta" version of a product is released to a limited community of interested parties (though in Microsoft's case this may be several million users). These users then provide feedback and comment on the product before it goes into its

[1] Examples include off-road / mountain biking, as well as the Hip-hop music industry – both started as community efforts with no commercial or government influence.

final development phase and released to the general public. This process helps to bind the community into the innovation process.

The Cathedral and the Bazaar

In 1997, Eric S. Raymond coined the phrase *the Cathedral and the Bazaar*. He was specifically referring to software development processes in relation to Linux; however, broad concepts of this can be expanded towards innovation in general.

Cathedral-type development involves a small group of individuals, or a single organisation, which labours to produce a single, grand solution. There is limited involvement of the wider community in such development or construction, and it is assumed that the end-product (the Cathedral) will meet the needs of the general population.

On the other hand, Bazaar-type development involves as many individuals as possible, constantly negotiating and developing small scale innovations. This, by necessity, requires intense collaboration between all the different role-players, and constant monitoring and evaluation of the viability of solutions.

Each mode has a specific strength, and related challenge.

Cathedral-type development is extremely focussed on a particular outcome, and can be clearly defined from the beginning. Construction will not start until there is a clear goal in mind. This provides a very structured approach, and can address long-term strategic issues. However, because of the lack of collaboration, and the minimal number of solution developers involved, finding the most efficient solution takes time; it may also ultimately not respond to the needs of the population.

Bazaar-type development is diametrically opposite to this – in that it directly responds to the immediate needs of society, and tends to produce a strong sense of ownership within that society; because they are involved in solving their own problems, they take more responsibility for ensuring the success of whatever solutions are developed. The drawback, however, is that Bazaar-type development is, of necessity, small scale – and being small scale, cannot directly address longer-term strategic issues. It drifts according to the whims of the people involved.

One of the “laws” which was recognised in this description was loosely stated as: “with enough eyeballs, all bugs are shallow”. This is taken to mean that if enough people are considering a challenge, the solution will be easy to find.

This speaks to the heart of Open Innovation – by inviting as many people to solve problems as possible, the most efficient solution will be found with the least effort.

Social Innovation

Social innovation is related to organisational innovation, except instead of restructuring firm-level processes to achieve greater efficiencies – and thus profits – social innovation relates the ability of community structures and members to implement new social structures in order to achieve social benefits

Where product-related innovation satisfies the demands of consumers, social innovation meets demands for public good which are not necessarily satisfied through current structures. There is a strong argument that South Africa is more in need of solutions to the latter problems, than the former; trickle-down effects from economic growth are not having a sufficient impact on the social challenges of the country, and so new social processes and initiatives must be conceptualised to deal with these challenges – in other words, social innovation may be of more importance to the South African environment than product innovations, at least in the short- to medium-term.

Social innovation has different driving forces to economic innovation – it is natural then that the mechanisms for incentivising social innovation must also differ. It may be closely connected with Public Innovation (dealt with separately below), but can often be performed by communities and community-based organisations. Here, the constraint on innovation may not be a profit-motive, but rather a direct lack of resources – community-based organisations would very much like to do their work more efficiently, but do not have the capacity to develop those solutions themselves.

What is also important about social innovation, especially that performed by communities, is that there is a much stronger sense of ownership of the solution. Social innovations are often locally developed, but these successes are not necessarily disseminated amongst the wider community. On the other hand, social innovation solutions which are government-driven – through public innovation processes, for example – tend to be widely disseminated, but not necessarily “owned” by the people on the ground.

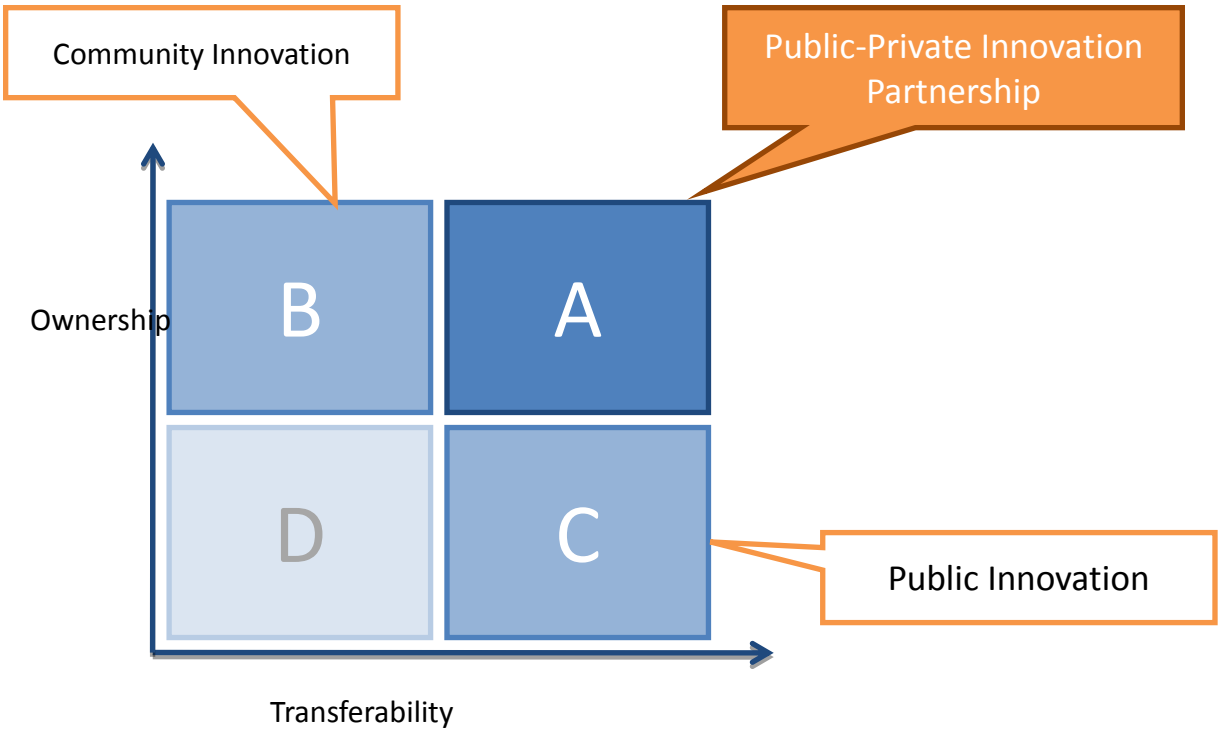

Figure A1: Relationship between ownership and transferability in social innovation, NESTA, SC/03, March 2007

Figure A1 shows the relationship between the transferability of a social innovation, and the ownership felt by the developers of that innovation. The fundamental characteristic of a truly successful social innovation will be the personal ownership of that innovation, by each member of society.

