



LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

LIMPOPO LIVING LAB

LEAD, LEARN, LEVERAGE

FEASIBILITY STUDY FOR THE ESTABLISHMENT OF
A TECHNO HUB FOR THE LIMPOPO PROVINCE

COMMISSIONED
BY
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LIST OF ABBREVIATIONS

BEE	Black Economic Empowerment
BUG	Business-University-Government, an innovation model, better known as triple helix
BUG-C	Business-University-Government-Citizens, extended BUG innovation model
CEO	Chief Executive Officer, used interchangeably with managing director
CPSI	Centre for Public Service Innovation
CSIR	Council for Scientific and Industrial Research
DoC	Department of Commerce, also DOC
DoE	Department of Education, also DOE
DoL	Department of Labour, also DOL
DST	Department of Science and Technology
DTI	Department of Trade and Industry
EC	European Community
EIP	European Investment Bank
EPRD	European Programme for Reconstruction and Development in South Africa
EU	European Union
FDI	Foreign Direct Investment
FETI	Further Education and Training Institution
FIFA	Fédération Internationale de Football Association
FTE	Full Time Equivalent
GDP	Gross Domestic Product
GDPR	Gross Domestic Product per Region
GEM	Global Entrepreneurship Monitor
GGP	Gross Geographical Product or GDP of a Region
GNP	Gross National Product
HE	Higher Education
HOD	Head of Division
HR	Human Resource
HSRC	Human Sciences and Research Council
IASP	International Association of Science Parks
IKS	Indigenous Knowledge Systems
ISAD	Information Society and Development
ICT	Information and Communication Technologies
KZN	KwaZulu-Natal
LISCC	Limpopo Information Society Strategy Coordinating Committee
LimDev	Limpopo Economic Development Enterprise
LIBSA	Limpopo Business Support Agency
LLL, L ³	Limpopo Living Lab, the concept presented in this study
MEMC	Mogalagkwena Educational Multipurpose Centre
MPCC	Multi-Purpose Community Center
NBI	National Business Initiative
NGO	Non-Governmental Organisation
NTTC	National Technology Transfer Center
OECD	Organisation for Economic Co-operation and Development
PGDS	Provincial Growth and Development Strategy
PNC	Presidential National Committee
R&D	Research and Development
RSA	Republic of South Africa
SEDA	Small Enterprise Development Agency

SITA	State Information Technology Agency
SA	South Africa
SALGA	South African Local Government Association
SMME	Small, Medium and Micro Enterprise
SPII	Support Program for Industrial Innovation
STP	SEDA Technology Program
SWOT	Strengths, Weaknesses, Opportunities and Threats
TEA	Total Entrepreneurial Activity
TAP	Technology Advancement Program
THRIP	Technology and Human Resources for the Industry Program
TIL	Trade and Investment Limpopo
TTF	Technology Transfer Fund
TUT	Tswane University of Technology
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIN	University of the North, now U Limpopo Turfloop Campus
USAASA	Universal Services and Access Agency of South Africa
VC	Venture Capital, Venture Capitalist
VUDEC	Vista University Distance Centre
WSIS	World Summit on the Information Society

EXECUTIVE SUMMARY

The objective of this project was to discover the most feasible concept for a science park/techno hub in the Limpopo Province by assessing whether it would be feasible to weave traditional science park type concepts and ICT development initiatives into the economic and social fabric of the Limpopo Province. A parallel study has been conducted to look at the feasibility of starting an ICT institute. While independent in form, these two studies are intertwined in content.

The feasibility study was commissioned by the Limpopo Provincial Government through Trade and Investment Limpopo. The work was conducted by a Finnish consulting firm, Professia Ltd, that specializes in regional business development and innovation strategy solutions.

The study was conducted by engaging a large contingent of public sector stakeholders in two workshops as well as in individual discussions to explore the potential for, commitment to and interest in the science park/technology centre type of concept. A random selection of private sector representatives was also interviewed. However, it was decided by the contractor that the business core is to be approached in a workshop after this initial feasibility study to discuss the results of the feasibility study and to further enhance and (re)direct the proposed further actions.

It was concluded from the interviews that there is a clear collective need for, interest in and commitment to something like a technology centre or hub type of concept.

It was concluded that the traditional concept of a science park or technology centre would not on the one hand fulfil the potential of the province, and on the other hand would not have a large enough research base to operate from and into. Thus, the concept was expanded and subsequently we decided to rename it the "**Limpopo Living Lab**" to better illustrate the inclusion of not only academia and industry but also the civil society. Therefore, it promises to be an entity which has strong business development potential and covers cooperation between business, universities, government and the civil society.

The direction for the Limpopo provincial development has been outlined in the Provincial Growth and Development Strategy document with the ultimate goal of improving the quality of life of the people in the province. The concept of a technology center/science park (that we have termed the Limpopo Living Lab) addresses these aspects of the provincial development through the enhancement of economic development.

The purpose of the Living Lab is to

- retain the educated workforce in Limpopo,
- attract investments,
- develop key clusters through knowledge creation, transfer and exploitation
- foster entrepreneurship
- create jobs, and
- enhance collaboration among businesses, universities, government and the civil society for the development of the province.

For the all-encompassing approach already adopted in the PGDS, the proposed broader concept of the Limpopo Living Lab is thus based on a more holistic business development approach. It will be established on the four cornerstones described above and listed below:

- Community Projects
- Training and Education (as part of the ICT Institute)
- Business Incubator
- Innovative Solutions

The Limpopo Living Lab concept is presented in figure 8 in chapter 4. The concept is divided into two sub-concepts; the Limpopo Living Lab itself and the ICT Institute.

In the **incubator** business ideas are transformed into new companies. The inputs for it originate from various sources, the main sources being business spin-offs, universities, and innovative solutions activity. Training and education together with community projects also generate business ideas, a majority of which can be handled by existing organisations (like LIBSA). Financial and funding institutions such as venture capital companies, banks and LimDev are important partners for the incubator. As a result, companies which have potential for growth are generated.

The incubator companies, together with existing companies, generate needs for **training and education**, especially in the fields of business management, ICT skills and project management. Much of the actual training and education is carried out by existing training and education institutions with the Living Lab acting mainly as an initiator, catalyst and coordinator. Due to output of this activity, local companies and the business environment in general benefit in the form of a more adequate and skilled labour force.

Training and education needs often generate **community projects**. Community projects in the concept are looked upon from the business development perspective. An important aspect of the community projects is that they can serve as a test bed for companies testing their products for markets in developing countries. Community projects result in more jobs, especially in existing or new local SMMEs.

Innovative solutions need the expertise from companies and universities as input for joint, mutually beneficial undertakings between companies and universities. Also, "high innovation - low technology" applications needed by local businesses in order to transform themselves for the purpose of reaching the next level are included in the concept as well as innovative ideas stemming from community-level initiatives. As a result, applications and solutions for the benefit of the local economy and companies are generated as well as seeds for new SMMEs.

It is recommended that the **process owner** be the **Office of the Premier**. This is the obvious office to be in charge of an undertaking that involves several departments, parastatals, municipalities and other stakeholders. Further, it is neutral with respect to the departments and also has executive powers vested in it. In addition to the Office of the Premier, it is recommended that for strategic decision-making an Advisory Board be formed. The board should include representatives of strategic stakeholders in the Living Lab.

Consequently, a **light administration model** for the Living Lab is recommended. In addition to the managing director responsible for all the operations of LLL, the four sectors should have their responsible directors and working groups as advisory boards consisting of persons from relevant organisations and companies. It is further proposed that one of the existing parastatals that operates in a relevant field (such as TIL or LimDev) should take responsibility for the daily administration-related operation of the Living Lab.

The basic **funding** for the Living Lab and the ICT Institute will come from the Provincial Government. Each sector with projects and programs will have parts of its funding gathered from multiple external sources, including both public and private funding.

The basic government funding should cover the costs of the managing director, sectoral directors, their assistants and managers, administration and other overhead costs, marketing costs (incl. Web pages) and costs related to premises. This basic funding should be secured at least for five years. Whether or not the Living Lab will be self-supporting in the long run will depend on whether or not it enters the real estate business.

In addition to the basic funding it is recommended that the Living Lab have **project funding** available for projects and programmes. The main contributor to this fund, at least in the beginning, will be the provincial government. This funding allows for projects and programmes to get a head start and covers the costs of the preparatory phases. During these preparatory phases many if not all the projects and programmes are expected to ensure funding for themselves from external sources such as various provincial and national government departments, development banks and international programmes.

The actual operation of projects and programmes will be funded from **outside sources**. By outside sources is meant here a wide range of potential funding sources ranging from local to international.

The cost-benefit analysis of the concept is based on minimal organisation. It can be feasible in the beginning of the operations as the concept is new, but in the long run the extent of the operation should be reconsidered. The benefits generated from the concept in relation to costs can be regarded as reasonable.

A preliminary **SWOT** analysis of the concept indicates that the strengths and opportunities are greater than the weaknesses and threats. The threats and weaknesses can, however, hinder or slow the development and success of the concept if proper actions are not taken to counter them. For example, if the ICT infrastructure is not to be improved, many of the potential opportunities will not be realized. All in all, it can be said that if the weaknesses remain and the threats materialise, the effects of the concept cannot be harnessed to the extent expected.

If successful, the concept goes beyond the regional economic development scheme and lends also itself to becoming a business opportunity. The proposed kind of Living Lab is potentially a concept that can serve as a model for other rural development initiatives in the country and abroad. There is a potential for exporting it to other regions and nations through consultancy. This could provide a revenue stream for the Limpopo Living Lab itself.

1. INTRODUCTION

1.1. Background

The purpose of this study is to assess the feasibility of constructing a technology center or hub (later living lab) in the province of Limpopo. A parallel study has been conducted to look at the feasibility of starting an ICT institute. While independent in form, these two studies are intertwined in content. As the concept of the Limpopo Living Lab is a more encompassing concept than the ICT Institute, this report provides an overall framework for operation and the report on the ICT Institute is more of an expansion of the training and education section of the Living Lab.

As a result of this study, a possible realizable model for the Limpopo Living Lab is presented, as well as a SWOT analysis, together with a very preliminary cost-benefit analysis.

The Limpopo Provincial Government completed the development of its Provincial Growth and Development Strategy (PGDS) in 2004. One of the major challenges facing the government is to promote economic growth and job creation while at the same time providing for social development as a means of addressing the needs of the poor. The PGDS is based on a comprehensive analysis of the economic and social conditions prevailing in the province and has identified a need to focus on sector-specific strategies, programmes and project-level opportunities and interventions, to identify appropriate institutional delivery and review processes, and to integrate and seek alignment with Integrated Development Plans (IDPs) of municipalities, sector development plans and the National Spatial Development Perspective (NSDP).

The PGDS for the Limpopo Province is heavily based on the development of key economic clusters, i.e. agriculture, mining and tourism, which are further targeted for development in seven industrial value sub-clusters, namely, the platinum and chrome mining sub-cluster in the Greater Sekhukhune District and in the Waterberg District, the coal mining and petrochemical sub-cluster in the Waterberg District, the fruit and vegetable or horticulture sub-cluster in the Mopani and Vhembe Districts, the logistics sub-cluster in the Capricorn District, the red and white meat sub-clusters in all the districts, the forestry sub-cluster in the Mopani and Vhembe Districts, and the tourism sub-clusters in all the districts. To reach the vision of a peaceful, prosperous, united, dynamic and transformed province, economic development, social justice and improved quality of life have a central role. Of these, economic development is the one that has effects on the other two, and thus contributes significantly to growth and development in the Limpopo Province.

Together with the Limpopo Information Society Coordinating Committee (LISCC), Trade and Investment Limpopo (TIL) started a process to find out whether a science park type of concept could be a vehicle for boosting economic development in the Limpopo Province. The first step in the process is this feasibility study. At the same time, the Office of the Premier was involved in the process of building an ICT institute for the Limpopo Province. As these two concepts, the science park/technology center and ICT Institute were thought to be closely related to each other, the feasibility studies for both of these were executed as a joint undertaking.

The feasibility study was commissioned by the Provincial Government through Trade and Investment Limpopo.

1.2. Objective and Method

The objective of this project was to discover the most feasible concept for a techno hub in the Limpopo Province. This was done by inviting a consulting firm named Professia Ltd from Finland to assess, whether it would be feasible to weave traditional science park type concepts and ICT development initiatives into the economic and social fabric of the Limpopo Province.

The study was conducted by engaging a large contingent of public sector stakeholders in two workshops as well as in individual discussions to explore the potential for, commitment to and interest in the science park/technology center type of concept. These interviews were arranged by TIL and conducted in August-September 2006 during two visits by Professia representatives. The interviewed organizations¹ included experts from universities, the provincial government and its departments, parastatals and government agencies at both the provincial level and the national level.

A random selection of private sector representatives was also interviewed. However, it was decided by the contractor that the business core is to be approached after this initial feasibility study in a workshop to discuss the results of the feasibility study to further enhance and (re)direct the proposed further actions.

While a more detailed stakeholder analysis is provided later in this report, it could be concluded from the interviews that there is a clear collective need for, interest in and commitment to something like a technology center or hub type of concept.

In the following, we will first discuss the overall ideology behind the regional development strategy proposed in this document in the form of a science park/technology center. This is followed by a short description of the policy framework related to the concept. We then briefly describe the key elements of the key industrial clusters and other key ingredients of the province that have led us to propose the approach outlined hereinafter. We also provide arguments for the proposed approach from foreign experience perspectives as well. An indicative cost-to-benefit analysis is provided. Finally, a SWOT analysis is provided together with a description of stakeholder interests based on interviews. In addition, a benchmark report will be presented in Appendix 2.

The technology center/science park and the ICT Institute to be planned for the Limpopo Province comprise two largely integrated and yet distinct projects. The technology center forms an umbrella for both of the projects, and thus the ICT Institute goes under that umbrella.

As it was clear from the very beginning that the traditional concept of a science park or technology center would not on the one hand fulfil the potential of the province and on the other hand would not have a large enough research base to operate from and into, we have decided to expand the concept and subsequently rename our proposal the "Limpopo Living Lab" to better illustrate the inclusion not only of academia and industry but also the civil society.

¹ For a list of organizations and people interviewed, see Appendix 1.

1.3. The Regional Development Paradigm Behind the Living Lab

Limpopo Living Lab

The direction for the Limpopo provincial development has been outlined in the Provincial Growth and Development Strategy document with the ultimate goal of improving the quality of life of the people in the province. The concept of a technology center/science park (that we have termed The Limpopo Living Lab) addresses these aspects of the provincial development through the enhancement of economic development. It aims at becoming an accelerating element for the benefit of the key clusters and the civil society. The penetrating theme in all activities of the Limpopo Living Lab is an extended business development approach.

The purpose of the Living Lab is to:

- retain the educated workforce in Limpopo,
- attract investment,
- develop key clusters through knowledge creation, transfer and exploitation,
- foster entrepreneurship,
- create jobs, and
- enhance collaboration among businesses, universities, government and the civil society for the development of the province.

In the following, let us look at these objectives from the point of view the Living Lab.

A key priority for the development of the province is to have and create opportunities for the educated workforce to stay in or return to the province. The spillover effects of this are numerous and corroborate the paramount importance of an increasingly educated workforce. In what is described below as "the concept," all actions aim at making this possible. Without success in retaining the educated workforce, the future of the province will most probably oneday look different from the scenarios described in visionary policy documents.

Attracting companies to start up in, or to move all or part of their business operations to, the province is crucial, especially given the low number of medium size or large businesses in the province. We will assess only the aspect of attracting foreign firms and only the manner in which the Living Lab concept could enhance the foreign direct investments. As argued later in more detail, presently the traditional motivations for attracting foreign investments into the province are limited. For traditional FDIs the current main attractors are firstly the strong mining sector and the possibilities it presents to, e.g., tool manufacturers and service providers, and secondly, the agricultural sector that has the potential to benefit from foreign direct investments in a similar fashion to the fresh produce agriculture business carried on in India.

While the Living Lab can provide state-of-the-art operational facilities for businesses if new buildings are to be erected, the possibilities for the Living Lab to attract foreign companies to locate their operations in the province are limited. We propose two possible realizable alternatives. The first one is to create an environment where multinational companies could use Limpopo and the Limpopo Living Lab as their test bed when creating products for developing markets. The use of mobile hand-held devices is but one example. While any developing area is a potential test bed site, Limpopo has several advantages over other areas which favor its becoming in this sense a true Living Lab, as described later. Another possibility to attract foreign firms lies in the logistic position of the province in relation to Botswana, Zimbabwe, Mozambique and the rest of Southern Africa. The continued development of the road infrastructure and the airport could be an attractive opportunity for logistics companies.

Next, we will look in more detail at the nature of and prerequisites for the two latter objectives, knowledge exploitation and the networked mode of working and operating.

Regional Development Through Collaboration in the Knowledge Economy

A technology center or hub is traditionally a manifestation of collaboration and co-operation between government, businesses and universities with the purpose of enhancing regional growth and business development based on new knowledge, technology and innovation. In Figure 1, below the evolution from an investment-based economy to an innovation-based economy via a knowledge-based economy is depicted. The necessary public sector investments are indicated in the boxes and the vertical arrows connect them to respective phases of the economy.