Public Service Innovation

Much of the focus on innovation, as noted already, is on those types of innovation driven by the private sector, for private sector consumers. However, there are significant efforts made in public service innovation – in other words, in attempting to identify new mechanisms and processes by which the public sector is able to deliver on its mandate.

This area has a very strong history throughout South Africa, and the world. Examples include programmes such as the Community Works Programme (CWP) which provides a novel approach towards providing an employment safety net. Crucially, much of the innovation within the public sector is very specific towards a social and cultural group. Therefore, while there are certain similarities

between social programmes in different countries, each must be customised towards what is appropriate in a particular region.

It is critical, given the social challenges facing Gauteng, that Public Service Innovation is recognised and supported. The Provincial Government has a number of very aggressive strategic targets. It is not certain that, by continuing with business as usual, that GPG will be able to achieve those goals. It therefore becomes necessary for the government itself to become innovative in fulfilling its mandate to the citizens of Gauteng.

There is very little focus provided on PSI within the existing body of policy literature around innovation. However, this strategy document puts forward the contention that accelerating and supporting PSI is crucial in achieving the strategic goals of the department, and the province.

Much of the focus on innovation, as noted already, is on those types of innovation driven by the private sector, for private sector consumers. However, there are significant efforts made in public service innovation – in other words, in attempting to identify new mechanisms and processes by which the public sector is able to deliver on its mandate.

One of the agencies of the National Department of Public Service and Administration is the Centre for Public Sector Innovation (CPSI). The role of this institution is, self-evidently, to support public sector entities in developing new, innovative mechanisms for service delivery. There is therefore recognition of the importance of public sector innovation within the South African environment. However, this recognition is independent of other support mechanisms for innovation; it also excludes any type of innovation for the public sector – which arises from outside the public sector.

This is problematic, since there are countless solutions to public service challenges provided by private sector groups, civil society, or the international environment.

A particular example of public innovation, which deals with the above problem, is Knowledge Management Africa (KMAfrica). This project was established by, amongst others, the Development Bank of South Africa. The strategic goals of KMAfrica are of particular relevance to this document, given the symmetry they show with the proposed intervention mechanisms:

- Enhance the implementation of knowledge management in Africa

- Leverage the use of knowledge in policy and service delivery
- Promote partnerships among the public sector, private sector, and civil society in the creation, synthesis and use of knowledge
- Build knowledge management networks that will enable the creation and utilisation of knowledge
- Build an institutional infrastructure that will facilitate the implementation of the knowledge management mandate across Africa

Open Innovation

"Open innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology" Henry Chesbrough, 2003, Open Innovation

The above definition of open innovation speaks about innovation at the level of firms and institutions, and focuses on technological innovation. However, an important development in the past decade of innovation studies has been the recognition of the role of communities outside of the boundaries of firms increasing, shaping and disseminating technological and social innovations. In their book on Industry and Innovation, Joel West and KarimLakhani (2008) noted that although the dominant role of users in creating functionally novel innovations was established 20 years ago by von Hippel (1988), the advent of open source software communities has highlighted the important role of communities in the innovation process.

While the ability to connect inventors, innovators and entrepreneurs is important for a successful innovation process, the simple dissemination of knowledge, know-how and expertise can also support and assist in the process.

Interactions between these three agents will often bring new technologies, new services, and new solutions into the market and society. However, by disseminating existing ideas, it becomes possible for individuals and organisations to adopt newer and more efficient systems, *which have already been innovated.* Thus – instead of creating new valuable knowledge, this particular process of open innovation can help spread the most effective types of knowledge.

It is also important to understand the scale of information which can be accessed through open innovation. South Africa, in 2006, produced approximately 0.5% of the world's total research output. Phrased differently, 99.5% of all knowledge produced in that year occurred outside of South Africa. Although this relates specifically to 'basic' research, the picture painted is that the vast majority of solutions are produced outside the country. Even if South Africa were to achieve the Department of Science and Technology's goal of 2.5% of global research – this still leaves 97.5% produced elsewhere.

Open innovation is a mechanism by which this 99% of knowledge can be leveraged for the solution of South Africa challenges.

Importantly, this type of diffusion can be utilised not simply by innovators and entrepreneurs, but in fact by anyone who faces a similar challenge. Thus – solutions to problems become commonly shared amongst society, and the most efficient and effective solutions can be implemented. Within this diffusion, we can identify three 'areas':

1. Innovations which are new to the firm: these are innovations which individual organisations can adopt to make their own processes more efficient and effective. These innovations may already exist in other firms elsewhere
2. Innovations which are new to the country: these innovations have been developed outside of South Africa, generally for the solution of challenges and consumer markets specific to other areas. However, many of these innovations can either be directly applied, or modified slightly, to become effective within South Africa
3. Innovations which are new to the world: these innovations are the absolutely 'new' innovations, ideas that have been developed and implemented for the first time anywhere in the world

The idea of open innovation helps to drive the first two innovation types – it allows for more efficient functioning and markets by adopting the most efficient processes and mechanisms. Open innovation can also lead to "globally new innovations" but the largest impact will be through the diffusion processes of areas 1 and 2.

Appendix B: Innovation and Development

Innovation is the process by which we bring new ideas of value into use within society – thereby making more efficient use of our resources and time, and finding better solutions to the challenges that face us. To quote from Paul Romer, one of the founders of endogenous growth theory,

"A useful metaphor in an economy is in the kitchen. To create valuable final products, we mix inexpensive ingredients together according to a recipe. The cooking one can do is limited by the supply of ingredients, and most cooking in the economy produces undesirable side effects. If economic growth could be achieved only by doing more and more of the same kind of cooking, we would eventually run out of raw materials and suffer from unacceptable levels of pollution and nuisance. Human history teaches us, however, that economic growth springs from better recipes, not just from more cooking"

While the above refers more specifically to economic growth than "development", the two are closely linked. In fact, our first step in understanding the connection between innovation and development is to ask what we mean by "development". The term itself is heavily contested, and there are many ideas behind this. Quoting Alan Thomas (2000:777) in Henry Bernstein (2006:1), there are three broad conceptions of the term *development*:

1) as a *vision, description or measure of the state of being a desirable society*;
2) as an *historical process of social change* in which societies are transformed over long periods;
3) as consisting of *deliberate efforts aimed at improvement* on the part of various agencies, including governments, all kinds of organisations and social movements. (emphasis in original)

The most appropriate of these ideas, in the context of the provincial government, is the third – the deliberate attempts made by government aimed at the improvement of society. This immediately begs the question, however, of what improvements are to be made? Is there a specific definition which the South African government – and by extension, the provincial government – can use to understand what is meant by development?

Such a definition does not exist, unfortunately. What does, however, exist, is a set of operational objectives that are closely linked to the idea of development – in fact, are developmental objectives. These can therefore be used a working definition for how and what government views to be development. These objectives are given below:

- Creating decent work and building a growing, inclusive economy
- Strengthening the developmental state and good governance
- Building cohesive and sustainable communities
- Stimulating rural development and food security
- Better health care for all
- Promoting quality education and skills development
- Intensifying the fight against crime and corruption

The above 7 objectives represent a functional definition of what development means for government – and that achieving these will lead to Thomas's first concept of development, that of being a desirable society.

So the question must then be asked for each – what is the relationship between innovation and those objectives? Is there a connection between (i) innovation and health care? (ii) Rural development? and (iii)Education and skills development?

A crude answer is that yes, there are connections between them. But this does not help guide us to understanding what that connection is, whether it is beneficial or not, and how we can take advantage of it where appropriate. So what is necessary is a short analysis of the role innovation plays in each of these strategic objectives. However, although specific *innovations* may have a direct impact on many of these objectives, in general innovation as an activity will play a dominant relationship with the first objective – that of a growing economy. The relationship between innovation and economic growth, and with employment creation, will be examined in some detail.

The remaining objectives are, in the current context, outcomes of either specific innovative products and services, or a generally improved economic and social context. They will not necessarily directly benefit from an enhanced innovation culture; certainly not in the same manner that economic growth will be directly affected.

Innovation and Economic Growth

The development of economic models to describe economic growth has occurred over a long time. Neoclassical economics – the dominant economic theory for the past century – has relied on a number

of constructions which describe growth in terms of, generally, capital stock, employment and total (or multi) factor productivity.

In short, an economy was able to grow when either the capital invested in the economy grew, the total labour force grew, or the means by which these two factors were combined was improved. This last item – the improvement of the combination of factors of production is multi-factor productivity, and is nothing other than a proxy for technological change. Technological change, of course, is nothing other than innovation.

The earlier models of growth treated the change in technology as an exogenous variable, however; something that was outside the system they were modelling, and that could not be measured. Although the Solow-Swan model used the rate of technological progress as the convergence rate for economic growth, this rate itself was not determined by the model, or the theory. What this meant for policy development is that there was some "natural" rate of progress which could not be enhanced or changed pro-actively. Critiques of these neoclassical growth models led, amongst other things, to the development of what were termed endogenous growth models. These models treat technological change as a variable or factor within society which can be actively encouraged; importantly, this could lead to significant effects on economic growth. This is because capital deepening and employment growth were in general restricted in the majority of countries with established investment, and relatively low unemployment. Employment could then only really grow with population growth, while capital would not need to be redeployed to purchase new technology. Thus economic growth became dependent on the ability of an economy to innovate, to affect its rate of technological change.

In this context, then, is there a measurable relationship between multi-factor productivity, and economic growth? Much of the data for this is taken from the OECD group of countries, for which there is significant data available. Figure A1 below shows the changes in multi-factor productivity along with changes in GDP for the period 1987 to 2008, as an average of the OECD countries.

Although this aggregation creates a very crude depiction of the relationship, it is still apparent that falls in MFP growth (1993 and 2003) coincide with falls in GDP growth. There are various reasons for this, and this is not actually arguing a causal relationship between the two (though it may in fact exist). Instead, Figure A1 demonstrates the connection between the two; there is a wealth of literature which explores this connection.

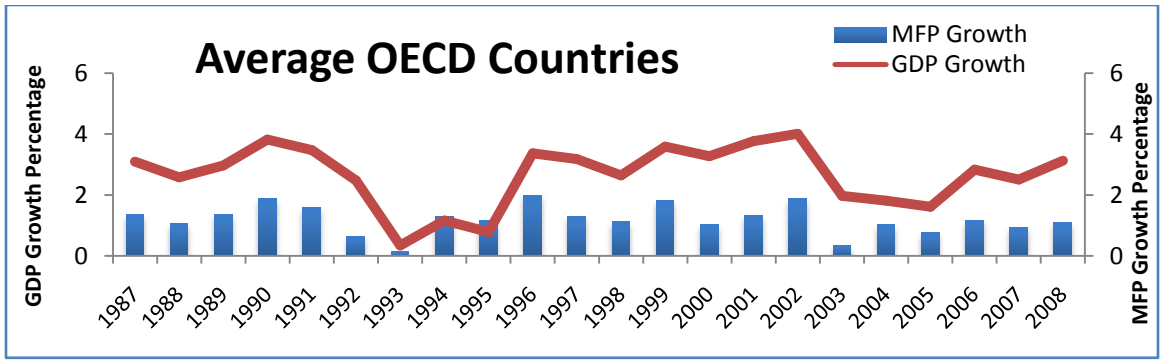

Figure B1: OECD MFP and GDP Growth

While the connection between MFP and economic growth may be well established, the connection between innovation and MFP is less established. Although there is a clear conceptual link between the two (the rate of innovation simply being the rate of technological development, which is of course the rate of MFP) what evidence is there that changes in innovation lead to changes in MFP?

Innovation is very difficult to quantify, as it is composed of a range of "inputs" and "outputs" which do not have a simple relationship. So various proxies are usually used to measure the input and output characteristics of innovation. An example of an input proxy is the level of research and development expenditure in a region. For an output proxy, the number of patents could be measured. The measurement of innovation is an ongoing and important area of research in the global literature currently. However, there are studies showing the relationship between innovation inputs such as R&D, and multi-factor productivity.

Figure B2 below shows the relationship between MFP and the average intensity of business R&D. Business R&D is plotted on the x-axis, while MFP is plotted on the y-axis. It shows that, in general, as the intensity of research increases (along the x-axis) the productivity of the region (along the y-axis) also increases. The implication is that an increase in innovation inputs leads to an increase in multi-factor productivity.