While the public sector (and other) capital investments are the driving force in an investment-based economy, the two knowledge economy phases rely mostly on government shifting investment into human capital as well as into development of the operational environment for the economy. While there are still major challenges and even obstacles in the province to entering the knowledge-based growth mode, there are quite viable entry points that can be used as cornerstones for the first steps into this triple helix type of collaboration between companies, universities and funding agencies.

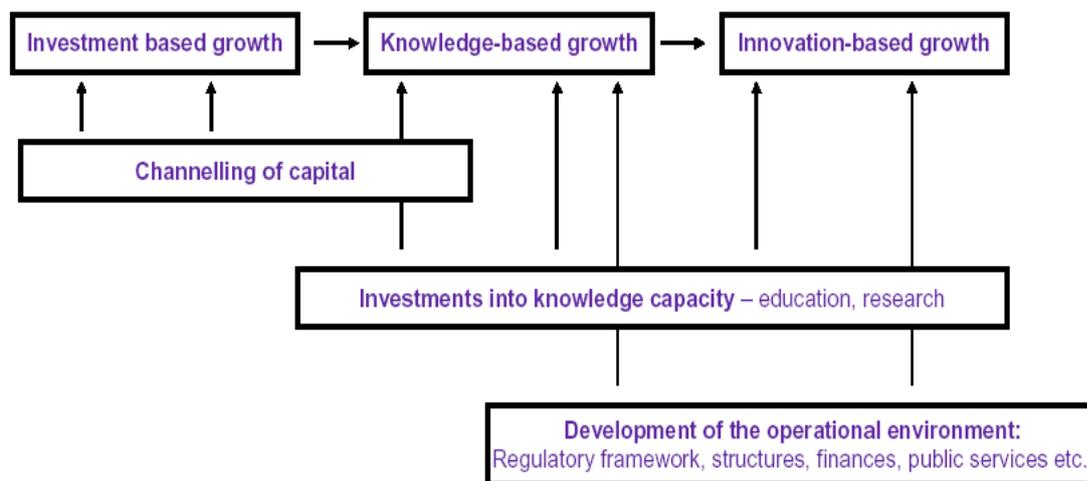


Figure © EK/TK

Figure 1. Evolution from an investment economy to an innovation-based economy.

The major paradigm shift that will take place is the one in public sector investment from financial capital to human capital when entering the knowledge-based growth phase. The further shift towards innovation-based growth can be viewed as a more subtle change. In the knowledge-based phase, one key ingredient is the collaboration between the wells of new knowledge (typically universities, research institutes and research hospitals) and the business world resulting in mutually beneficial exploitation of new knowledge. There is a clear distinction between a normal business competitive advantage and one based on long-term research. The research based on some new business possibility (preferably in an existing firm but a start-up is acceptable) is more sustainable and has a more lasting competitive advantage. The path is naturally a more demanding one and should not be seen as the only path to be followed. Yet, it remains a paramount factor in a knowledge-based economy that novel knowledge created at universities and research institutions is transformed into business and other economic activity for the benefit of society.

The best way to enhance this transformation is by bringing businesses closer to universities and research institutes. As funding is always a key element in these kinds of set-ups, provincial and national funding should be utilized in this collaboration. National and provincial funding ought to be brought together in a synergistic and coherent way. Scarce resources should be used with good knowledge of the overall set-up to ensure optimal results instead of partial optimization for the benefit of someone other than the intended stakeholders.

The building of a fruitful triple helix such as collaboration between government, universities and companies (sometimes also referred to as a "BUG" model) is a subtle and fragile process with vast benefits to be reaped if carried out successfully. The pitfalls are many, starting at the very beginning with universities and businesses coming together. Companies often donate goods and money to universities but that is a different mode of collaboration, a kind of charity. In a knowledge-based economy, one is seeking set-ups where work carried out at universities can benefit companies in more direct ways, in a win-win set-up for all parties involved. The development of the identified industrial and service clusters and especially their competitiveness in increasingly global markets will depend much on how well they are able to utilize novel methods and technologies and apply them in the marketplace within their respective sectors to create a sustainable competitive advantage for their own benefit.

A necessary - but not sufficient - condition for fruitful collaboration is, for instance, a shared interest in solving a given problem by a university for the benefit of a company. Both parties end up as beneficiaries of this collaboration. A company gains insight into new knowledge or its application, while the university for its part benefits not only financially but also by getting hands-on experience with regard to problems confronted in industry and business. In the beginning, creation of the necessary trust (or social capital) is the groundwork for future success. Both parties need to give more than the other understands to require. If giving is one-sided, no fruitful lasting collaboration will result. If both aim at win-win situations, then a sustainable basis for co-operation will be achieved.

This leads us to another crux of the knowledge economy: networks of trust. As the economy becomes more polarised between the large, volume-based economy and the small, expertise-based economy, various networks form the basis for creating a working business environment. The valuable knowledge lies in the networks, no longer located at any individual company. Information sharing is a norm. Trust in and ease of use of networks is a prerequisite for larger collaborations, say around universities, to take place.

These two issues - capability to collaborate and use of networks - are the key ingredients in the paradigm shift from the capital-intensive economy to knowledge-based growth. As knowledge is a resource best accumulated by sharing, failure to accommodate those needs that a rise from this shift may hinder or delay much of the desired development.

Living Lab for the Regional Development of Limpopo

In the case of Limpopo, this translates into creating an environment in which the kind of co-operation described above can be realized for the benefit of the province, its economy and people.

When tailoring the somewhat elitist concept of a science park/technology center to the industrial, economic and educational fabric of the Limpopo province, it becomes clear that a traditional science park/technology center concept is not sufficient. On the one hand, it cannot encompass the broad potential available in the province. On the other hand, the technology and research base of the province by itself alone does not presently justify the establishment of a

Living Lab. Thus, a broader approach is needed to satisfy the needs of the province presented, e.g., in the terms of reference document for this project.

We propose a model that includes the traditional elements of science park and technology centers such as business incubation and innovative business solutions based on interplay and collaboration between businesses, universities and the public sector. Yet this triple helix type of approach needs to be extended to a full living lab concept.

There is a clear need for training, education and capacity building as also implied in the terms of reference for the ICT Institute study. As the human resources in the province are limited, the approach to this area should be that of complementing the work carried out at existing institutions and realizing further initiatives together with the existing educational institutions such as FETIs and universities. It is proposed that this activity be included in the ICT Institute.

Another element missing in traditional technology centers is the civil society aspect. There is an abundance of community projects in various sectors addressing a multitude of different needs, in particular social and educational ones ranging from family planning to the exploitation of indigenous herbs, from HIV/AIDS protection to building ICT capacity and many more. These projects are financed by an array of organizations, carried out by a fleet of operatives and fulfilling a great need in more ways than one.

We suggest that there could be a business development angle to these community projects that could develop them further by engaging proper competencies in the process. One obvious example are the development activities related to various possibilities in indigenous plants or to cultural preservation. If started from top down by fulfilling the interests of, e.g., large pharmaceutical companies alone, much may be lost. If combined with a grass-root-level approach, much more may be achieved. Other examples include technical and technological devices that can be tailored to meet the needs of and possibilities in rural areas.

For the all-encompassing approach already adopted in the PGDS, the proposed broader concept of the Living Lab is thus based on a more holistic business development approach. It will be established on the four cornerstones described above and listed below:

- Community projects
- Training and Education
- Business Incubator
- Innovative Solutions

This will be a basis for a Living Lab that has possibilities for sustainable operation in the province for the foreseeable future. While the concept is somewhat novel, it is rooted deeply in two tested elements: the traditional technology center or science park approach combined with the strengths of the civil society in its quest for improved quality of life. The combined approach is further supported by evidence and experience from science parks that often fail to reach beyond the major cities. It is further corroborated by experiences from various grass-root-level community projects from different continents that manifest the importance of relieving poverty as a precondition for sustainable growth. It is the ambitious goal of the hub to create an environment where both these elements could contribute to the growth and well-being of the province.

The dynamics of the proposed hub are depicted in Figure 8 in chapter 4. As can be seen from that figure, the four legs that the hub stands on are not only potentially strong but also feed into each other, thus creating a circle that is fueled from outside but also from within.

If successful, the concept lends itself to a becoming business opportunity. The proposed kind of Limpopo Living Lab is potentially a concept that can serve as a model for other rural development initiatives both within the country and abroad. There is a potential for exporting it to other regions and nations through consultancy. This could provide a revenue stream for the Living Lab itself.

1.4. Policy Framework for Limpopo Living Lab

The Limpopo Living Lab fits well into both national and provincial policy frameworks. By combining the high tech nature with non-high-tech innovations stemming from the communities and their needs and transforming both of these approaches into viable business opportunities for either growth-driven firms or SMMEs serving basically the local and regional needs, the Living Lab concept can be found in a range of policies.

The following policies provide a core framework for the development of the Limpopo Living Lab:

- UN Millenium Development Goals and declarations adopted by WSIS World Summit in Geneva and Tunis
 - Bridging the Digital Divide
- PNC on ISAD
 - SMME development and local content development priority areas
- DST National R&D Strategy 2002
 - Achieve global leadership in identified key scientific and technological domains.
 - Develop multi-disciplinary technologies, skills and methodologies to address areas of market neglect, especially to eradicate the Digital Divide.
 - An indigenous ICT sector that is developed, growing, innovative and competitive.
 - The smart proliferation of ICT within other sectors of the economy.
- DST National ICT R&D Strategy (under development)
- PGDS Limpopo
 - Economic development building on the strengths of the province and enhancing innovation and competitiveness
 - Support for the growth and development of the clusters identified in the PGDS.

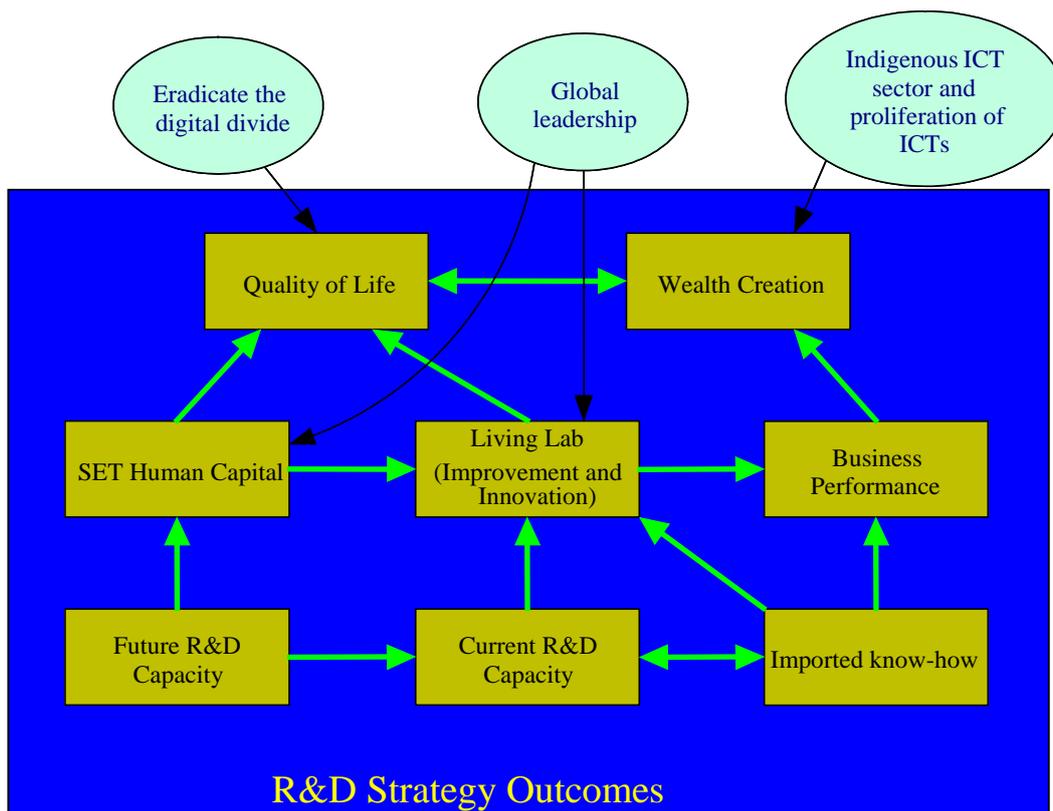


Figure 2. Outcomes of the ICT R&D Strategy linked to the R&D Strategy. Modified.

South Africa spent about R12 billion, or 0.87% of its GDP, on research and experimental development (R&D) in 2003/04. The 2004/05 figure represents an improvement on the situation reported in the 2003/04 R&D survey, which recorded R&D expenditure as R10.1 billion, or 0.81% of the GDP.

The intensity of R&D expenditure (measured as the percentage of the GDP spent on R&D) is a good indication of the competitiveness of a country's economy. The OECD country with the highest R&D intensity is Sweden (3.98% of its GDP), followed by Finland (3.48%). The United States R&D expenditure measured 2.68% and the average for the 25 European Union (expanded) member states was 1.82%. The European Union has set a goal of achieving an average R&D expenditure of 3% of its GDP by the year 2010. South Africa has set a goal of achieving R&D expenditure equivalent to 1% of its GDP by the year 2008.

In comparison with other developing countries that provide R&D data to the OECD, South Africa spends proportionately more on R&D than Argentina (0.44%) and Greece (0.62%) but less than China (1.44%) and the Russian Federation (1.17%).

South Africa has a total of 29 692 full-time-equivalent (FTE) R&D personnel, comprising researchers, technicians and other support staff. About 60% of these personnel (or 17 910 FTE) are researchers or academically qualified people who perform, manage and guide the process of undertaking research that leads to new knowledge and novel research findings. While South Africa's R&D expenditure is fairly high compared to that of other developing countries, the total number of researchers expressed as the number of researchers per thousand total employed is low at 1.6 researchers per thousand total employed. Comparative figures are: Argentina 1.8, Russian Federation 7.1 and China 1.2 researchers per thousand total employed.

The demographic profile of researchers in South Africa is changing. Women researchers now comprise 38.3% of the total researchers compared, e.g., to 11.6% in Japan, and 29.4% in Norway. In developing countries Argentina leads the way with 50.9% women researchers.

The business sector is the major performer and financier of R&D in the country and performs 58% of all R&D undertaken, while financing 45% of total R&D. The higher education sector undertakes 21.1% of national R&D while the government (including the science councils) performs 20.9% of the total but finances 32.1% of R&D. About 15% of South Africa's R&D is financed from abroad.

It is important to have a strong basic research component in a country's national system of innovation in order to challenge and train new researchers. Basic research is also important in that it provides the input to applied research and experimental development for which there are several important funding sources in South Africa, such as the Innovation Fund, THRIP, the Competitiveness Fund, the Support Programme for Industrial Innovation, and other national funding programmes and international sources such as the EU 6th Framework Programme for Research.

Applied research and experimental development contribute to economic development by providing new R&D-based products and processes with potential for introduction to the market. The strengthening of the R&D system through national policies and mechanisms, including special support for cooperation across what is termed the 'triple helix' of the business, government and higher education sectors, can lead to a more competitive international positioning through R&D-based innovation and there is now sufficient empirical evidence in the world to support this notion.

2. LIMPOPO ECONOMICS

The PGDS for the Limpopo Province is heavily based on the development of the main economic clusters: agriculture, mining and tourism. In order to attain the vision of a peaceful, prosperous, united, dynamic and transformed province, economic development, social justice and improved quality of life have a central role. From the three last-mentioned economic development is the one that effects the other two, and thus contributes significantly to growth and development in the Limpopo Province.

Limpopo has excellent reserves of agricultural, mineral and tourism resources. In Figure 3, the sectoral contribution of each of these to the GDP is depicted. A basic problem in the fields of agriculture and mining is the low level of added value connected to the primary production.

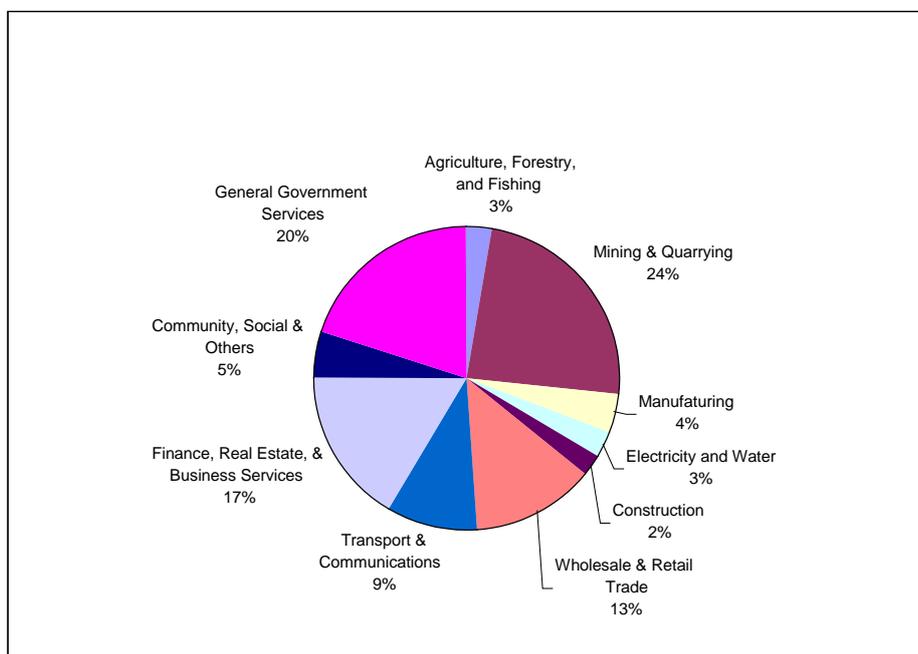


Figure 3. Sectoral contribution to provincial GDP 2002. Source: Macro-Economic Indicators, Statistics South Africa: GDPR 2002

For economic development in Limpopo, the PGDS sets a goal of an above average growth rate. The average real economic growth rate of Limpopo over the period extending from 1996 to 2002 was 4%. This is the highest among the provinces of South Africa and higher than the average real economic growth rate of South Africa over the same period of 2.8%. However after 2002 the growth rate somewhat declined, and in 2003 it was slightly below the average of 2.8% for the whole country (see Figure 4).