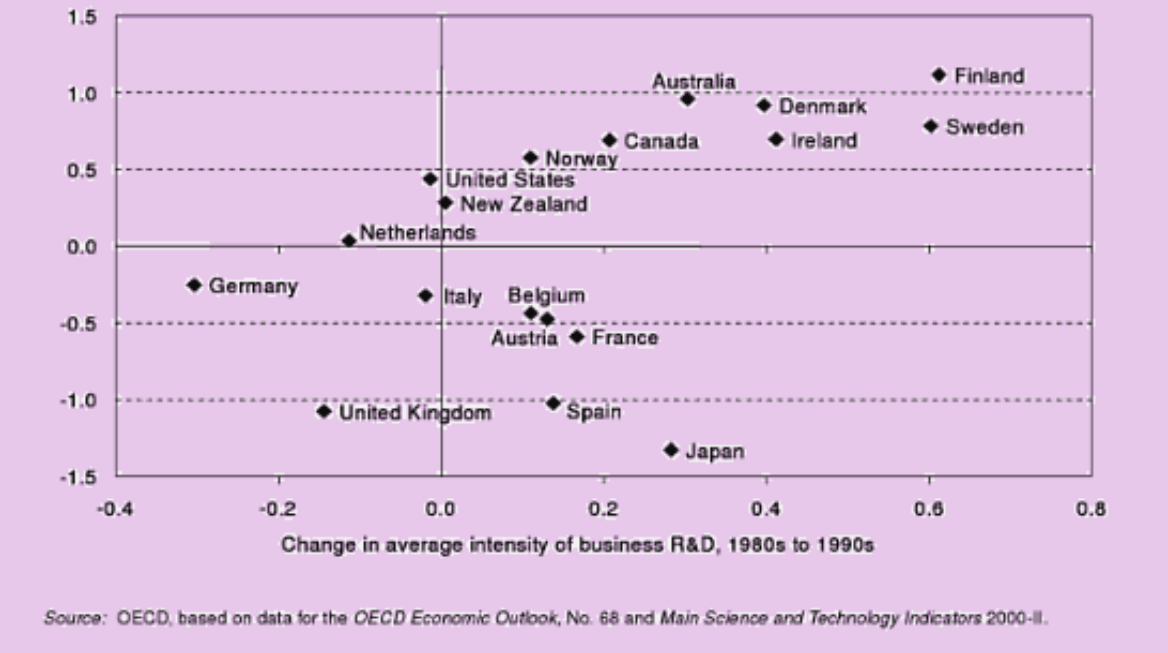

Figure B2: Change in MFP and in average intensity of business R&D

Box A1: Science, Technology and Innovation: Implications for Growth

Extracts from Science, Technology and Industry Outlook, OECD 2001

A cursory comparison illustrates that a strong correlation exists between GDP per capita, and formal R&D. Analyses of the link between *increases* in business expenditures for R&D (BERD) and *increases* in MFP show a similar relationship (Figure B2 above): OECD countries in which business expenditure on R&D relative to GDP grew most rapidly from the 1980s to the 1990s typically experienced the largest rates of MFP growth. However, importantly, not all countries with increased expenditure on business R&D saw an improvement on MFP. Some experienced marked declines in MFP despite growing levels of BERD. This distinction emphasises the fact that increases in R&D funding are, by themselves, insufficient to drive improvements in MFP and economic growth. The way in which R&D funds are allocated (*e.g.* the institutions to which they are directed, the fields of science and industry to which they are related, and the kinds of mechanisms used to finance R&D) and the processes for commercialising and disseminating knowledge, matter crucially...

Cross country comparisons of growth patterns provide additional insight into the elements that underlie differences in R&D efficiency across the OECD. Recent econometric analysis of 16 OECD countries reaffirms that increases in private sector, public sector and foreign R&D all contribute to increases in MFP.

Guellec and van Pottelsberghe[2] identify a connection between the long term impact on multi-factor productivity given an increase in expenditure on research and development by various institutions, including private and public R&D. This is summarised below in Table B1:

	Business R&D	Public R&D
Long term elasticities of MFP	0.131	0.172

Table B1: Long term elasticities of output with respect to R&D variables

What Table B1 shows us is that for a 1% permanent increase in Business R&D, there is a 0.13% increase in MFP; similarly a 1% increase in public-led R&D leads to a 0.17% increase in MFP. Activities that therefore stimulate research and development are likely to lead to a long term increase in MFP, and consequently to economic growth. Quoting from Guellec*et al*., "doing R&D is important for productivity and economic growth. … The social return on business R&D is then higher than its private return, which is a possible justification for some sort of government support to business R&D".

What is important in the context of this strategy, however, is not directly the support for research and development. Instead, the importance of changes in multi-factor productivity – in innovation – and these changes are driven by innovation activities (of which R&D is one). So the important policy implication to be taken away is for the support of innovation activities, in order to drive MFP – ultimately in order to enhance economic growth.

Innovation and Employment

The central priority for South Africa at present is addressing the employment needs of citizens. So-called "jobless growth" has characterised the South African economy for much of the last decade, and even while many efforts were made in the creation of jobs, the scale of the problem remains significant. This has been further exacerbated by the global economic downturn of 2008-9, and the loss of in the region of a million jobs in South Africa in this period[3].

[2]Guellec, D, and van Pottelsberghe, B., R&D and Productivity Growth: Panel Data Analysis of 16 OECD countries, OECD Economic Studies 33, 2001/II

[3] Labour Force Survey Q3 2008, Q3 2010, Statistics South Africa, www.statssa.gov.za

Employment therefore represents the largest economic challenge for South African society, and addressing employment growth will have numerous additional benefits, such as an increased tax base, reduced dependency on welfare, increased social cohesion, reduced crime and many others.

How does innovation play a role in employment creation? It is, unsurprisingly, a double-edged sword. On the one hand, process innovation leads to a substitution of capital for labour. This is because there are rapid productivity gains with new technology in the production process. Product innovation may also lead to job losses, as less competitive products are displaced from the market (along with the people manufacturing them). However, the same reasons for job losses provide opportunities for job creation. More efficient production processes lead to an expansion of production, and hence an increase in employment; new products require many more people to work in new factories. So the question becomes – which of these effects dominates?

Pianta[4] provides a broad "study of studies" where he analyses a variety of research about the positive or negative impact which innovation has on employment. The broad results from the studies show mixed results depending on the level of study, i.e. at firm, industry or macro-economic level. Table A2 below gives a summary of the results.

Table B2: Summary of results of Pianta, 2003

	Number	Positive	Negative	Neutral	Notes
Firm	9	8	3	0	2 studies indicated differences in outcomes due to product or process innovation
Industry	6	3	5	2	4 studies indicated differences in outcome due to product or process innovation
Macro-economy	8	1		7	6 studies showed that there was significant differentiation by country and time period

Table B2 shows firstly that there are dramatic differences between the impacts of innovation at firm, industry and macro levels. Secondly, that a clear distinction must be made between the impacts of process innovation (which were often found to be negative) and that of product innovation (which were

[4]Pianta, M. Innovation and Employment, The Oxford Handbook of Innovation, Ch 22, 2003

found to be positive). So the lesson that can be learnt from the Pianta synthetic review is that in general, process innovations lead to job losses, while product innovations lead to job creation.

However, an important criticism of Pianta – especially in the context of Gauteng – are the subjects of the studies. All the studies were performed on advanced countries with high technology bases and relatively close to the technology frontier itself (if not at it, such as the US). These countries manufacturing and other industries tend to be far more advanced, and already users and producers of "high technology". Gauteng is not at the same technology position, and is not focussed on the development of high technology manufacturing industries. Instead, a focus on low- and medium-technology manufacturing is a core component of the Gauteng Industrial Policy Framework. So the question then becomes – is there evidence that these same findings hold for areas which are focussed on low- and medium-tech innovation?

Merikull[5] analysed the impact of innovation in Estonia, which shares closer similarities to South Africa and Gauteng than an advanced economy such as France or Germany. Merikull found "*innovation positively affects employment growth resulting from the strong effect of process innovation in the medium- and low-tech industries".*

This is an important differentiator, because it illustrates that in medium- and low-tech industries which are dominated by semi- and unskilled workers, process innovations lead to growth in employment.

Although additional research should be undertaken to understand the Gauteng-specific relationship between innovation and employment, it is clear that there is strong evidence to show that innovation, if correctly channelled, can be a strong driver of employment growth.

[5]Merikull, J. The Impact of Innovation on Employment, Eastern European Economics vol 48, no 2

Appendix C: National and Provincial Policies

The final component that must be considered before the development of any strategic interventions is the overall direction which Government is pursuing as part of its social mandate. While National Government provides the overall framework and direction of public-sector innovation, the Provincial Government still has a crucial role to play as the Regional Authority.

This will ensure that any and all interventions are closely aligned to both national and provincial priorities, and will accelerate the achievement of these priorities.

National Government Policies

There are a range of national government policies that will impact on the focus of the various strategic interventions. These provide an overall policy context, and include strategies such as:

- The ANC Manifesto, as contained within the Polokwane Resolutions of 2008
- The various Millennium Development Goals
- Industrial Policy Action Plan
- ASGISA
- Various National Treasury regulations

Two specific policies which are important to consider because of their relevance to the Provincial Strategies, are the Industrial Policy Action Plan, and the 10 Year Innovation Plan.

Industrial Policy Action Plan (IPAP)

The last release of the IPAP was August 2007, however, Minister Davies provided insight into the new Plan in December of 2009.

“We in South Africa will shortly be adopting our next Industrial Policy Action Plan. This will focus on stimulating industrial activities capable of producing inputs to support infrastructure programmes, energy savings and green jobs and agro industries. We will also take forward our programmes in the automotives sector, clothing and textiles and chemicals amongst others. While we pursue our own national programme, we are also conscious of the need to support initiatives at the regional and continental level.

In this regard, we are working to build industrial standards and norms including institutions to enforce these standards, build industrial innovation systems, invest in energy security especially renewable energy, and build responsive human capital development systems in our region and across the continent. Our efforts in these areas are at an initial stage, but with the help of our development partners, we are beginning to see some signs of progress."

Dr Rob Davies, Minister of Trade & Industry, UNIDO 13th General Conference, 7 Dec 2009

This Innovation Strategy has purposefully aligned itself with the appropriate areas of the new IPAP, particularly with the focus on green technology, and support for those manufacturing industries with a provincial presence. Further alignment will be undertaken with the finalisation of the Gauteng Industrial Policy (discussed below).

10 Year Innovation Plan

The Department of Science and Technology released the Ten Year Innovation Plan, a Cabinet-level plan that seeks to achieve a number of outcomes for South Africa. These are contained in five "Grand Challenge" areas:

- The "Farmer to Pharma" value chain to strengthen the bio-economy – over the next decade South Africa must become a world leader in biotechnology and the pharmaceuticals, based on the nation's indigenous resources and expanding knowledge base.
- Space science and technology – South Africa should become a key contributor to global space science and technology, with a National Space Agency, a growing satellite industry, and a range of innovations in space sciences, earth observation, communications, navigation and engineering.
- Energy security – the race is on for safe, clean, affordable and reliable energy supply, and South Africa must meet its medium-term energy supply requirements while innovating for the long term in clean coal technologies, nuclear energy, renewable energy and the promise of the "hydrogen economy".
- Global change science with a focus on climate change – South Africa's geographic position enables us to play a leading role in climate change science.

- Human and social dynamics – as a leading voice among developing countries, South Africa should contribute to a greater global understanding of shifting social dynamics, and the role of science in stimulating growth and development.

These areas remain closely connected with the provincial government priorities, as detailed below. This is especially the case in the drive for areas such as 'clean technologies', energy security, and climate change.

The Innovation Strategy actively responds to three key areas of the 10 Year Innovation Plan – it specifically addresses energy security and global change science, with the focus on Green Technology. It also addresses issues around Human and Social Dynamics, by placing emphasis on the importance of collaborative innovation actions within Social and Public Innovation

The Innovation Agency

The Technology Innovation Agency (TIA) is a new public entity that is aimed at stimulating and intensifying innovation and inventions in order to improve the economic growth as well as enhance the quality of life of all South Africans by developing and exploiting technological innovations and interventions and creating an enabling environment wherein these could be commercialized. The objectives of TIA are:

- Stimulating the development of technology-based services and products;
- Stimulating the development of technology-based enterprises - both public and private;
- Providing a nursery for technology commercialisation;
- Stimulating investment by means of venture capital, foreign direct investment, and other mechanisms;
- Facilitating the development of human capital for innovation.

This Strategy has taken the objectives of TIA into consideration and a formal relationship has been agreed between DED/TIH and TIA in principle.

Provincial Government Policies

The provincial government has a different and independent mandate from National Government, as laid out in the South African constitution. Therefore, although the province follows the country in terms of the overall policy direction, there are certain specific areas which the province has a more direct influence over.

At the same time, it is important to ensure that any interventions designed to accelerate innovation within the province are closely aligned to other provincial strategy documents, as discussed below.