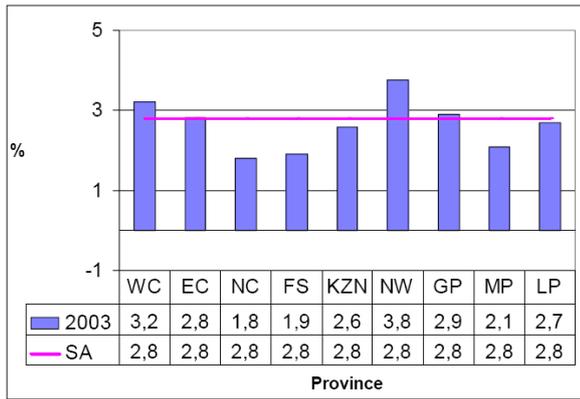


Figure 4. Growth rate by province, 2003.

The mining sector has grown in importance in the provincial economy (see Figure 5). The growth in mining has been remarkable between 1995 and 2002 as compared to agriculture and manufacturing.

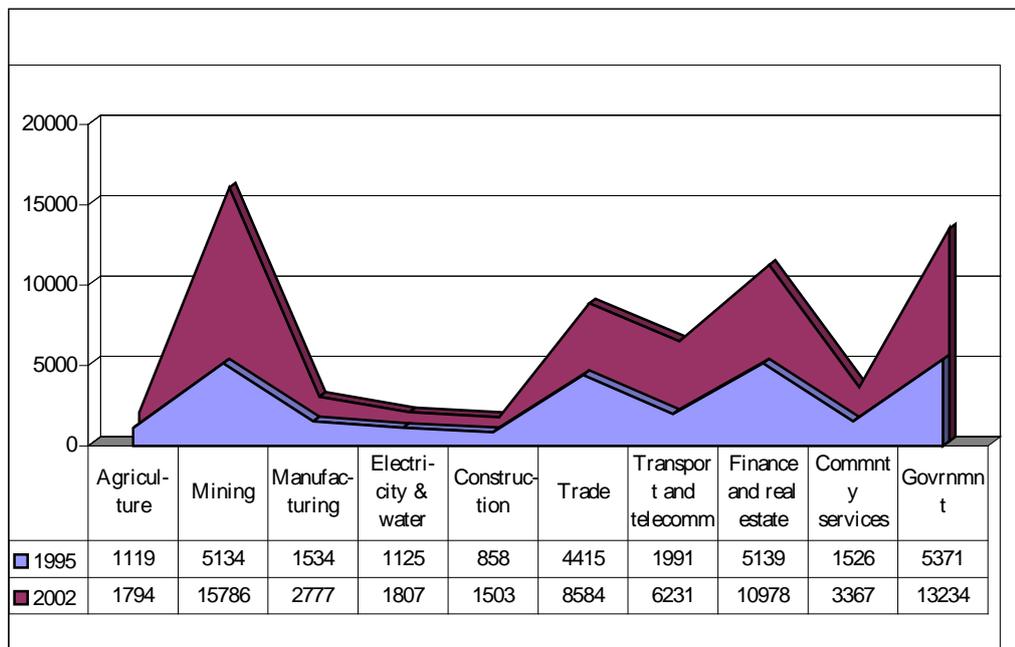


Figure 5. Provincial GDP in 1995 and 2002: R millions. Source: Macro-Economic Indicators, Statistics South Africa: GDPR 2002.

In the following, short descriptions concerning the main economic clusters together with logistics and the ICT sector will be given. In addition, a description of the entrepreneurial activity will be presented.

The Mining Sector

Limpopo is rich in mineral resources, with mining as the most important economic sector in the Province. It contributes 22% to the GGP. The platinum group includes platinum itself, chromium, nickel, cobalt, vanadium, tin, limestone and uranium clay. Other reserves include antimony, phosphates, fluorspar, gold, diamonds, copper, emeralds, scheelites, magnetite, vermiculite, silicon, mica, black granite, corundum, feldspar and salt. The potential growth sub-clusters

within the mining cluster include the platinum-mining cluster on the Dilokong Corridor in Sekhukhuneland and Mokopane together with coal mining and the petrochemical cluster in the Waterberg district.

One of the challenges in this sector is to ensure that the residents of Limpopo can benefit more extensively from the exploitation of the province's mineral wealth in the future. New minerals legislation, enacted in 2004, has raised the prospect of the transformation of the mining industry through the de-concentration of ownership, increased access to mineral resources on the part of junior and small-scale mining companies and black economic empowerment. At the same time, the new legislation is intended to stimulate new growth in the industry and bring about increased levels of minerals processing and related economic development in the province. New innovative solutions with respect to both business and technology, together with ICT and logistics support could be areas to be looked into in order to enable the desired progress to take place.

Agriculture

Agriculture is another important sector of the Limpopo provincial economy, contributing 4.3% of the GGP in 2003. The province produces 75% of the country's mangoes, 65% of its papaya, 36% of its tea, 25% of its citrus, bananas, and litchis, 60% of its avocados, two thirds of its tomatoes. Limpopo is the 2nd largest producer of potatoes in the country, accounting for 19% of South Africa's total production. Other products include coffee, nuts, guavas, sisal, cotton, tobacco, and timber. In addition, cotton, sunflower, maize, wheat as well as grapefruit are produced in the province. Many of the higher-lying areas are devoted to cattle and game ranching.

Fruit and vegetable clusters can be found in the Vhembe, Mopani and Bohlabela districts. Red and white meat is being produced throughout the entire Province. One important element of the agriculture cluster in Limpopo is forestry. Forestry activities can be found in the Mopani and Vhembe districts.

Essential for the further development of these clusters in order to progress from primary production to processing and distribution, is to increase professional activities and create connections between the organizations at the different levels of the value chains of the clusters. The province offers opportunities for the processing and packaging of fruit and vegetables.

Tourism

The Limpopo Province has exceptional tourism potential. The Province offers a diversity of ten rich cultures and a concentration of game farms, nature reserves, national parks, biosphere nature reserves and transfrontier conservation areas. Altogether there are eight tourism sub-clusters in Limpopo at a number of high-potential destinations.

The great concentrations of game areas provide substantial potential for developing this tourism sector further. The estimated size of these game areas exceeds 4 million hectares. Together with the transfrontier areas and immediately adjacent game areas this translates into a concentration of more than 6.5 million hectares in total. Private game farms alone are increasing by an estimated 100 000 to 300 000 hectares per year.

The archaeological and cultural heritage includes, for example, the Mokopane (Makapan) Valley Heritage Site, which has been declared a world heritage site by UNESCO. It is the site which exhibits the longest virtually unbroken record of human habitation, about 3.2 million years.

Another world heritage site is the one in Mapungubwe. It is reckoned to be the cradle of the most important ancient African civilisation in Southern Africa.

For the success of the tourism sector, reaching potential customers plays a central role. In this case, with potential customers in different locations worldwide, the internet can be considered the most effective communication channel. What is more, pre-payments, for example, can be handled via the internet. Furthermore, for the development of different tourist services, it is important to bear in mind the needs of potential customers in respect to different ICT solutions. The current level and development challenges of ICT-related skills, service providers, solutions and infrastructure that satisfy the needs of modern tourists forms a demanding challenge, especially regarding the opportunities the 2010 FIFA World Cup will provide.

Logistics

From the economic development point of view the basic logistical infrastructure is in place. By "basic logistical infrastructure" is meant the existence of roads, railroads and airports. The Province is linked to the Maputo Development Corridor through the Phalaborwa Spatial Development Initiative, a network of road and rail corridors connecting to the major seaports. However, for the development of the main economic clusters the existence of a basic logistical infrastructure is not enough.

Limpopo possesses the Polokwane International Airport which has been upgraded recently and now has operational customs and immigration facilities in order to handle international traffic. According to current estimates the airport is handling 5000 aircraft and 38 000 passengers annually.

In Figure 6 the main freight corridors in South Africa are presented. As the figure shows, the main route from the South to Zimbabwe and Botswana goes through the N1 and thus through Limpopo. The challenge in Limpopo is to find solid logistical solutions for the transportation of agricultural products to the coast. Thus, the Maputo Development Corridor creates an important potential.

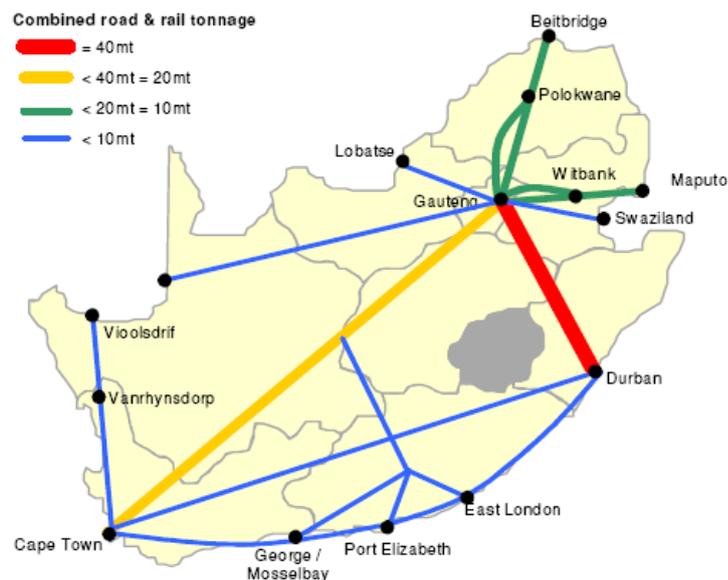


Figure 6. Freight flows per corridor (tonnage 2003). Source: *The first state of logistics survey for South Africa 2004*.

Logistics has an important role to play in supporting the functions of the other clusters. Its role can, however, be central to the development. Conversely, if neglected, the other clusters will not be able to fulfil their development goals.

ICT

At the provincial level in Limpopo, the Provincial Growth and Development Strategy 2004-2014 formulates a comprehensive, multifaceted strategy for the economic and social development of the province. The rationale behind the PGDS is to ensure equitable social development for all citizens by emphasising economic growth and sustainable social development. ICT together with information society development does not form a central issue in the PGDS, but it is acknowledged that ICT can be used for ensuring affordable access to information. Further, the provincial government is committed to developing their information-society strategies and to enhancing information-society development.

Focusing on developing ICT as an economic sector may produce significant economic benefits such as growth and new investment, but these gains do not automatically translate into achieving development goals. It is therefore imperative to use ICT to improve Limpopo's competitive positions in relation to the rest of South Africa and the global economy.

The ICT sector as an economic sector in Limpopo Province is fairly limited. The number of companies operating in the field of ICT in the Province is small. Most ICT companies are product-related, and the software and ICT service companies are almost non-existent. The software and ICT service companies that operate in the Province do so primarily on a project basis, having their offices mainly outside the province.

Entrepreneurial Activity

New business creation is fundamental to the growth of the economy in Limpopo. The entrepreneurial activity can be measured by the Total Entrepreneurial Activity (TEA) index². The TEA measures the proportion of a country's adults involved in starting or running new businesses. In 2004 the TEA index in South Africa was 5.4% compared to an average of 9.4% in all 34 countries included in the 2004 survey, and 21.0% in the developing countries included in the 2004 survey. The 2004 survey provides confirmation that South Africa has a relatively low TEA rate compared to the other countries included in the study.

Total entrepreneurial activity varies considerably among South Africa's provinces (Figure 7). This is measured as the percentage of the economically active population that takes part in entrepreneurial activity. It ranges from 9.9% in Gauteng to 3.0% in the Northern Cape and North West, and in Limpopo. The more rural provinces clearly exhibit less entrepreneurial activity.

² GEM (Global Entrepreneurship Monitor), 2004.

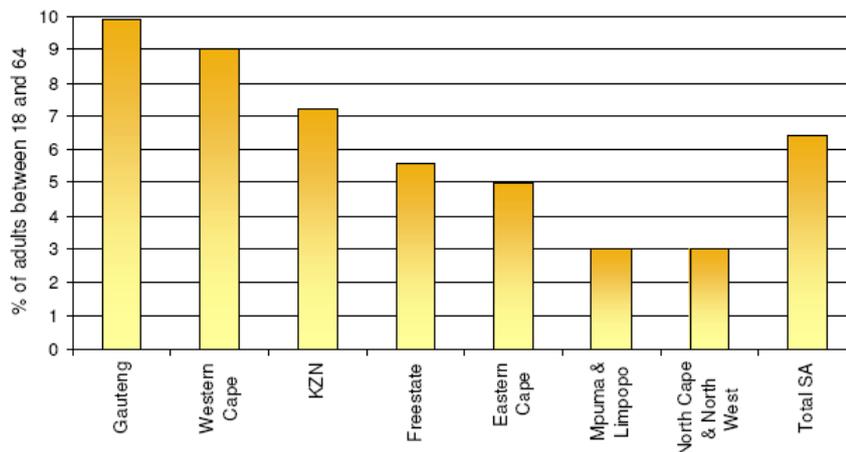


Figure 7. Entrepreneurial activity by province, 2003.

Education and experience are key elements in successful venture creation. Models showing support for entrepreneurship in rural and urban areas are likely to be very different. In rural areas, individual-focused models showing entrepreneurial support are unlikely to prove cost-effective or sustainable. Rural entrepreneurial support programmes need to develop community-based models that address the key limiting factors associated with rural locations. Programmes aimed at alleviating constraints associated with rural or “poorer” SMMEs could result in higher entrepreneurial and hence higher economic activity in the more deprived regions.

3. EDUCATION AND RESEARCH IN LIMPOPO

In 2001, 33% of the population aged 20 years or older in the Limpopo province had no education at all, while 7% had post-high-school education (Table 1). These figures, in general, show an increase in all categories since 1996 and subsequently the "no schooling" category decreased.

*Table 1. Level of education among adults 20 years or older, in Limpopo, 2001.
Source: Statistics South Africa.*

	Number	%
No schooling	789731	33
Some primary	336377	14
Completed primary	133206	6
Some secondary	629057	26
Grade 12/Std 10	337627	14
Higher	162454	7
Total	2388452	100

In Limpopo, there are approximately 4290 primary schools and 1300 secondary schools with over 1.8 million learners and almost 58 000 teachers (2002). In 2002, less than 10% of the schools in the province were computerised and fewer than half of those were really utilising their computers. Since then, the situation has improved, mainly due to a considerable amount of donations, but many schools still lack computers, connections and capabilities related to them.

In higher education institutions in Limpopo, there are approximately 40 000 students. The number of university graduates is about 15 000 per year. Out of these, the percentage of students graduating from ICT-related fields is around 4%.

Limpopo has two main universities, the University of Limpopo and the University of Venda. In addition, some other universities from South Africa have their units in Limpopo. The biggest of these is TUT, the Tshwane University of Technology.

University of Limpopo

The University of the North (UNIN), now the Turfloop Campus of the University of Limpopo, began its existence as the University College of the North in 1959. In the 21st century, the university has gone through many major changes. One of which is the merger with Medunsa. The other restructuring reducee the number of faculties from 8 to 3 and the schools from 58 to 11.

The faculties today include the faculty of Humanities (Schools: Languages and communication, education, social sciences); the faculty of Management, Sciences and Law (Schools: Economics and management, law, graduate school of leadership); and the faculty of Sciences, Health and Agriculture (Schools: Agricultural and environmental sciences, health sciences, physical and mineral sciences).

The University of Limpopo has two campuses. In the Tufloop campus, the total enrollment of students is around 14 500 and in the Medunsa campus 4 000.

The research conducted at the University of Limpopo has in some areas reached the top national level. An example of this is the speech technology center which has been selected as a center of excellence by the National Research Council.

Collaboration with the other universities, especially in South Africa and with companies, is quite active. The research collaboration is mainly company-driven, i.e. the company approaches the university with the problem. There is also an example of long-term research inputs for research at a level that interests companies.

The University of Venda

The University of Venda was established in 1982. At that time it was named the University of Venda for Science and Technology. Until 1994 the university recruited its staff mainly from various parts of South Africa, but since then staff members have been increasingly recruited from other African countries and overseas.

The University of Venda has three main faculties and seven schools. The Faculty of Health Agriculture and Rural Development has two schools, the School of Agriculture, Rural Development and Forestry, and the School of Health Sciences. The Faculty of Humanities, Management Science and Law comprises two schools, namely the School of Management Sciences and Law and the School of Humanities and Social Sciences. The Faculty of Natural and Applied Sciences has three schools, the School of Mathematics and Natural Sciences, the School of Postgraduate and Integrated Studies and the School of Environmental Sciences.

At the moment there are over 10 000 students studying at the University of Venda. The yearly intake of undergraduate students is around 2700.

Traditionally, the University of Venda has been a teaching-oriented university with a strong approach to offering opportunities for higher education to those who have the potential. Research has grown in importance during the recent years and at the moment the university has 8 main research fields on which it is concentrating. These areas represent niche areas with which it is possible to compete at a national level. These areas include, for example, research related to poverty alleviation, indigenous knowledge systems, literacy, and rational use of natural resources.

The University of Venda has been actively collaborating with the local communities. Different kinds of outreach programs related, for example, to ICT capability building have been executed by the university. There is also an increasing trend towards collaborating with the other universities both nationally and internationally, and with companies. There is, however, potential for increasing the collaboration with communities, other universities and companies.

The University of Limpopo also has collaboration with the local community through different out-reach programs, the science center being a good example of an effective way of reaching the communities.

The Tshwane University of Technology

The Tshwane University of Technology (TUT) was born as a merger of three Technology institutes in South Africa. At the moment it has physical sites in Pretoria, Soshanguve, Ga-Rankuwa, Witbank, Nelspruit, Polokwane, and Arcadia.

The new faculty structure of TUT includes eight faculties: The Faculty of Health, The Faculty of Natural Sciences, The Faculty of Agricultural Sciences, The Faculty of Arts, The Faculty of Economics and Finances, The Faculty of Information and Communication, The Faculty of Management Sciences and The Faculty of Humanities.

The Tshwane University of Technology can be regarded as a large university as it has 30 000 students and 2 767 permanent staff members. Of the staff, 895 members are research or instructional professionals. TUT has the largest number of residential students in South Africa.

As a technological university TUT places emphasis on applied research. It can be regarded as one of the most advanced and modern institutions of higher education in South Africa. With its emphasis on technology, it also uses technology in teaching and education (e.g., virtual classrooms, e-assessment).

The technological emphasis of TUT also shows in the research activities conducted at the university. Fields such as information and communication technology, materials processing and utilisation, computer-aided design in development, and entrepreneurship and innovation are examples of the areas which the Tshwane University of Technology concentrates on.

The University of South Africa

The University of South Africa the Unisa was created in a merger of the old Unisa and the former Technikon South Africa and Vista University Distance Centre (VUDEC) into one new institution that started its operations on Jan 1, 2004. Unisa is mainly a distance-teaching and learning institution and it also provides these services in Limpopo. One can complete bachelor's, master's as well as doctoral degrees with Unisa.

The tutorial course offering in Polokwane is limited currently to basic accounting classes but there is a wide tentative selection of courses available if need arises. There are about 15 000 students in Limpopo of the total of some 233 000 Unisa students nationwide. The Limpopo student body is about 6% of Unisa's total student body.

In 2006, 304 students graduated in Polokwane, most of whom achieved either undergraduate certificates and diplomas or bachelor's degrees. In addition, two graduated with a PhD and three with a Master's degree. In total, Unisa had about 13 000 graduates in 2006 across the nation.

The Edupark Facility

Edupark is a concentration of various higher and other education institutions and their branches, in addition to being a well-equipped conference and meeting center. It is legally a separate entity (a Section 22 company) but in practise it operates under the University of Limpopo. It hosts a variety of satellite units of various universities, including the University of Stellenbosch as well as the Eskom Regional Training Center. The universities offer either distance or mixed mode education services at Edupark.

Edupark also offers a variety of part-time postgraduate courses in various areas including but not limited to business administration, public administration, education, and public health management. It is home to the University of Limpopo Turfloop Graduate School of Leadership.

The Edupark complex provides one possible location for the Limpopo Living Lab headquarters. As it already hosts a variety of organizations also outside the province, it is a well placed location for networking. Its tight ties to the University of Limpopo are a major advantage as ties between the businesses and academia are the crux of the Living Lab activities and operations. Further, its

geographic location in the vicinity of the airport as well as near highway N1 are very important considerations when making decisions as to the physical location of the Living Lab.]

Further Education and Training Institutions

During the latter part of the 1990's, the Department of Education (DoE) and the Department of Labour (DoL) introduced policies and laws that together set out the goals and strategy for human resource development in SA. These also provided a framework for transforming the FET sector. The FET sector has a vital role to play in preparing young people for work and citizenship. Therefore, the newly reconstituted Further Education and Training Institutions (FETIs) are in a position to facilitate access to higher education and other learning opportunities, as well as increase the skills level of working adults.

The FETIs are integral to the new skills policy environment as captured in the Skills Development Act, the National Skills Development Strategy and a host of other legislative requirements and regulations. At the same time, the colleges will be subject to the new curriculum for FET introduced by the DoE in 2006. This policy is applicable to all programmes, whether these are offered by secondary schools or FET colleges.

The FET sector was formally reorganized in 2002, when 50 former technical colleges, colleges of education and training centres merged into FETIs in accordance with the FET Act of 1998. An important aspect of this new setup is the expectation that FET colleges will become responsive to the needs of the South African economy and society by providing high quality training relevant to the development of society and businesses. In this light, the restructured and revitalized FETIs have an important role to play in the realization of the Limpopo Living Lab concept.

All together there are seven further education and training institutions in Limpopo. These are located in various parts of the province (Lehphalale FET college, Capricorn FET college, Waterberg FET college, Vhembe FET college, Mopani South East FET college, Letaba FET college and Sekhukhune FET college).

4. THE CONCEPT

The Limpopo Living Lab concept is presented in Figure 8. The concept is divided into two sub-concepts: the Limpopo Living Lab itself and the ICT Institute. The ICT Institute is linked to the Living Lab mainly through education and training, but community projects, incubation, and innovative solutions also have a role to play in the operation of the ICT Institute. The ICT Institute concept is clarified in a more detailed fashion in a separate report.

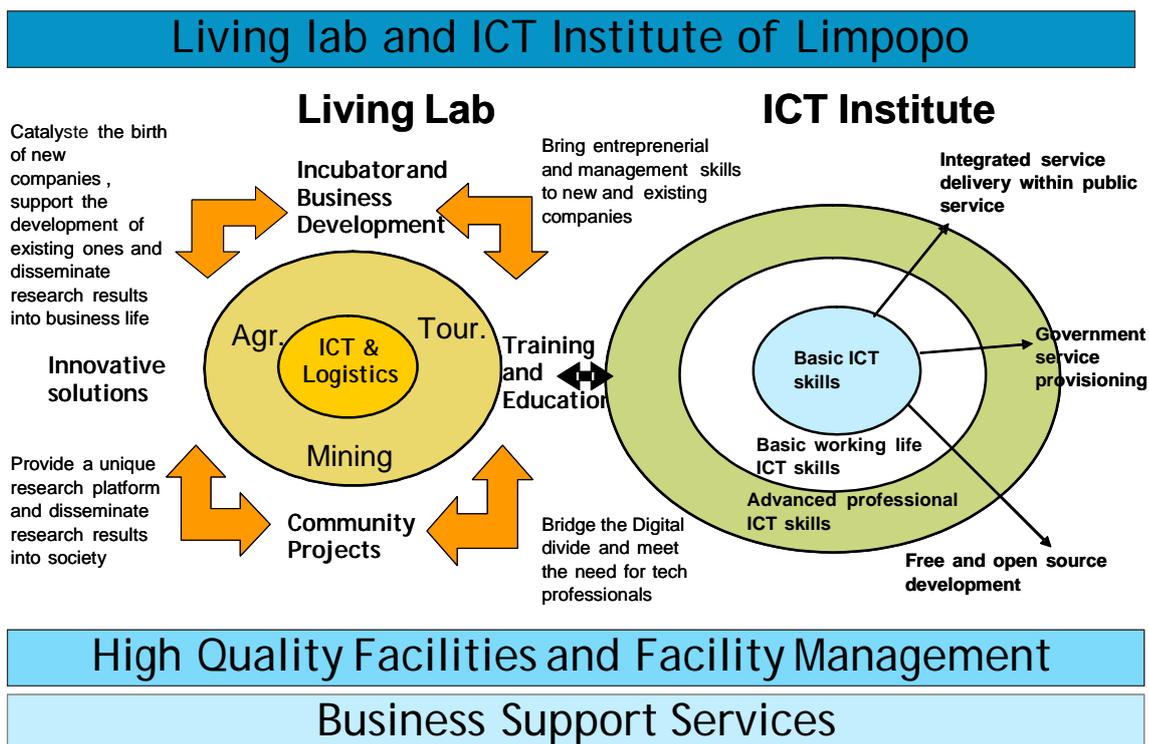


Figure 8. The Limpopo Living Lab concept.

Business development forms the core of the Limpopo Living Lab concept. The ICT and logistics are at the center, as they represent areas which if not developed can slow or even hinder the development in economic sectors. The agriculture, tourism and mining sectors in Limpopo are the main beneficiaries, as most of the activities executed through the Living Lab contribute to these economic sectors.

The Limpopo Living Lab - Process

The Limpopo Living Lab concept is presented in Figure 9 as a process or circle where the legs or activity areas are linked to each other and serve each other. The core here, as in Figure 8, is business development in the region.

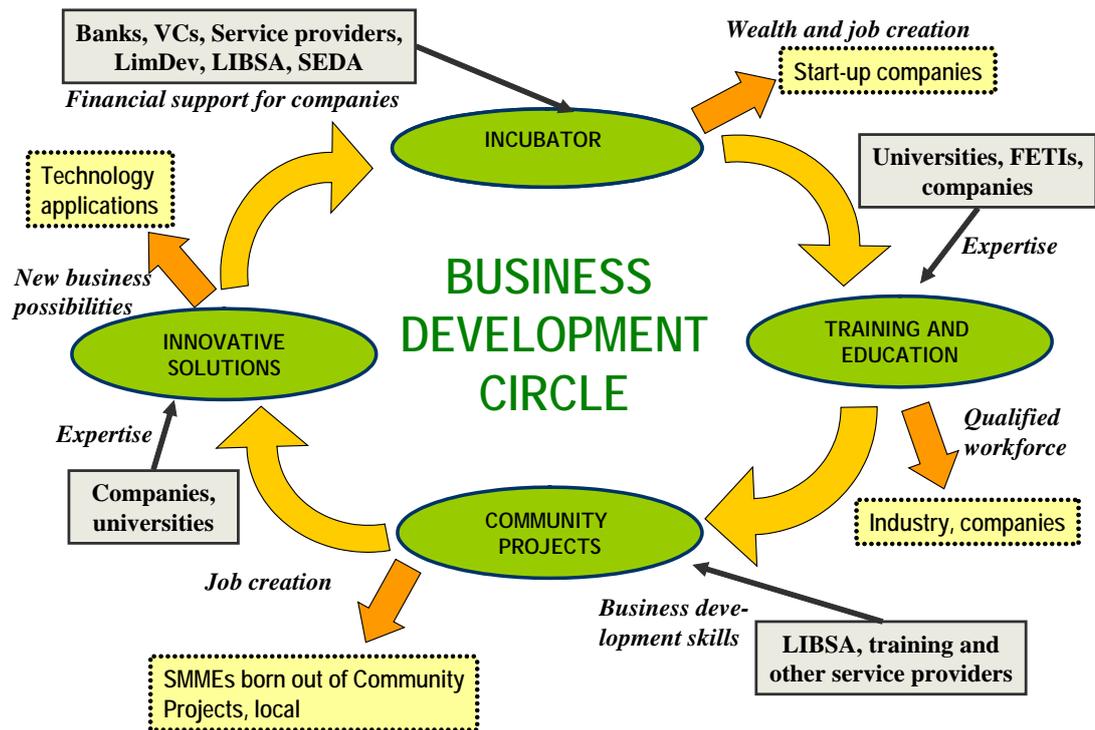


Figure 9. The Living Lab concept as process.

The **incubator**, is the part where business ideas are transformed into new companies. The inputs to it originate from various sources, the main sources being business spin-offs, universities, and the innovative solutions activity. Training and education together with community projects also generate business ideas, but a majority of those can be handled by existing organisations (like LIBSA). Financial and funding institutions such as the venture capital companies, banks and LimDev are important partners for the incubator. As a result, companies which have the potential for growth are generated.

The results of the incubator, the companies, together with existing companies, generate needs for **training and education**, especially in the fields of business management, ICT skills and project management. For example, in mining there is a need for developing the repair and maintenance related skills in the province. For training and education, inputs are also needed from educational institutions and companies in the form of expertise. Much of the actual training and education is carried out by existing training and education institutions with the Living Lab mainly acting as an initiator, catalyst and coordinator. As a result of this activity, local companies and the business environment in general benefit in the form of a more adequate and skilled labour force.

Training and education needs often generate **community projects** (as in case of the Mogalakwena iCommunity). Community projects are also central in the Limpopo Living Lab concept, but as this concept is a business development instrument, the community projects included in the LLL should include this aspect. An important aspect of the community projects is that they can serve as a test bed for companies testing their products for markets in developing countries. Community projects result in more jobs, especially in local SMMEs.

Innovative Solutions can use the community test bed for attracting foreign investment. As input the innovative solutions approach needs expertise from companies and universities. Here, as in all the four cornerstones of the concept, the main emphasis of all the activities should be on

business development. As output, applications and solutions for the benefit of the local economy and companies are generated.

The process picture in Figure 9 gives a somewhat simplified picture of the linkages between the main activity areas of the Living Lab. In order to broaden the view, some of the other potential important linkages are described in Table 2.

Table 2. Main areas of cooperation between the key activity areas.

Pairs of actions	Main areas of cooperation
TrainEdu - InnoSol	<ul style="list-style-type: none"> • Training and education of the users of new technological applications • Utilisation of university students in science and technology projects
TrainEdu - Incub	<ul style="list-style-type: none"> • Management- and- entrepreneurship-related training and education provided to new and existing companies • Catalysing the birth of new companies from other training and education projects and programs
TrainEdu - CommProj	<ul style="list-style-type: none"> • Bridging the digital divide through basic ICT skills training • Filling the gap of technology professionals by educating the young and re-educating the old
InnoSol - Incub	<ul style="list-style-type: none"> • Catalysing the birth of new companies from universities and companies through science and technology projects • Supporting the development and growth of existing companies by enhancing the utilisation of technology based applications and solutions • Dissemination of research results within business life through enhanced collaboration between universities and companies
InnoSol - CommProj	<ul style="list-style-type: none"> • Disseminating the research results within society through enhanced BUG-C collaboration • Providing a unique research platform (e.g. ICT solutions in less-developed environment; indigenous knowledge)
Incub - CommProj	<ul style="list-style-type: none"> • Management- and- entrepreneurship-related training and education to the communities (need basis) <ul style="list-style-type: none"> ◦ Catalysing and supporting the birth of new companies, especially in indigenous knowledge-related fields
InnoSol - TrainEdu - Incub	<ul style="list-style-type: none"> • Business- and- management related training together with technical training for the IT managers of companies

Explanation of acronyms used in Table 2: TrainEdu = training and education function, InnoSol = innovative solutions function, Incub = incubator, CommProj = community projects function

Limpopo Living Lab - Addressing Objectives

Incubator, Training and Education, Innovative Solutions, and Community Projects form the four functions and activity areas through which the six objectives of the Living Lab will be addressed. The way in which the four objectives are addressed through the key activity areas is described in Table 3.

Table 3. Key activity areas and their role in addressing the objectives.

ACTIONS VS. OBJECTIVES OF THE LIMPOPO LIVING LAB	Retaining the educated workforce	Attracting investments	Cluster development through knowledge creation, transfer and exploitation	Collaboration between business, universities, government and civil society	Job creation	Fostering entrepreneurship
Training and education	Contributes	Supports	Contributes	Contributes	Supports	Contributes
Innovative solutions	Supports	Contributes	Contributes	Contributes	Supports	Contributes
Incubation	Contributes	Supports	Contributes	Supports	Contributes	Contributes
Community projects	Contributes	Contributes	Supports	Contributes	Contributes	Contributes

In Figure 8, the concept of LLL, the high quality facilities and support services have a role in forming a platform for the activities. From the activities the incubation together with training and education need facilities which meet international standards related to, for example, ICT infrastructure, meeting rooms and office equipment. Also the support services, like catering, security, secretarial services, accounting and advertising, are mainly needed by the incubator and business-development-related activities. The facilities and support services, however, play a significant role in attracting foreign investment, and thus their importance cannot be neglected.

In the following chapters 4.1.-4.2., the roles of key activity areas will be discussed in more detail.

4.1. The Incubator

The aim of the incubator function in the Limpopo Living Lab is two-fold. It will provide a coordinated business incubator function for selected, growth-driven start-up companies. It will also arrange a comprehensive but somewhat lighter business incubation for a wider selection of start-up companies.