Overall, however, the following focus areas were laid out in the Premier's State of the Province address, as cross-cutting policies that must be present in all government strategy:

- Creating decent work and building a growing, inclusive economy
- Strengthening the developmental state and good governance
- Building cohesive and sustainable communities
- Stimulating rural development and food security
- Better health care for all
- Promoting quality education and skills development
- Intensifying the fight against crime and corruption

The following policy documents have been considered in constructing this Gauteng Innovation Strategy. The various policies are at different stages of development as at 01 February 2010. As and when new revisions are released, adjustments and modifications to this Strategy Document will be considered.

- Gauteng Employment Growth and Development Strategy
- Gauteng Industrial Policy Framework
- Green Jobs Strategy
- Gauteng Integrated Energy Strategy
- Gauteng Information and Communication Technology Strategy
- Local Economic Development Strategy
- The 2009 Business Environment Assessment Report
- Gauteng 2055
- OECD Territorial Review for Gauteng
- The 2008 draft Gauteng Innovation Strategy

Gauteng Employment Growth and Development Strategy

The Gauteng Employment Growth and Development Strategy (GEGDS) presents a series of medium-term strategies aimed at ensuring equitable job creation, inclusive economic growth, and improved social welfare for all of Gauteng's citizens. The GEGDS is characterised by four central strategies:

- *Cross-cutting measures to enhance overall economic efficiency and productivity*: improving the reliability and cost-effectiveness of core economic infrastructure (electricity, transport, telecommunications and water); identifying and addressing skill bottlenecks, especially amongst professionals and artisans; and reducing unnecessary red tape and high costs to economic actors for low-priority regulations and programmes.
- *Ensuring more inclusive growth:* In the coming year, vastly increasing opportunities for the unemployed, especially young people, through community-based public employment schemes supplemented by educational and cultural programmes, combined with increased emphasis on local procurement in order to protect employment as far as possible. In the coming five to ten years, increasing support for labour-absorbing sectors, especially in the agricultural value chain, light manufacturing, construction, retail and services; encouraging more equitable access to wealth, including through broad-based ownership schemes and the housing programme, as well as improvements in basic education and expanded access to post-school training and higher education (the latter based increasingly based on merit rather than ability to pay).
- *Improving the mobilisation of domestic resources for development:* Exploring ways to channel contractual savings into developmental projects in a sustainable fashion, and greatly strengthening local procurement efforts in order to reduce dependence on imports and consequently foreign financing.
- *Laying the basis for long-term growth:* Continuing to support knowledge-intensive industries, above all by gradually strengthening the provincial centres of excellence in tertiary research, education, healthcare and capital goods production.

The Innovation Strategy responds to all four of the GEGDS central strategies:

- Innovation is one of the cross-cutting measures to enhance overall efficiency and productivity, both of labour (through innovative organisational structuring, new industries) and capital (again through new industries, and through more efficient use of resources)
- Through supporting social and public innovation to drive service delivery and public goods, this ensures that we achieve a more inclusive society
- By creating local value chains through economic, social and public innovation, creating and strengthening local industry and development
- By creating and sharing new knowledge, driving the importance of a knowledge-based society for future growth

Gauteng Industrial Policy Framework

The Gauteng Industrial Policy Framework puts forward that "Industrial policy needs to be focused upon structural transformation of the Gauteng economy".

The research indicates that:

"An analysis of value-added, investment, output and employment trends across services and manufacturing supports the case for the development of medium-tech, light manufacturing sectors with relatively low investment to output ratios and high labour intensities. These include textiles, clothing and leather, electrical machinery and apparatus, and furniture and other manufactures. This analysis also highlighted the limitation of business services as a driving sector for the massive expansion of employment owing to a high investment-output ratio."

Although formal analysis of this policy is not yet possible, the document will be broadly aligned to other existing documents. It may require that certain components of the Gauteng Innovation Strategy are refined to take account of regional specifics, but this will not affect the initial focus on Green Technology.

Gauteng Information and Communication Technology Strategy

The New Growth Path has identified rapidly extending access to and use of ICT based on a continual and rapid reduction in broad-band costs, as part of the technology policy. In this light, Gauteng ICT

Development Strategy aims to foster realisation of the potential value that information and communications technology can bring to employment, growth and economic development in Gauteng.

ICT without innovation is unproductive and can lead to loss of competitive edge in the knowledge economy. Gauteng is the largest ICT cluster in South Africa and has the potential to expand this cluster through innovation. Innovation cluster has stakeholders/drivers that have to interconnect for a successful innovation cluster. One of the key focus areas of the strategy is to create an enabling environment for start-ups to emerge and grow by supporting the expansion of incubation program in the Innovation Hub to include more start-ups in the ICT sector so that innovative ideas are developed and funded for commercialization.

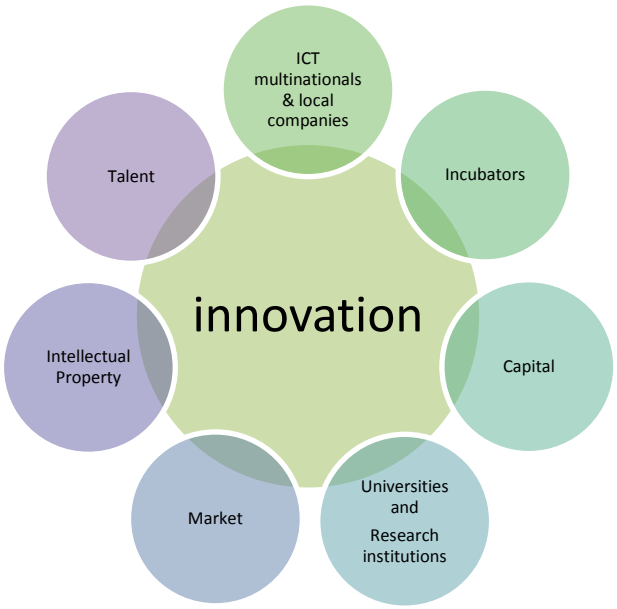

Figure C1: Stakeholders for a successful innovation cluster

Green Economy Strategy

”A Green Economy is one in which business processes are infrastructure reconfigured “to deliver better returns on natural, human and economic capital investments, while at the same time reducing

greenhouse gas emissions, extracting and using fewer natural resources, creating less waste and reducing social disparities."[6]

This statement, taken from the Green Economy Strategy draft document, outlines the basic idea which is a core policy objective not only of Gauteng, but also South Africa.