The first activity, business incubator services for a selected group of start-ups, will aim at generating and accelerating the development of those businesses that have both the capability and the intention to grow.

The second activity is a lighter version of an intensive incubation process for a wider selection of start-ups.

The business incubation should be designed and executed in close collaboration with other government services addressing the same space but in a different fashion, such as LIBSA, SEDA and LimDev.

Objectives

The objective of incubation activity is to contribute to the growth of the province in creating wealth and jobs in the form of new companies. The process is an important factor in the overall development, where opportunities are created for the educated workforce to remain in or return to the province. At the same time, the activities support the development of the key economic clusters by enhancing the growth and development of the companies which can fulfil the existing gaps in the development of various clusters. The incubation activity also enhances entrepreneurship in the province.

Content

The incubator activities can be divided into discovery, pre-incubator, incubator and post-incubator activities (see Figure 10). In the discovery phase, the incubator professionals seek promising start-up seeds typically in businesses and, e.g., universities. In the model we propose, the indigenous knowledge systems are to be one base for business creation. During the pre-incubator period the idea of the start-up is developed into a business plan and in the incubator phase the business plan is tested, redefined and begun. The post-incubator phase supports the growth of the company after the incubation period. The actual incubator phase usually lasts for 1-2 years.

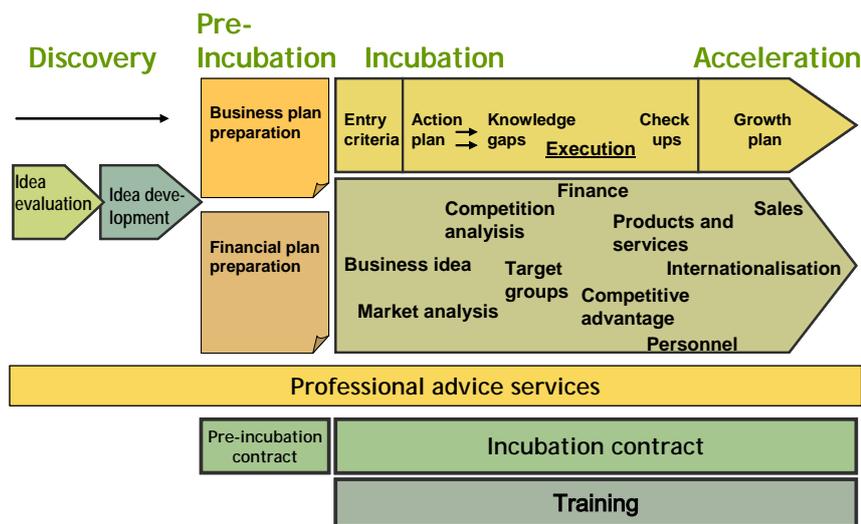


Figure 10. Incubation process.

It is proposed that the emphasis of the incubator could be on those sectors and start-ups that have the potential for growth and that support the on-going development of the key economic clusters in the province. One such developing area is the ICT sector whose impact cuts across all sectors; thus special support actions should be targeted towards developing new companies in this sector. In the start up phase of the incubator much attention should be paid to developing criteria for entry into the incubator since much depends on the finalized target of the incubator. The competences of key personnel are crucial to success.

While there are a variety of business supporting services available from both private and public organizations, there is a lack of a systematic, incubator-like business support services for small and starting firms in Limpopo. The incubator could take a coordinator role in creating this kind of environment of comprehensive business development activities for knowledge- and skills-based companies. The Limpopo Living Lab as a center concentrating on business development offers a good environment for this.

It should be pointed out that not all actions are to be carried out by the incubator but it can subcontract some of the services from private and public organizations thus creating business opportunities by means of its own activities.

Organization

Business development, especially small business development, is all about people. The professional as well as personal, inter-personal and social and communication skills of the director are therefore crucial. In short, he or she should be both a good business executive and good at managing people.

The director of the incubator will be responsible at once for the strategy of the incubator, its networks with all relevant stakeholders as well as the day-to-day operations of the incubator. In the first 6-12 months, the first two will be time consuming but once the operation is up and running, the operational mode will receive more attention. The director will report to the director of the hub and be part of the executive group of the hub. There will be a Working Group which will assist the director in strategic planning.

The incubator operatives should be carefully chosen, as one wrong choice can ruin the whole incubator. In addition to the director, the operation may start with 1-2 full-time people who each have a business background and a desire to contribute to the benefit of the young entrepreneur and the province. The key to success also lies in the networks that these people have.

Thus, we see that the operation could be started and run with 2-3 professionals and one super-all-around assistant even though the scope of the operation is fairly extensive. It is not the purpose of the incubator to have in-house all the services the companies need but to provide them through networks.

The incubator will also interact with business development units throughout the province regardless of their host organizations. For the small business development arising from the communities and indigenous bases, a networked model of operation needs to be devised.

Next Steps

If an incubator is to be created the next steps to be taken, are outlined below in a schematic format. The activities in the starting phase should be concrete enough to meet expectations and extensive enough to form the basis for future activities. In Table 4 our schematic proposal for the main activities during the early phases of operation is given.

Table 4. The first phases of incubation and business development.

Before the start	The first year	The second year
Creation of the business plan for the incubator concept, including the funding model; appointment of the director	Execution of the incubator; first companies selected for the incubator	Ensuring the continuous and fluent operation of the incubator; changing the mode if needed
Building the networks for the incubator for growth firms, for the light incubator, for communities	Building a networking model which supports the incubator activities	Using the network effectively in the incubator activities, extending the network
Do a detailed study of all the business development and financing activities	Planning an integrated model of early-stage business	Executing the model and planning extensions for all

in Limpopo.	development activities	business development activities
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4.2. The Training and Education

Training and education are key functions of the Limpopo Living Lab. The linkage to the ICT Institute³ is clear here, as many of the training and education activities in the Living Lab concern ICT skills and capabilities. Here the discussion concerns the education and training activities other than those related directly to ICT. ICT-related training and education will be discussed in a separate document.

Organisationally, these two, the ICT Institute and the training and education function of the Living Lab, are the same. Operationally the ICT Institute will concentrate on ICT-related training and the training and education part of the Living Lab will concentrate on training and education in business-development-related training (like management training). These two aspects will in practice incorporate many of the training and education programs. For example, the training program in the ICT Institute can consist of management training sections that are provided through the training and education function.

As the operations expand it will be possible to separate these two into two organisationally separate entities.

Objectives

The objective of the training and education function of the Living Lab is to create the necessary skills and capabilities to enhance knowledge creation, transfer and exploitation in the Province. These activities support the development of key economic clusters together with the ICT and logistics cluster by filling the skills-, capabilities-, and knowledge-related gaps in development. In order to bridge the digital divide and meet the need for high tech professionals, training-and-education-related activities are needed. It should be highlighted that the training and education activities in the Living Lab are also business development-driven, thus all of them should one way or the other support the development of the companies and business in Limpopo. The broader aspect of ICT-related capacity building will be addressed by the ICT Institute.

Content

The activities in the training and education function can be divided into three main sectors: basic skills, basic working-life skills and advanced professional skills.

The main focus areas in training and education are related to management and entrepreneurship together with the areas that are based on the needs of companies in the key economic sectors. All in all, the emphasis is on business-development-related training and education. The ICT training and education function is dealt with in the separate document concerning the ICT Institute.

Training and education projects can be community projects or training and education elements can be integrated into community projects. The purpose here is clearly the business-related capacity building in the communities.

³ A separate, comprehensive plan for the ICT Institute will give an in-depth picture of the ICT Institute. Here only the basic principals will be discussed.

By **basic skills** is meant here the skills that in the information society are equivalent to skills usually learnt at schools. The role of the training and education here is to fill the potentially existing gaps so that people are able to be integrated into working life and have better opportunities. The basic skills training will be part of the other training and education programs carried out by the Living Lab or the ICT Institute.

Basic working skills are those needed in most work places, if not necessarily in all workplaces today, then in the near future. Project working and management, group work, report writing, accounting basics are examples of the basic working skills in more demanding and knowledge-intensive jobs.

Advanced professional skills can be developed through projects which fill the gaps in the existing educational and training programs, and can be planned and executed together with education institutions and/or companies.

As these programs reach degree status, the higher education institutions may take the responsibility for their execution. The Living Lab can also develop and execute training and education packages developed for the purposes of a single company or a government organisation.

The training and education aspect of the Living Lab should be considered as complementary training and education to that given by the existing educational institutions. There are thus at least two implications.

1. First of all, a study is needed concerning all the relevant training and education programs given in the Province.
2. Secondly, this means that the Living Lab and the ICT Institute will not confer any degrees; they can develop, initiate and even test degree programs, but the degrees will be conferred by the educational institutions.

By adopting this approach, the Living Lab enhances knowledge creation in already existing organisations and increases their commitment to the concept. Further, the existing human resources in the province should be strengthened and not diversified; sustainable growth and development of these capabilities and institutions.

The training and education function together with the ICT Institute will cooperate with existing educational institutions by creating need-based programs which combine parts from various already existing programs in various institutions.

As the province is large, there is a challenge in reaching all those who would need the training and education activities created. To meet this challenge a satellite-type of concept could be created in which the Living Lab acts as a Hub, and other already existing or new entities could take responsibility for carrying out the activities. The role of the Living Lab here would be more that of an initiator, a developer and a coordinator, while the satellites would, at least partly, carry out the activities.

It should be pointed out that not all programs, projects and courses are to be carried out by the training and education function but it can subcontract parts of the services from private and public organizations offering training and education services, thus creating business opportunities from its own activities. It can also employ outside experts on a project basis (like part-time teachers). Thus, it provides both business and job opportunities itself.

Organization

As in the case of the incubator, here too the role of the director is crucial. Experience related to educational planning, business and educational institutions is essential. As "a network node" the director needs to have good connections not only to educational institutions, but also to companies, NGOs, parastatals and government bodies. With an academic background he/she will be able to understand the challenges of the educational institutions, and with his/her business background he will be able to easily figure out the relevant gaps and needs which are to be addressed.

The training and education function and the ICT Institute will be under the same management so they will have the same director. The training and education function and the ICT Institute will also have a common working group which will take part in directing the operations. The working groups act as advisory boards for a given function. The working groups for each function will consist of persons from relevant organisations and companies.

The director of the training and education function and the ICT Institute will be responsible both for the strategy of the function and for the ICT Institute, its networks with all relevant stakeholders as well as day-to-day operations. The director will report to the director of the Living Lab and be part of the executive group of the hub.

In addition to the director, the operation may start with 1-2 full-time people who each have a business background and/or ICT background, experience related to education planning and good connections to local companies and other stakeholders. The key to success lies partly in the networks that these people have.

Thus, we see that the operation could be started and run with 2-3 professionals and one super-all-around assistant, even though the scope of the operation is fairly extensive. It is not the purpose for the training and education function to run all the programs by itself, but through networks.

The training and education function will interact and cooperate with public and private educational institutions and individual experts regardless of their host organisation.

Next steps

The first steps to be taken after the establishment of the Living Lab and the ICT Institute are crucial to successful operation in the future. Those steps should be concrete enough in order to convince the important stakeholders and partners, and broad enough to build a basis for future actions. The planning-related activities are thus not enough, as concrete results are expected.

Our proposition here is to mix both planning and concrete elements in the starting phase so that expectations will be met. In Table 5 an example of pre-starting phase and starting phase activities is given.

Table 5. The first phases of training and education.

Before the start	The first year	The second year
Do a study of the existing relevant education and training projects, programmes and institutions	Analysis of the gaps found in the study, the first program for the filling of a gap starts	At least four other programs for the filling of gaps starts
Study concerning the existing and future needs of the companies and organisations related to training and education of their workforce	Analysis of the needs; first tailored programs addressing the existing needs	Programs addressing the future needs of the companies
Developing the operational mode for the training and education functions (incl. the satellite model)	Execution of the operational mode	Ensuring the continuous operation; modifications to the mode if needed

4.3. Community Projects

Community projects form the interaction point between the Living Lab and the local communities. As the Living Lab focuses on business development, this aspect should be central in co-operation and other interaction with community projects.

Reaching the communities was emphasised in many discussions with the representatives of the stakeholders. Reaching communities was seen as a way of not merely educating and training the people in the communities but also creating tools and vehicles for alleviating poverty and creating sustainable means of livelihood in the communities. Here, this is expanded into developing the communities from the business development point of view through the looking glass of innovation.

Objectives

The objective of the community projects is to fill the gaps in the cluster development and introduce the results from other activities into the society. Without the community project aspect of the Living Lab, part of the potential benefits for the Province will not be harnessed. Community projects will bring the different activities of the Living Lab near to the everyday life of ordinary citizens, and increase the well-being of ordinary people.

In addition, the community projects can, together with innovative solutions, provide a test bed for international companies to test their products and services for markets in developing countries.

The needs of communities should be taken into account, and be integrated into community projects already in the planning phase.

Content

The community projects can have a training and education emphasis or an innovative solutions emphasis. Regardless of the emphasis, community projects can include training and education, and innovative solutions can be developed for the projects. The objective in each and every project should be to somehow support business development in the province.

We propose a test-bed concept as a key vehicle for the community projects. The aim is to develop a concept and an environment where multinational companies could use Limpopo and the Limpopo Living Lab as their test bed when creating products for developing markets. While any developing area is a potential test bed site, Limpopo has several advantages over other areas:

- the province has some experience with a similar type of collaboration, cf. the Mogalakwena i-community project
- the province is close to Gauteng, which offers a major advantage as Johannesburg is the hub for multinationals for sub-Saharan operations,
- the dual nature of the South African economy can be turned around and utilized; the first economy is present and is an attractor, which is not the case for most developing countries.

The test bed concept offers multinationals possibilities to come and test their products in an environment which offers not only the testing environment they need but also the infrastructure needed for testing. However, the concept needs to be developed so that it takes into account not only the needs of the multinationals but also the needs of the rural communities. For the rural communities the test bed concept will offer an opportunity to develop.

Attracting multinationals to come and test is somewhat different from attracting companies to come and make money. In test bed thinking it is relevant that a concept be well thoughtout and planned so that it makes it as easy as possible for a multinational company to come to Limpopo and test a product. In that sense the test bed concept is a service concept which

- attracts multinationals to Limpopo
- supports multinationals through the testing process
- gives communities possibilities to develop.

The indigenous knowledge systems (IKS) provide an area in which the communities have a central role and which provide a very promising area of livelihood for communities. Certain aspects of the IKS can also attract multinational companies to the province. Cooperation with universities, communities and businesses forms an important aspect in this regard. As numerous initiatives in this field are already taking place in the province and nationwide, interaction with these is needed, among other things in developing the concept further.

Training-and-education-related community projects offer clear benefits for the communities, as the skills level in the communities is increased. There have been many examples of the ICT training project in the communities (e.g. in the Mogalakwena i-community project), and those examples should be evaluated and experience from them gathered. On that basis new kinds of projects could be built and executed. In training-and-education-related programs the entrepreneurial skills development, as a part of the program, can offer possibilities for communities and people in communities to start their own businesses.

The role of existing organizations working already in this space is very much acknowledged. Especially the workings of LIBSA are of great importance and more detailed discussions on matching the activities of LIBSA together with those proposed here should be conducted. Our brief preliminary analysis shows that there is mutually beneficial and complementing roles for both LIBSA and the Living Lab, naturally working in close, confidential relationship.

Organization

The director of the community project function needs to have good relationships with and understanding of various stakeholder groups, since cooperation with various stakeholder groups plays a central role in the operation. Experience in working with communities together with

business experience would form a good combination. Social skills should also be emphasised here.

The director of the community project function will be responsible both for the strategy of the function and the ICT Institute, its networks with all relevant stakeholders as well as day-to-day operations. The director will report to the director of the Living Lab and be part of the executive group of the hub. There will be a working group which will assist the director in strategic planning.

In addition to the director, the operation may start with 1-2 full time people who each have an understanding of communities and a business background, as well as good connections to relevant stakeholders. The key to success lies partly in the networks that these people possess.

Thus, we see that the operation could be started and run with 2-3 professionals and one super-all-around assistant even though the scope of the operation is fairly extensive. It is not the purpose for the community project function to run all the programs by itself but through networks.

The community project function will interact and cooperate with public and private institutions and individual experts regardless of their host organisation.

Next Steps

The first steps to be taken after the establishment of the Living Lab are crucial for successful operation in the future. Those steps should be concrete enough in order to convince the important stakeholders and partners, and broad enough to build a basis for future actions. The planning-related activities are thus not enough, as concrete results are expected.

Our proposition here is to mix both planning and concrete elements in the starting phase so that expectations will be met. In Table 6 an example of pre-starting phase and starting phase activities is given.

Table 6. The first phases of community projects.

Before the start	The first year	The second year
Develop the test-bed concept	Test the test-bed concept	Execute the test-bed concept
Do a study concerning the existing and future needs of the selected communities; related to skills development, business potential and indigenous knowledge	Analysis of needs; first tailored projects addressing existing needs	Programs addressing the future needs of the communities
Develop the first training programs	Execution of the first training programmes; planning the next ones	Execution of the programmes; planning the next ones

4.4. The Innovative Solutions

Innovative Solutions function in the Living Lab represents the dynamo where the research at universities and other sources of new knowledge meet business development needs supported by public funding. In addition, the innovative concepts that arise from community projects or

indigenous knowledge systems are further cultivated here in a multiparty environment to viable and sustainable business and other ideas and innovations.

The central concept is the combination of innovative ideas, whether stemming from universities, businesses or communities, that are refined as complementary knowledge and experience are gathered from sources not available to the original innovator. It is the purpose of the innovative solutions to create a business development environment that can take these ideas further. The possible routes are many:

- to existing companies to be developed into products and services
- to universities where further research and other knowledge is gathered around an innovative idea
- to start-ups and incubators when the idea is best realised in a new company
- to the public sector when the innovation best serves the interests of the society and the public.

The ideas may stem from various sources. Traditionally, science parks seek ideas originating at universities but we propose that this section of the Living Lab seek and gather innovative business concepts from businesses and communities universities. The unique feature of the innovative solutions is that in it the knowledge from various sources (universities, businesses, communities) is pooled to provide a more sustainable business platform. Thus, starting from the needs of the companies and potential for development in the province, new innovative solutions will be created.

As the traditional way of operating is the "high-tech - high-innovation", we propose that a "low-tech - high-innovation" aspect be included. This is also happening in many other countries where parallel developments are taking place when high tech innovations are not available or are not producing enough. Also, low-tech (or rather "non-high-tech") businesses are much more common than high-tech businesses around which the traditional science parks were established.

One are very much worth considering here is the indigenous knowledge and its further cultivation for the benefit of the society. A path from community projects to innovative solutions and further to business development in this area is clearly visible. The use of ICT as a tool for, e.g., databases is one route to be considered. Cultural preservation is a further area where the use of ICT could prove to be beneficial.

Objectives

The objective of the innovative solutions activities is to enhance cluster development and thus the economic development of the province through knowledge creation, transfer and exploitation within the Province. This is done by encouraging and supporting companies to start to develop and utilise new applications and solutions in order to improve their operations and create potential for growth.

Further, the transfer of new knowledge from universities and its exploitation in businesses is enhanced. The emphasis here is on the cooperation between businesses and universities, but in some cases other parties are included (as in the case of indigenous knowledge, the communities have a central role as well as in other innovations stemming from the communities).

The innovative solutions activity is an important aspect of the Living Lab in attracting investment to the province. As skilled labour and an innovative environment are factors which encourage companies to relocate their operations to a region, the Innovative solutions approach while somewhat invisible, is a strong indication of the province's capability to renew itself. In

the longer run, science and technology will create a basis and an atmosphere for development and cooperation which in turn can also attract high technology related investments to the Province.

Content

A key activity area is the creation, transfer and exploitation of relevant knowledge. What is relevant should be defined on the basis of the needs of local companies, especially in the key economic clusters. The emphasis can vary from practical applications (technology) to high technology and science based ideas; from service needs (e.g. ICT) originating with communities to development projects related to indigenous knowledge.

ICT and logistics form inherently interesting areas for further development as they cut across fields that provide form, means and structures for all other clusters. The Living Lab should consider taking a special interest in developments in these two sectors. Logistics could even be developed within a sector which would have, in addition to the test-bed concept, great potential for attracting investment to the province.

As tourism, mining and agriculture can be seen as already existing clusters, and ICT and logistics as supporting clusters having potential for growth, one should also think of potential future growth clusters. In the case of Limpopo, indigenous knowledge could here be taken as a cluster that can form one of the basic economic clusters in the future. In the field of indigenous knowledge the cooperation with and between researchers, communities and companies plays an important role. Numerous activities and projects already exist that combine research and business activities in the field of indigenous knowledge. These could be developed further, and coordination and cooperation between different activities and their benefits can be increased.

The Cooperative activities between universities, research institutions and companies are a central element of the innovative solutions part of the Living Lab. The starting points here are the needs of the companies in the key economic clusters. The role of the universities and research institutions is to provide the relevant knowledge and expertise for the companies. The Living Lab thus acts as a match-maker and a catalyst for cooperation in generating novel innovations.

The relevant knowledge and expertise needed by the companies is not necessarily found in the local universities, and thus in that case one must reach outside the province to universities and research institutions in other parts of South Africa and abroad and also to companies with the required knowledge. For this purpose it is of utmost importance for the Living Lab to create connections to and networks with relevant institutions nationwide and worldwide.

Organization

The Innovative Solutions function is a living connector, a match-maker, a live hub. The key people in the unit ought to ideally have experience both in the industry and in the academic world, and have gained the respect of their peers in both worlds. Further, a broad education and/or wide experience is required; they should be not only "a jack of all trades" but also a master of at least two or three. One key ingredient is that the key people should have extensive, relevant and living networks that can be used to benefit the province and that they are willing to use them for that purpose. If the key personnel cannot effectively assign a most demanding and abstract task to the parties in the network, minimal benefit will occur.

The director should be a respected, senior professional with both academic and industrial experience, and should have a thorough understanding of rural communities and their challenges and possibilities. He/she should at the same time have excellent managerial skills as well as social and inter-personal skills, and be a visionary par excellence. In addition, a burning desire to work for the benefit of the province is needed. He/she will need an assistant and one junior colleague. The director will report to the CEO of the Living Lab.

The rest of the organization in the Innovative Solutions sector can be left to grow on a project basis; the primary task of the permanent staff is to generate multiparty projects that provide funding for the project-specific personnel.

The Innovative Solutions unit has a working group that will direct the strategy of the unit.

The networking and partnering possibilities provided through international association of science parks ought to be explored. However, in parallel one should create one-to-one or one-to-many relationships between the Limpopo Living Lab and other organizations that the Living Lab can benefit from and that have a genuine interest in working together with the Living Lab. These organizations ought to have expertise in the cluster areas relevant to the province.

Next Steps

The starting phase should be concrete enough to meet expectations and extensive enough to form the basis for future activities. In Table 7 is our proposal for the main activities during early phases of operation.

Table 7. The first phases of innovative solutions.

Before the start	The first year	The second year
Planning and building cooperation forums for key economic sectors + ICT and logistics with the representatives from companies and universities	Utilisation of the forums for project development and commitment of different partners; first projects initiated by forums to start	Ensuring the continuous and fluent operation of the forums; changing the mode if needed; constant project flow from the forums
Sectoral studies concerning existing and future development needs of companies	Analysis of the needs; first tailored projects addressing existing needs	Programs addressing the future needs of the companies
Establishing connections to potential partner organisations world wide	Activating the world-wide partner pool on a project basis; keeping the pool updated	Activating the world-wide partner pool on a project basis; keeping the pool updated
Planning flagship projects with forums and key companies (e.g. food security and safety, automation of mines)	Execution of the first flagship projects; planning the next ones	Execution of the flagship projects; planning the next ones
Planning the cooperation model related to indigenous knowledge	Coordinating the research and other activities related to indigenous knowledge; initiating new projects	Coordinating the research and other activities related to indigenous knowledge; initiating new projects

4.5. Facilities, Facility Management and Business Support Services

Business development is at the heart of the facility aspect of the Living Lab concept. The Living Lab offers high quality spaces for the companies. The space is flexible enough to be adjusted to different purposes. In addition to the high quality office space available for foreign companies and start-ups, the Living Lab can offer spaces that can be easily transformed, for example, into laboratories.

The facilities and the environment of the Living Lab create a platform for interaction and innovation. A central location and flexible connections to other parts of the country and outside the country are essential.

Facility management represents part of the support services offered to companies located in the Living Lab. Other support services include more business-related support services like lobby services, catering, security, secretarial services, accounting, advertising and ICT support services. These services are not offered by the Living Lab itself but by the network of companies that operate in the Living Lab.

From the facility point of view the Living Lab has at least two roles. The first is to make clear that the center of the Living Lab is only one of the locations where the Living Lab operates, although it is the administrative and partly also the operational center. The other units located throughout the Province are only operational units, and most of them are not permanent in nature. The second role is the attractor role. The Province has been lacking high-quality facilities for high-tech companies. In creating these kinds of facilities for the Living Lab, it is possible at the same time to build an environment that enhances innovation and development.

From the image and marketing point of view, it is important that the Living Lab be able to attract companies from other Provinces and abroad to move to its premises. It is also important to have local companies situated in the Living Lab. To have companies on the premises gives people the image that the Living Lab is not just something that government is doing, but that it can also offer something also to companies.

4.6. Foreign Direct Investments and the Limpopo Living Lab

Typically companies relocating their operations to a new location are in search of new markets, cost structure benefits or skilled labour and innovative environments. From these perspectives, the potential traditional FDI areas would be the well developed mining industry, especially various subcontractors and service providers to the mining houses. The other would be the agricultural sector, presently providing rather low added value to the province.

To this end, we propose two novel possibilities to attract foreign investments. The first one is to create an environment where multinational companies could use Limpopo and the Limpopo Living Lab as their test-bed when creating products for developing markets. While any developing area is a potential test-bed site, Limpopo has several advantages over other areas with regard to becoming also in this sense a true Living Lab. One obvious example is the mobile telecommunication industry that is now developing means to penetrate into the developing economies.

In this kind of set-ups, foreign companies are in need of a local interface between them and the communities. TIL or another organization could be such an interface organization. For the test-bed concept to be realized, it would need a properly created concept with strong emphasis on

various managerial and project skills together with knowledge of foreign business cultures that could also be developed under the LLL umbrella.

Another possibility for attracting foreign firms is the logistic position of the province in relation to Botswana, Zimbabwe, Mozambique and the rest of the Southern African countries. The continued development of the road infrastructure and the airport could be an attractive opportunity for logistics companies. This is especially attractive for two reasons: (i) most major firms use Johannesburg as their hub for doing business in sub-Saharan Africa, and (ii) the location of Polokwane combined with a considerably lower cost structure could be a lucrative location for a logistics operations hub that needs much space. Further, as the interest in South Africa both as a business and tourism magnet has increased tremendously in the past two years in the northern hemisphere, a long-haul budget airline would most probably be interested in looking at Polokwane as its "Johannesburg" airfield.

4.7. Institutional Framework .

The organizational structure of the Limpopo Living Lab should reflect both the objectives of the LLL as well as of the stakeholders. As these are many, the organizational structure of the LLL is not trivial. We propose below one possibility for the governing structure of the LLL. As is obvious below, changes in one part of the governing structure will affect other parts. Thus, one should consider this only as one alternative.

One of the key strategic questions in planning and developing a new entity or operation is the question of the process owner. Considering the discussion in the previous chapter related to the Business-University-Government -model, it would be natural for one of these parties to be the process owner.

If the Living Lab were to be constructed as a traditional science park, and its main task would be to enhance the collaboration between universities and government, then one of the universities would be a natural choice for the position. But as the concept covers many aspects other than the business-university collaboration, universities are not, perhaps, optimally positioned to assume the role. Neither is it necessarily in their interest for a variety of reasons.

If the Living Lab were to operate on behalf of a specific group of companies like the mining houses or the ICT companies, this group could take responsibility for running the Living Lab as is often the case in many business-driven science parks. But as the Living Lab has all the main economic clusters as its target groups added to the ICT and the logistical companies, it would be hard to find a group of companies that would be able to represent all of these different kinds of companies. In addition, at this point of the development work, the business sector would hardly be interested in taking charge, even in this respect, of the regional economic development.

Thus, this leaves us with only one choice for the process owner, the provincial government. Many issues support this:

- a. basic funding should come from the provincial government
- b. different departments of the provincial government have a key role in the proposed activities (e.g., the Dept. of Education, the Dept. of Economic Development, Environment and Tourism)
- c. the provincial government is responsible for or involved in many other development projects that should be linked to the Living Lab concept.

It can be argued that the provincial government has a central role as financier, motivator and information source in the development and operation of the Living Lab. Our recommendation is therefore that the process owner of the Living Lab should be the Provincial government.

Another question is the one that concerns which department or instance within the Provincial government should be the process owner. In the above discussion we already mentioned the central roles of the provincial government in this undertaking. While there are arguments to support several of the departments and parastatals becoming the process owner, we found most arguments to favour the Office of the Premier. It is the obvious office to be in charge of an undertaking that involves several departments, parastatals and other stakeholders. Further, it is neutral with respect to the departments and also has the executive powers vested in it.

In addition to the Office of the Premier, it is recommended that for strategic decision making an advisory board be formed. This board should include representatives of the strategic stakeholders of the Living Lab. These ought to include at least the following:

- universities
- representatives of both small and large companies
- SITA
- TIL
- LIBSA
- SEDA
- LimDev
- Dept. of Economic Development, Environment and Tourism
- Dept. of Education
- A representative of local government
- A representative of the Office of the Premier
- Dept of Local Government and Housing (representing the interests of municipalities) or alternatively (SALGA Limpopo Chapter)
- South African Local Government Association (SALGA) Limpopo Chapter
- Dept of Public Works (as the government property management agency)

SITA should be included as it has a key role in ICT infrastructure provision and development, and TIL as it is responsible for investment attraction activities. The Department of Economic Development, Environment and tourism should be included as it has a role in business development, LIBSA and LimDev as they have a central role in business development activities and the Department of Education as it has a central role in education. The representative of local government is also needed as the activities will take place at the local level.

In addition to strategic planning the advisory board will be responsible for at least the following:

- strategy work for the Limpopo Living Lab
- evaluation of the Living Lab (at least once a year)
- recommendation to the Office of the Premier concerning the continuation of funding for the Living Lab on the basis of the evaluation
- decisions concerning the bigger seed-funding applications.

The Living Lab as a concept is divided into four separate but related sectors which are responsible for the operational activities of the Living Lab. The institutional frameworks should be built in a manner that supports the operational level activities and at the same time allows enough freedom to execute the needed activities.

Consequently the light administration model for the Living Lab is recommended. The reasons behind this recommendation include the following:

- there already exist a number a projects/programmes in four sectors of the Living Lab → coordination will be one of the main tasks

- the new projects/programmes can be executed on a project basis either by the Living Lab (new persons recruited on a project basis) or by an outside instance (like LIBSA, USASA, universities, TIL)
- the capacity is created not only for the Living Lab but also for the partners in the network
- the network-based model enhances the commitment of the stakeholders and partners
- the network-based model allows flexibility and offers possibilities for rapid adoption of new ideas

The last point mentioned relates to the differing concepts of time of the parties involved. Consequently, in order to be able to respond to different needs at different speeds flexibility is needed, and flexibility can be achieved through light management and a project-based organisational model. It should be noted that while the above model is an oversimplification of various time concepts, failure to service these different expectations within the time frame may severely affect the commitment of the respective parties in the Limpopo Living Lab.

The light management alternative means that in addition to the Office of the Premier as the process owner and the board, a managing director is needed. The managing director will have the following tasks:

- overall responsibility for the activities that take place in the four sectors of the Living Lab and the ICT Institute.
- marketing of the Living Lab and the ICT Institute
- creating connections to national and international funding sources
- making decisions on preparatory and other small funding for projects and programs together with sectoral directors
- reporting to the board of directors

All four sectors will have working groups as advisory boards and one person that is responsible for the activities in that field of operation. The working groups for each sector will consist of persons from relevant organisations and companies. The tasks of these groups will include at least the following:

- initiating new projects
- making sure that all the relevant parties are included in the projects
- making sure that projects are in line with the objectives of the Living Lab
- supporting the activities of the managing director.

The sectoral directors will be responsible for the activities related to their sectors. Their tasks will include at least the following:

- initiating the projects
- coordinating
- marketing
- reporting to the managing director
- making decisions concerning the small funding applications together with the managing director
- discussing project and program initiatives with the working group.

It should be noticed that the tasks will depend on the sector. For example, in the case of the incubator function, the main task of the director in the beginning will be planning and building the incubator concept.

Our recommendation is that one of the existing parastatals take responsibility for the daily operation of the Living Lab. This way the administration-related costs will be cut down and the money spent on actual activities. The ideal parastatal would have operations that are in parallel and possibly even overlapping with the planned operations of the Living Lab. This would enable synergies between the parastatal and the Living Lab, thus enhancing mutual commitment and interest in it. For governing purposes, the parastatals should be chosen so that the provincial government has a certain level of decision-making power also within the parastatal. The Living Lab would also report directly to the Office of the Premier in addition to reporting to the parastatal. Trade and Investment Limpopo, a parastatal operating very much in the space of the proposed Limpopo Living Lab, would be a suitable candidate to give birth to, nurture and host the Living Lab.

In Figure 11 the organisational model of the Living Lab is described.