At an international level this led to South Africa joining with the other G20 nations to make a number of recent commitments in this space:

- "We will make the transition towards clean, innovative, resource efficient, low carbon technologies and infrastructure."[7]
- "As leaders of the world's major economies, we are working for a resilient, sustainable and green economy."[8]

The Green Economy Strategy, in order to guide Gauteng in moving towards this form of economic thinking, puts forward a number of policy options, as well as intervention strategies. There are clear references to the need for innovation, and there are also clear needs for innovation to play a greater role in supporting a Green Economy.

Of the various policy options proposed, one of the first is to *promote innovation in existing processes and new technologies [related to a green economy].*

Because innovation relates equally to technology acquisition, as technology development, the importing of appropriate green technology while the local industry is underdeveloped, remains an area of innovation that must be supported and facilitated.

Furthermore, a number of the actual projects suggested (e.g. legislation around solar water heaters, waste management, alternative fuel and transport systems) all require innovation of various types. These include technological innovation (e.g. for the development of cleaner fuels), social innovations (such as facilitating local food production areas) to organisational and industrial innovation, for example, the development of an entire solar energy industry within the province.

[6]UNEP, *Global Green New Deal: An Update for the G20 Pittsburgh Summit*, ii.
[7]G20, London, 2 April 2009
[8]G20, Pittsburgh, 24-25 Sept 2009

Throughout the Innovation Strategy, prevalence is given to the development of Green Technologies – this is a specific response to the importance of the Green Economy in the future activity of the province, and the sustainable development of our society.

Gauteng Integrated Energy Strategy

The Gauteng Integrated Energy Strategy (GIES) was developed in response to the challenges associated with global climate change, the global economic meltdown and the electricity crisis in South Africa. Thus the strategy aims to improve Gauteng's environment, reduce Gauteng's contribution to climate change and tackle energy poverty, whilst at the same time promoting economic development in the province. The purpose of the Gauteng Integrated Energy Strategy and Implementation Plan is to direct the way that energy is supplied and used within the Gauteng province during the next 5 years (2014); 16 years (2025); 46 years (2055) and beyond, in an integrated and sustainable manner. This will be done by advancing and driving energy efficiency and supporting an energy supply mix that includes renewable energy technologies across the province.

Furthermore within industry, commerce and civil society, many initiatives and attempts at making changes have been instigated. The large industry sector in particular has begun to work on their carbon footprint and reduce their energy consumption. What is lacking and what this strategy will attempt to do is to integrate the many initiatives across the different sectors in such a way as to provide cohesion, alignment and co-operation. Thus, this strategy is expected to provide a framework for these diverse and laudable initiatives in order to ensure that the whole is bigger than the sum of its parts and in doing so being a catalyst for change across the province.

One of the action plans of the GIES is to "Promote Innovation and Clean Energy Technologies". This is to be achieved through four main objectives:

- Build strong relationships and networks with research institutes, academia and potential funders
- Set agenda according to province's needs to guide research development
- Develop a supportive environment for new business development in the clean energy technology sector
- Build awareness

The Innovation Strategy has paid careful attention to these objectives, and is aligned to them as following:

- By creating the Flow Networks, relationships are not only strengthened, but also created; importantly, these relationships are not just between the agents identified within the GIES, but also the community as well – ensuring public participation throughout
- By focusing innovation incentives on Green Technologies, research is persuaded towards the Province's objectives
- The development of Innovation Clusters, and industrial innovations within this area, speak to the development of a supportive environment for business
- Awareness is developed by the establishment of the Flow Network, communities, individuals and organizations are brought into contact with each other, and with solutions for clean technologies

Local Economic Development Strategy

For Local Economic Development (LED) in Gauteng to contribute significantly to attainment of sustainable economic growth and employment targets, substantial changes are required in the way LED is conceived and implemented. Whereas progress is evident, LED in Gauteng municipalities still needs to mature to a level where it is able to make a significant contribution to economic growth, employment and equity shifts. The challenges are broader than capacity of LED units, and points to a number of systemic deficiencies.

The Department of Economic Development (DED) of Gauteng initiated the development of a Strategic Framework for LED in Gauteng that seeks to address these challenges. This LED framework therefore aims to increase the number of local economies that benefit significantly from sound LED, by contributing:

1. An Assessment of the current challenges,
2. Guidelines for more effective LED,
3. A vision of a desired future state of LED,
4. A statement of expectations of key LED stakeholders (Roles and functions), and
5. Definition of the contribution by Province, through six focussed programmes.

The LED Strategy specifically references innovation in two areas: self-evaluation and learning, and technology research. The strategy is not clear, however, on the exact mechanism by which innovation is meant to take place in reference to LED.

One of the characteristics of the Desired Future State of LED within Gauteng, is learning and improving LED faster. This is achieved through the development of a climate which is conducive to economic learning, and innovation.

In addition, strengthening local innovation systems is seen as a core responsibility of universities, who are also responsible for the establishment of Technology Acquisition Stations.

The Gauteng Innovation Strategy greatly values local economic development; this is evident from the importance given to both social innovation, as well as the focus on the creation of local value chains. It seeks to expand and strengthen certain aspects of the LED Strategy, by creating additional mechanisms for improved service delivery, local industrial support, and social development. Specifically,

- The Flow Network provides an opportunity for interaction between local communities, municipality and ward councils, SMMEs and other stakeholders in sharing knowledge and solutions. In combination with functions such as Knowledge Management Africa, this acts as a key driver for LED innovation
- In addition, the Flow Network allows all stakeholders to function in strengthening the local innovation systems, adding to the existing ability of universities
- Cluster Development is fundamentally designed to drive local economic activity; this is able to act as a catalyst for further growth

2009 Business Environment Assessment in Gauteng

This report (often referred to as the "Cost of Doing Business Report") was compiled in order to understand the challenges facing the business sector within the province. Recommendations of the report were then designed to alleviate and/or mitigate these challenges.

The report itself found that the three largest "internal" issues were:

- Roads, traffic and transport
- Lack of skills
- Crime

However, far and away the most critical challenge for business was simply “Market Conditions”. This is shown below in Figure C2: Main Challenges to doing Business

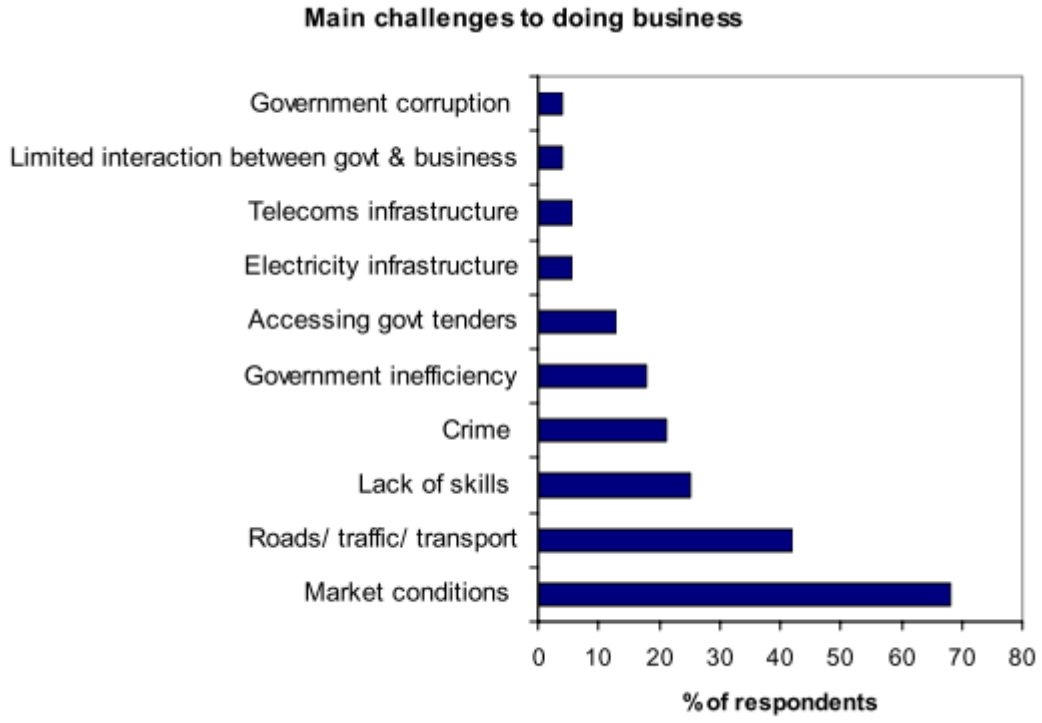

Figure C2: Main Challenges to Doing Business, 2009 BEA for Gauteng, SBP, 2009

The majority of concerns raised by the private sector are, relatively speaking, simple to engage with. As such, an “innovative environment” – or the lack of specific innovation support mechanisms - is not necessarily seen as a hindrance to business activity.

In that sense, the Innovation Strategy does not directly address any of the major concerns raised by the Business Environment Assessment – except for the ‘market conditions’ challenge. Even this is approached in a subtle manner.

Market conditions are a complex combination of both local, and international, supply and demand challenges. Throughout all economic activity are different levels of efficiency – it is here, that innovation can subtly affect market conditions. By increasing the efficiency, not only of the production chain itself, but also even of products, local industries become more competitive. This results not in easier trading conditions, but in a stronger ability to trade.

The entire Innovation Strategy is geared towards this – creating stronger and more competitive activities within the province.

Gauteng 2055

The Gauteng Vision 2055 process takes its mandate as one of the 11 Strategic Pathways of the Gauteng City Region (GCR) Road Map. The GCR is an inter-governmental process of structured engagement that includes the Gauteng Provincial Government (the GPG), the three metropolitan and the three district municipalities and the local municipalities within the boundaries of the Gauteng Province. The concept of the GCR is that an integrated functional economic region that transcends administrative boundaries, and recognises that Gauteng Province lies at the hub of South Africa's globally connected economy. There are some 10.5 million people living with the Gauteng boundaries of the GCR, and an additional 2 million people living within the surrounding provinces of North West, Limpopo, Mpumalanga and the Free State.

Scenario planning has therefore been used to define a 'best case' scenario for Gauteng in 2055. The best case scenario is derived through (1) assuming a median or 'central tendency' scenario for the key global, African and national driving forces affecting Gauteng and (2) assuming that the City Region makes the best possible effort to address those forces. Unpredictable events which will throw these scenarios awry are identified as 'triggers' where the effect would be positive and 'tripwires' where the effect would be negative.

Through linking scenario planning with its various planning processes, the government and people of Gauteng will be in a position to prepare for and avoid the future 'tripwires' that would pose major risks, on the one hand, and instead discover and exploit the 'triggers' that would allow rapid economic growth and social progress on the other.

The 2011 OCED Territorial Review for Gauteng

Gauteng province has been South Africa's innovation hub since the 19th century, when gold and mine deposits were discovered around the Witwatersrand, which led to the establishment of South African school of mines, today known as University of Witwatersrand. In 2008-09, the Gauteng's R&D accounted for 52.2% (R11 billion) of the total national R&D expenditure and its percentage of GDP rose from 1.42% to 1.45%, which compares with OECD regional average of 1.58%, a figure nonetheless below the target of 3% set by the European Union in the Lisbon Agenda.

A significant R&D infrastructure is also concentrated in Gauteng, although the contribution from higher education is low when compared to the OECD regions. The province's infrastructure includes eight universities, nine science councils and considerable private sector infrastructure. In 2009, the business sector in Gauteng was leading contributor to R&D (64.9%), followed by science councils (18.1%), higher education (13.4%), government (2.4%), and the not-for-profit sector (1.1%).

	Business Enterprise	Government and Science Councils	Higher Education	Not-for-profit
Gauteng	**64.9%**	**20.5% (2.4% state)**	**13.4%**	**1.1%**
OECD Regional Average	**59.4%**	**14.4%**	**24.8%**	**1.3%**

Source: 2011 OECD Territorial Review for Gauteng

Figure C3: Distribution of R&D by sectors: Gauteng (2009) and OECD regional average (2007)

The 2008 draft Gauteng Innovation Strategy

The draft 2008 Gauteng Innovation Strategy sought to make the province an *innovative global city-region* in support of the long-term growth and development initiatives of the metropolitan, district and local governments. While the contribution of mining and resources to South Africa's GDP has fallen in the past two decades, the Gauteng province has historical assets in manufacturing and a large services sector that require R&D and innovation in its broadest sense. In growing its economy off this diverse asset base, this emergent city region must create and exploit new products, processes and services and operate more effectively in order to be a smart, competitive, socially-cohesive, global player. The strategy highlighted the following five pillars:

1. Directed investment in R&D projects for social change and economic innovation;
2. Foster the helix of government-university-NGO-industry collaboration for innovation;
3. Expand the R&D for innovation and knowledge asset base;
4. Invest in building and attracting the knowledge, skills and talent for R&D; and
5. Promote a culture of innovation in society.