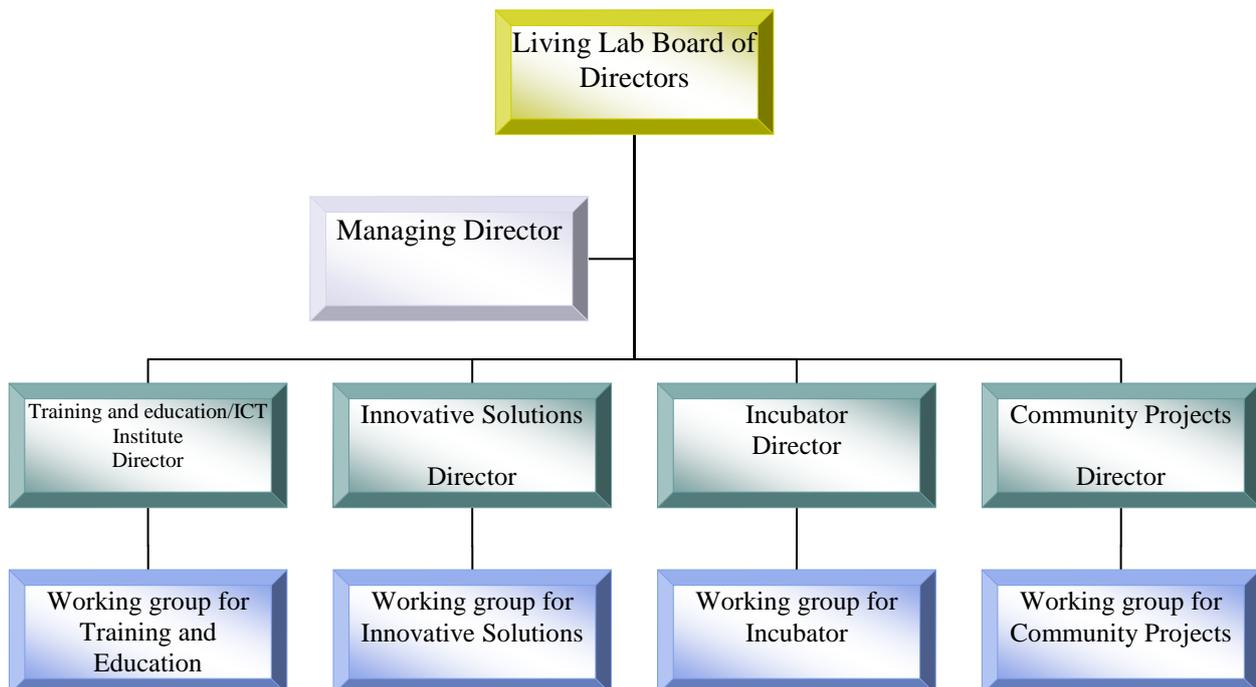


Figure 11. Organisational structure of the Living Lab.

The organisational structure of the ICT Institute will be discussed in a separate document in amore detailed fashion.

4.8. Funding

Earlier two basic principles for the funding have been mentioned. Firstly, the basic funding for the Living Lab and the ICT Institute will come from the provincial government. Secondly, each project and programme has its own funding, which in many cases will be gathered from multiple sources and often includes both public and private funding.

The basic government funding should cover the costs of the managing director, the sectoral directors and their assistants and managers, as well as administration and other overhead costs, marketing costs (incl. Web pages) and costs related to premises. This basic funding should be secured at least for five years. International experience indicates, however, that the initiation and coordination activities are difficult to fund from private or project-related sources. Thus it

is recommended that the government should be prepared to fund the basic activities for quite a long time.

As a financier, the provincial government should take an active role here. This means that operations of the Living Lab and the ICT Institute used to be evaluated at least on a yearly basis, and funding for the following year should be dependent on the results achieved during the previous year. The evaluation and monitoring system for the operations should be in place as the operations start. The board of directors is responsible for making decisions concerning the continuation of operations.

In addition to the basic funding, it is recommended that the Living Lab have a project fund for projects and programmes. The main contributor to this fund, at least in the beginning, should be the provincial government. This fund provides funding for the preparatory phases of the projects and programmes. During these preparatory phases many if not all the projects and programmes are expected to ensure funding for themselves from external sources such as various provincial and national government departments, development banks and international programmes.

For the funding there should be a transparent mechanism for applying and for evaluation of the applications. This requires application forms to be available on all the web pages, clear evaluation criteria for the applications and a transparent evaluation process for the applications. For the smaller sums decision about seed funding can be made by the managing director together with the responsible sectoral director. For larger sums the seed funding decision is to be made by the board of directors.

As mentioned earlier, projects and programmes will be funded from outside sources. By outside sources is meant here a wide range of potential funding sources ranging from the local to the international. In the following section the potential national and other funding sources are described.

National Funding Sources.

The following are some examples of the national funding sources available especially for start-ups and small businesses. Emphasis is placed on the sources suitable for the knowledge-intensive potential growth companies and for technology development.

SPII - Support Program for Industrial Innovation (www.spii.co.za) promotes development of technologically innovative products/processes that are commercially viable and internationally competitive. SPII is administered by the Industrial Development Corporation (IDC).

THRIP - Technology and Human Resources for Industry Program (www.nrf.ac.za/thrip) aims at improving the competitiveness of SA's industry by supporting research and development activities and enhancing the quality and quantity of appropriately skilled people. The cooperation with the HEIs and FETIs is emphasised together with special development activities targeted at SMMEs. The program is administered by the National Research Fund and is guided by an advisory board with representatives from various stakeholder groups.

SEDA Technology Programme⁴ (www.stp.org.za) supports technology and SMME development by developing innovative technology platforms. The services offered through this program include

⁴ As part of government's national strategy of consolidating small enterprise support interventions across different government departments and government agencies, the DTI has commenced its own process of streamlining its small enterprise support interventions. As part of this process, the DTI and the Department of Science and Technology (DST) have therefore agreed to transfer the GODISA Programme to the DTI. In addition, the DTI has agreed to merge its National Technology Transfer Centre (NTTC) and the Technology Advisory Centre (TAC) with the GODISA Trust, to create a national institution that will be

establishment of technology business centers (incl. incubators), offering assistance for incubator development, support services and advisory and consultancy services for instance creating and developing incubators. STP also manages a Technology Transfer Fund (TTF) that provides funding for small enterprises to acquire the necessary technology and technical support for effective technology transfer transactions.

Innovation Fund (www.innovationfund.ac.za) invests in near-market, technological innovations that lead to the establishment of viable start-ups and expansions of industrial sectors. The Innovation Fund has several funds including TAP, MITECH, The Seed Fund, The Patent Support Fund and The Patent Incentive Fund. TAP (The Technology Advancement Program) concentrates on the proof-of-concept phase in the technology development process, and MITECH supports the development of high-risk, market-driven technology platforms.

Technology for Women in Business (www.twib.co.za) aims at moving women in business from the periphery to the mainstream of the economy through the use of technology.

The DTI also has two funds: the **PII - Partners in Industrial Innovation - Fund** and the **Venture Fund**. More information about these can be acquired by contacting Dr Johannes Potgieter at the DTI (johanp@dti.pwv.gov.za).

The DST in turn has a fund called the **Lead Programmes Fund**. This fund is targeted at innovation action with international partners. More information can be acquired from Dr Neville Arendse (neville.arendse@dst.gov.za).

The DTI has a programme called GCINA under development. The programme concentrates on developing regional industrial strategies with support and mechanism. The programme will include concepts like techno hubs and living labs, and a regional development fund to fund these kinds of initiatives will be developed. The programme strategy is at a draft stage at the time of the writing of this report.

In the private sector there exist quite a lot of venture capital (VC) companies, but they are mainly focusing their operations on expanding businesses, not on early-stage firms. It has been estimated that only 1% of the VC funding goes to early-stage development. As a result, some of the incubators are having problems in getting financing for companies in the incubator.

International Funding Sources

Below are some examples of major international funding sources available especially for concept development.

The European Union has several programmes which offer potential funding for the LLL concept and its projects. Here are some examples.

- The European Programme for the Reconstruction and Development of South Africa (EPRD) offers funding for projects related to social affairs, training, education, public management, human rights and cooperation and development
- The European Investment Bank (EIB) offers loans for projects realised in public and private sectors in South Africa. Domains concerned include transport, telecommunications, tourism, energy, environment and industry.

responsible for a broad array of business and technology incubation and technology transfer services and support. The merger of the GODISA Trust and its ten centres with the NTTTC and TAC, and the incorporation of the DTI's incubators has consequently resulted in the creation of the SEDA Technology Programme (stp).

- EIB has an instrument called Investment Facility which provides various forms of risk-sharing financing instruments to most sectors of the economy for projects which are economically, financially, technically and environmentally viable. This includes projects in the infrastructure sector, where possible those which have been initiated by the private sector and regional initiatives. In addition, the investment facility supports the financial sector through debt finance, guarantees, equity-type financing, and by acting as an investor in private equity funds. (<http://www.eib.europa.eu>)

The World Bank's work in South Africa is focused on helping to reduce the apartheid legacy of poverty and inequality. The Bank focuses on its role of "knowledge partner" by providing expertise and knowledge from international experts from the private sector, academia, the public sector, and non-government organizations from all over the world, as well as from within the Bank. The World Bank is particularly active in economic research and technical assistance in the areas which include, among others, private sector development, industry and trade.

The African Development Bank's services include the principal loan terms and conditions offered by the African Development Bank to regional member countries or public entities that benefit from a state guarantee. (www.afdb.org)

The Development Bank of Southern Africa (DBSA) is southern Africa's premier infrastructure development finance institution. It acts a triple role as financier, adviseer and development partner. The Development Fund of DBSA aims at maximising the impact of development finance by mobilising and providing grant funding to address human, institutional and financial constraints on rural and urban development, thereby promoting efficient and effective service delivery and local economic development.

DBSA has a development fund that can take part in various initiatives. It seeks to address human, institutional and financial constraints on rural and urban development, and aims to thereby promote service delivery and local economic development. The funds are aimed at capacity building funding through grants, development credits and other financial instruments. In addition, the development fund has soft instruments available such as expert consulting and development facilitation.

One DBSA instrument is the possibility to take equity in infrastructure development which in practise means investment in the development. DBSA also has a quite innovative internal training program on innovativeness and entrepreneurship that could be utilized.

While DBSA decisions are made on a case-by-case basis, the areas that repeatedly come up as areas where it invests and which it supports include education and capacity building thus making the bank a potential financier for the Limpopo Living Lab programs and initiatives (www.dbsa.org).

Other Sources

The Provincial government can also fund individual projects and programmes but that is always separate funding from the basic funding. Donor funding can be applied for from companies and from foreign governments. Our recommendation is that donor funding should be channelled into actual activities (projects and programmes), due to e.g. the following arguments:

- in the case of companies it allows many companies to fund at the same time as they can fund separate projects or programmes
- for the donors the input/output -ratio should be bigger as some of the overhead expenses are taken care of by the Living Lab

- the directors of the Living Lab can concentrate on actual operation as they do not have to worry about getting donor funding for their operations.

As mentioned earlier, companies and organisations participating in the projects and programmes should pay at least a nominal fee for their participation. When companies pay something that increases their commitment to the projects and programmes. Of course in some cases it is justified to organise seminars and workshops in which the companies can participate for free. But in these cases something else, like knowledge, initial commitment or opinions can be expected from the participating companies.

5. FEASIBILITY OF THE CONCEPT

The proposed concept of The Limpopo Living Lab is compatible with the current provincial and national development policies. It contains views, proposals and interests of the various stakeholders interviewed during the feasibility study. The concept starts from the traditional science park/technology center idea but expands that to include various aspects of the civil society to provide a comprehensive development frame and content.

The intended organizational structure takes into account the different stakeholders both in the private, public and third (NGOs) sector. It also relies on the possibility of a light administrative structure that we propose would be carried out by the Living Lab being part of a parastatal while reporting also to the Department of Economic Development, Environment and Tourism. The Office of the Premier should be able to nominate its representatives to the board and working groups of the Limpopo Living Lab.

The proposed funding structure utilizes both national and provincial public sources but also paves a path toward increased private funding in those areas where it is feasible. The starting point is a lean management model to make the start-up possible. The growth of the Living Lab is to evolve organically through projects and programs that are need-based. The concept lends itself to international collaboration and consulting as an innovative regional development scheme.

5.1. Feasibility of the Incubator Function

Content and General Policy Framework

The purpose and content of the hub is a direct realization of both national and provincial policies aimed at enhancing entrepreneurship in the nation and in the province. It enhances the general goals of BEE as well as the PGDS goals of retaining the educated and skilled workforce in the province. Through its strong emphasis on creating small businesses from various possibilities of the indigenous knowledge system, it supports the national policy goals of benefitting from the indigenous knowledge.

Content and Aims of the Incubator

The goals of the incubator are in line with the objectives and indicators for economic growth, sustainable job creation, innovation and competitiveness in the province. It should be noted that unlike traditional incubator models, the one proposed also has impacts on and implications for poverty reduction. Further, as indicated in Table 8 below, the objectives of the incubator contribute directly to the overall objectives of the Limpopo Living Lab.

Table 8. The realisation of the objectives in incubation.

THE INCUBATOR	Retaining the educated workforce	Attracting investments	Cluster development through knowledge creation, transfer and exploitation	Collaboration between business, universities, government and civil society	Job creation	Fostering entrepreneurship
Role	Contributes	Supports	Contributes	Supports	Contributes	Contributes
Content	providing business development support for experts returning to Limpopo	Attracting out-of-province people and investments to start-ups and SMMEs	Enhances the knowledge transfer from universities to business through incubator-concept	Supports the cooperation between businesses, universities and civil society	Creates new jobs by supporting the creation of new companies	provides business creation and development support
Indicators	Number of university graduates and other educated or skilled people working in the clusters	Out-of-province people and investments in start-ups (VC, national government support, firms) Start-ups and SMMEs bought by out-of-province companies	Number of start-ups and SMMEs servicing the larger cluster firms; number of cluster networks that start-ups and SMMEs belong to.	Number of university-based start-ups; number of projects start-ups and involved with universities; number of university-business networks and forums SMMEs and start-ups are part of.	Number of new jobs created	Number of new companies

Benchmarks

The basic model of the incubator follows that of most incubators in the world. While there are differences in the emphases of the incubators, the basic model is more or less the same, as the basic needs of start-ups are similar across the globe.

The emphasis in the proposed incubator is on the quality of the key personnel and their networks. There is ample evidence from incubators in the northern hemisphere that these two aspects are the main factors for success. The converse is also true: if the key people are not properly suited professionals with adequate networks, the incubator will fail in reaching its goals, or at most have only moderate success.

The province-specific feature of the incubator is the inclusion of the indigenous knowledge systems and community projects in the base from which companies are created. While novel in format, there are many examples where low-tech innovations have provided very useful and sustainable technologies and small businesses which benefit rural and developing areas in developing countries as well as in more developed nations.

Funding

As the incubator fits very well into the general national policy frame, the public funding channels are open to it. Further, as it has a component (the indigenous knowledge) that is very much in the focus of national policies but is absent in current incubator models in the nation, and as it is of such a nature that it also raises interest in other than of business development policies, the prospects of attracting funding for this pilot effort are very good.

Business incubators are not self-supporting even in the long run. We know of a handful of private incubators that were successful around the year 2000 but which have now all folded. Public support is necessary for running an incubator. The public sector will receive its benefits through individual and company taxes, increased buying power, increased GDP and further development of the province.

Stakeholders

The incubator as presented speaks to the interests and fulfills the needs of many stakeholders as we understood them from the interviews.

Universities, and research and educational institutions. For the universities and other related institutions the incubator provides a potential route for technologies and other research results to be commercialized and to benefit the society. These organizations also carry out extensive community projects and other civil society actions, and the incubator may be used as a vehicle to create small, local businesses as a result of these actions.

DTI, DST and their subunits. The relevant departments in the national government are the DST and the DTI and their subunits and agencies. The proposed incubator model fits in well with the available financial instruments and incubator development schemes at the DTI. The DST on the other hand has schemes for commercializing research that can be utilized in university-based start-up development.

The Provincial Government. The incubator supports the PGDS.

Financial institutions. The incubator will feed screened and trained potential clients to the financial institutions for whom that represents their main interest in involving themselves with the project. It should be feasible to construct working models where banks with their seed funds and other early-stage instruments would be more involved, either operationally or financially.

Business development organizations. The working model of the incubator is such that it involves both private and public organizations in the development of start-ups by subcontracting part of the services from them. LIBSA as the main public business development organization should be engaged in extensive talks concerning the further development of the incubator concept in order to optimize the complementary and supporting roles of the two.

The Innovation Hub and other SA incubators and their networks. The incubator should engage itself with other incubators as soon as possible and already learn from them in the concept design phase. The Limpopo Living Lab Incubator will complement well the existing networks and incubator profiles.

The Meraka Institute and CSIR. These two organizations should be engaged in the incubator as advisors from the very beginning.

Companies. The incubator provides an interesting window for the larger companies to see what is developing in the province. They can be involved as advisors or potential customers both of the firms and the incubator.

5.2. Feasibility of the Training and Education Function

Content and General Policy Framework

The purpose and content of the Living Lab is a direct realization of both national and provincial policies aimed at enhancing capacity-building and job creation. It enhances the general goals of BEE as well as the PGDS goals of retaining the educated and skilled workforce in the province. Through its strong emphasis on ICT and management-related training it supports skills development and capacity building in the province.

Table 9. The realisation of the objectives in training and education.

TRAINING AND EDUCATION	Limpopo Living Lab objective					
	Retaining the educated workforce	Attracting investments	Cluster development through knowledge creation, transfer and exploitation	Collaboration between business, universities, government and civil society	Job creation	Fostering entrepreneurship
Role	Contributes	Supports	Contributes	Contributes	Supports	Contributes
Content	Educates the youth and re-educates the old for the needs of the companies	Creates a pool of well-educated and skilled workforce members	Creates a knowledge, skills and capabilities base in the Province; Supports knowledge transfer between universities and companies, and between universities	Supports the collaboration between businesses, educational institutions and communities	By educating people gives them better opportunities to find jobs	Provides entrepreneurial education and training
Indicators	Number of the educated young and re-educated old	Educated persons employed by new foreign companies	Number of new training and education programs; number of programs planned for the purposes of companies; number of programs using capabilities from at least two universities	Number of community-based training programs	Number of educated and trained persons who have found job	Number of people having taken part in entrepreneurial training; number of those having taken part in training and established a company

Content and Aims of the Training and Education Function

The goals of the training and education function are in line with the objectives and indicators for economic growth, sustainable job creation, innovation and competitiveness in the province. It should be noted that unlike traditional models, the one proposed also has impacts on and implications for poverty reduction. Further, as indicated in Table 9 below, the objectives of the training and education function contribute directly to the overall objectives of the Limpopo Living Lab.

Benchmarks

The basic model of the training and education function follows the principles used in many institutions for extension studies. These institutions provide training and education complementary to that given by the educational institutions and their degree programs.

The emphasis in the proposed training and education function is on need-based training and cooperation with existing educational institutions. The need basis is the key element in the success of the many institutions providing complementary training. Whereas typical educational institutions concentrate on degree training which cannot change at the same pace as the needs of companies, complementary training institutions can change and keep up with the needs of the companies.

The province-specific feature of the training and education function is the inclusion of community projects. While novel in format, there are many examples of such efforts where training can benefit communities, especially if combined with business development.

Funding

As the training and education function fits in very well with the general national policy framework related to capacity building, public funding channels are open to it. In the case of community projects, there is the potential for donor funding. The tailor-made programs will be funded by the customer.

Depending on the emphasis of the training and education function, it can be self-supporting in the long run. If it concentrates only on programs which are totally funded by companies or donor funding, it is possible to reach self-sustainability by a definite point in time.

Stakeholders

The training and education function as presented here speaks to the interests and needs of many stakeholders as we understood them from the interviews.

Universities and other educational institutions. For the universities and other educational institutions the training and education function provides opportunities for cooperation with companies, communities and other educational institutions. The educational institutions cannot by themselves fill all the gaps or answer all the needs, and thus the Living Lab offers relief in the current situation.

Companies. Companies can be integrated into the training and education function in two ways. First, they can form the important customer group, and second, they can provide expertise for the training and education programs.

DTI, DOC, DOE and their subunits. The relevant departments in the national government are the DOC, DOE and the DTI and their subunits and agencies. Through the DTI and its subunits there exists the potential for applying for funding for business development-emphasised programs.

The Provincial Government. The training and education function supports the PGDS.

The Meraka Institute and CSIR. These two organizations should be engaged in the training and education function and the ICT Institute as advisors from the very beginning.

Communities. The needs of the communities should be the starting point in the community-based training and education programs. The communities should also be integrated into the networks built around the function.

Donors. Donors can be integrated into the community-based training and education programs.

5.3. Feasibility of the Community Project Function

Content and General Policy Framework

The purpose and content of the Living Lab is a direct realization of both national and provincial policies aimed at enhancing capacity building and job creation. It enhances the general goals of BEE as well as the PGDS goals of job and wealth creation. Poverty alleviation will also be addressed through the community project function.

Content and Aims of the Community Projects Function

The goals of the community project function are in line with the objectives and indicators for economic growth, sustainable job creation, innovation and competitiveness in the province. It should be noted here that unlike many other community projects, the community projects also address many issues other than poverty reduction and job creation. Further, as indicated in Table 10 below, the objectives of the community project function contribute directly to the overall objectives of the Limpopo Living Lab.

Benchmarks

The logic of the community projects function as described here is not in accordance with traditional community projects, which are mainly based on donor activities. Here a more transparent win-win situation is being created.

Similar kinds of set-ups can be found in other parts of the world; although they generally occur more on an ad-hoc basis and lack a systematic organisation of testing activities. International companies using communities for testing purposes could benefit from the "organised testing laboratory" -concept.

The community aspect here goes beyond even the test-bed thinking by expanding it to include situations in which the knowledge possessed by communities is regarded as valuable for research

and development purposes. There are many activities taking place in South Africa and in other parts of the world where similar kinds of challenges need to be faced when building concepts for indigenous knowledge systems.

In traditional community projects the involvement of many different stakeholders is not usual. In this case the concept is based on the cooperation model existing between businesses, universities, government and communities.

Table 10. The realisation of the objectives in community projects.

COMMUNITY PROJECTS	Limpopo Living Lab objective					
	Retaining the educated workforce	Attracting investments	Cluster development through knowledge creation, transfer and exploitation	Collaboration between business, universities, government and civil society	Job creation	Fostering entrepreneurship
Role	Supports	Contributes	Contributes	Contributes	Contributes	Contributes
Content	Creates a platform for re-education of the old and education of the young for those fields needed by the companies	Creates a test-bed concept for attracting investments	Develops a new model for creation and exploitation of indigenous knowledge in communities in a way that benefits the communities	Forms a channel leveraging results from other activities and other parties to benefit the civil society	Creates skills and capabilities for people to find jobs or self-employ themselves	Provides training and education together with skills and capabilities which enhance entrepreneurial skills.
Indicator	Number of young and old trained or educated in the communities	Number of companies using test-bed concept	Number of development projects related to indigenous knowledge	Number of leverage activities	Number of employed who have been involved with projects	Number of people who have gotten entrepreneurial-related training

Funding

In community projects donor funding is often used as an important source for funding. There will surely be donor funding available also for community projects, but this will also be extended more in a business-like direction. Thus companies will fund the projects, but they will pay for the services they get.

The projects related to indigenous knowledge systems should be funded for example, by a combination of national research funding and company funding. Of course the funding model will vary here from project to project.

The nature of community projects offers possibilities for this function to be self-sustainable in future. This means that the Living Lab general functions which are not directly related to the projects will have to be funded somehow through the projects.

As in the case of training and education, here also the funding of the basic functions of the community project function in the Living Lab are to be funded by the provincial government. Funds should also be available in the Living Lab to be used for the development of projects.

Stakeholders

The community project function as presented speaks to the interests and fulfills the needs of many stakeholders as we understood them from the interviews.

Universities and other educational and research institutions. For the universities and other educational and research institutions the community function provides opportunities for cooperation with companies, communities and other educational institutions. The educational institutions cannot by themselves fill all the gaps and answer all the needs of the communities, and thus the Living Lab offers relief in the current situation.

Companies. Companies can be integrated into the community project function in two ways. First, they can be the customers of the test-bed function, and second, they can be partners in indigenous knowledge-related projects.

DTI, DST, DOE, DOC and their subunits. The relevant departments in the national government are the DOC, DOE, DOC and the DTI and their subunits and agencies. Through the DTI and its subunits there is potential for applying for funding for business-development-emphasised and technology-transfer-related programs.

The Provincial Government. The training and education function supports the PGDS.

The Meraka Institute and CSIR. These two organizations should be engaged in the community project function as advisors from the very beginning.

Communities. The needs of the communities should be the starting point in the community projects. The communities should also be integrated into the networks built around the function.

Donors. Donors can be integrated into the community programs.

5.4. Feasibility of the Innovative Solutions Function

Content and General Policy Framework

The content of the innovative solutions function is at the core of the economic development policies of the nation: on one side it is in the core of innovation and R&D policies that aim at exploiting and transferring research results to the benefit of the nation. On the other side, the approach is deeply rooted in community-level development where poverty reduction is an aim together with bridging the gap between first and second economies.

Content and Aims of the Innovative Solutions Function

The goals of the innovative solutions function are in line with the objectives and indicators for economic growth, innovation and competitiveness in the province. The proposed model has been created to also have impacts and implications with respect to poverty reduction. As indicated in

Table 11 below, the objectives of the innovative solutions function contribute directly to the overall objectives of the Limpopo Living Lab.

Table 11. The realisation of objectives in innovative solutions.

INNOVATIVE		Limpopo Living Lab objective				
SOLUTIONS	Retaining the educated workforce	Attracting investments	Cluster development through knowledge creation, transfer and exploitation	Collaboration between business, universities, government and civil society	Job creation	Fostering entrepreneurship
Role	Supports	Contributes	Contributes	Contributes	Supports	Contributes
Content	Develops job opportunities for skilled people in development projects	Creates an atmosphere of advancement and buzz	Initiates and develops concrete development projects for technology applications and solutions needed by companies	Creates a forum for collaboration and project initiation between businesses and universities	Develops job opportunities in development projects	Creates a basis for new business development
Indicators	Number of jobs created; number of out-of-province educated people in these jobs	Number of out-of-province firms or universities working with Limpopo universities, firms or communities on development projects	Number of development projects between firms and universities; number of businesses realised from community innovation	Number of development projects where any two of the following are involved: companies, universities, government, communities and the civil society	Number of jobs created	Number of spin-offs from the projects

Benchmarks

The model for the innovative solutions function is based on activities that are carried out in many regions to enhance regional development. In those models from Cambridge (UK) to Tampere (Finland), from Leuven (Belgium) to Stockholm (Sweden), mechanisms and vehicles to enhance university-industry collaboration have been created for the benefit of the region and the nation. More recently, models that also include social innovations have been incorporated into these originally purely technological innovation vehicles. Thus, that part of the Living Lab has its peers world wide.

While in most models the universities stand as the sole source for novel innovation, we have extended that aspect end to also allow innovative ideas to stem from and be further developed in companies and in communities. While the innovation base in the two extended options differs

from that at universities for high tech, it provides a different kind of basis for innovation in the non-high-tech space. While there are few examples how this kind of enhancement works, the potential is significant in the province. Also, other than high-tech innovations should be included in the model because the R&D base at both universities and companies does not merit the establishment of a Living Lab kind of construction, let alone a typical science park.

Funding

As the innovative solutions activity fits in very well with the general national policy framework, public funding channels are open to it. Further, as it has a component (inclusion of the community-initiated non-high-tech innovations and the indigenous knowledge system as a base for innovation) that is very much in the focus of national policies but is absent in current structured hub/center-type models in the nation, possibilities to attract funding for this pilot project are very good.

It is agreed in world trade forums that businesses may receive government subsidies for their R&D. Thus, there is both political motivation and the possibility to fund R&D. While the national government typically funds operations on a project basis, the provincial government can single out province-specific tasks that can receive separate, ear-marked funding. While certain aspects of the innovative solutions activity may become self-supportive in the long run (such as coordinating collaborative university-industry projects funded in part by the national government) there are elements that need subsequent support from public funds. It may be worth considering the creations of provincial development programs that would target certain areas.

While the real estate business of science parks is typically a profit-making business, the regional development activities, like the innovative solutions activity, never are. In those set-ups where they are carried out by a single organization, some of the profits are often channeled off to development projects. This kind of set-up may create a governance conflict, as it is then the real estate business that decides on what development to fund and what not to fund, and not a provincial development agency or government department.

Stakeholders

The innovative solutions function as presented speaks to the interests and fulfills the needs of many stakeholders as we understood them from the interviews.

Universities. The proposed concept of the innovative solutions function provides universities with possibilities and gives them a vehicle for engaging the private sector in dialogue and research collaboration beyond the scope of present activities.

Communities. Innovative solutions activities reach into communities. If carried out properly with mutual respect and in serving mutual needs, the mechanism may provide sustainable solutions for small business development and in some cases enhance community participation and indigenous systems-based knowledge to support the growth of operations and companies.

DTI, DST and their subunits. The relevant departments in the national government are the DST and the DTI and their subunits and agencies. The proposed model fits in well with the available financial instruments and innovation development schemes at the DTI. The DST on the other hand has schemes for commercializing research.

The Provincial Government. The innovative solutions function supports the PGDS.

The Meraka Institute, CSIR, and the Innovation Hub. These organizations should be engaged in the Living Lab/Innovative Solutions program as advisors from the very beginning.

Companies. While the set-up is very promising for companies in the province, the needs and interests of the companies should to be discussed with them, as this feasibility study did not include them but only a random sample of firms. The innovative solutions function should start its operations on the basis of the needs of companies. That is the true and the most essential need and getting that need fulfilled is the most sustainable route to continued operation.

6. COST-BENEFIT ANALYSIS

In this chapter, an indicative cost-benefit analysis of the Living Lab is presented. The discussion here concerns only the Living Lab. The ICT Institute is discussed in a separate document.

It should be noted that many of the figures to be presented are only rough estimates. Thus, the analysis here is only indicative and aims at giving primarily a general picture about the quantitative implications of the Living Lab.

In the following, the costs of the Living Lab will first be estimated and thereafter the benefits will be discussed.

6.1. Costs

The costs are separated here into six groups: costs related to premises, personnel costs, administration costs, marketing costs, costs related to additional services and seed funding. These operational costs are presented below in Table 12.

It is recommended that the premises should be rented, at least in the beginning, to ensure a fast take-off for the Living Lab. Here are some requirements related to the premises:

- central location and easy access from various parts of the province
- flexibility (potential to transform the premises for different purposes)
- potential for growth in the vicinity (possibility for foreign companies to build their own buildings)
- high quality office space
- proximity to major highways, university/-ies, an airport

In the beginning, there will be a need for office space for the directors and their assistants together with office space required for incubator companies⁵. Access to boardrooms will also be needed. The training and education function would also need some space for training purposes. All together the needed space during the first year would be around 430 sq.m. As the operations (more incubation companies, projects etc.) may expand during subsequent years, rental costs will probably increase. In the beginning there might be a need for renovating the premises, and so renovation-related costs are included in the premises costs for the first year.

A central location and easy access means that the ideal location for the premises would be in or in the vicinity of Polokwane near the N1 and with good connections to the airport.

The personnel costs include the salaries and salary related costs of a managing director, four sectoral directors, five managers and their necessary assistants. This also includes the costs of modern communication devices (computers, phones and mobile phones) and connections. It is recommended that the management of the Living Lab be as light as possible, not only in the beginning but also when operations expand during the coming years. This means that the management team will not increase during those years.

⁵ It should be noted that the incubator companies also pay for premises, so there will be some income from the premises, but as that is not significant, the income is not included in the figures here.

The administration costs include, for example, accounting, invoicing, auditing and the costs related to secretarial services.

The marketing costs cover the Web-page-related costs, travelling costs, brochures and other marketing material costs. In the beginning these will be slightly higher due mainly to web-page design costs and other initial marketing efforts.

Equipment costs cover computers, printers and other office equipment. In this category is also included office materials (like paper), furniture and environment-related costs. Added to these costs are also the costs related to computerising two classrooms for training purposes.

The additional services include, for example, Internet connections as well as security and catering costs. These costs also cover other types of costs such as costs related to surveys. These costs should stay quite constant throughout the operation.

The project`s funding-related costs should stay quite stable throughout the operation.

Table 12. Operational costs.

COSTS	The first year	The second year	The third year	Total
Premises	250 000	235 000	270 000	755 000
Personnel	4 400 000	4 500 000	4 700 000	13 600 000
Administration	350 000	320 000	330 000	1 000 000
Marketing	700 000	600 000	650 000	1 950 000
Additional services	500 000	550 000	570 000	1 620 000
Equipment	700 000	300 000	300 000	1 300 00
Project funding	1 000 000	3 000 000	2 000 000	6 000 000
Total	7 900 000	9 505 000	8 820 000	<u>26 225 000</u>

6.2. Benefits

The discussion regarding related benefits concerns primarily the quantitative benefits of the Living Lab. The inherent challenge in this calculation lies in the intertwined nature of the results and in the time span within which the results are to be realised. As in all policy-related issues and especially in business development, there is always a question concerning what the immediate result of an action is and what would have happened if no action had been taken. The underlying reason is simply that these systems are not isolated, but part are of a developing society.

One option for presenting the benefits would have been to convert the benefits into rands. But as the insecurity issues will increase substantially in this process, we decided to deal with the output numbers.

The benefit items mentioned in Table 13 can also be used as evaluation criteria for the Living Lab. For this purpose these should be divided between the four sectors of the Living Lab.

It should be noted that the benefits indicated in Table 13 are direct benefits generated by the Living Lab. The indirect benefits will be many times these. One example of the indirect benefits could be indirect job creation for service companies serving the new companies.

Table 13. Benefits of the Living Lab.

BENEFITS	Year 1	Year 2	Year 3	Total
Jobs created				
for new companies	50	150	300	500
for existing companies	50	150	300	500
for new foreign companies	10	100	300	410
for projects/programmes	50	150	200	400
Number of new companies established				
knowledge-intensive growth companies	3	5	8	16
other	25	50	75	150
New BUG-C networks established	3	1	0	4
New innovative solutions projects	5	10	30	45
Number of educated younger persons	100	300	1000	1400
Number of re-educated older persons	100	200	600	900
New community projects				
test-bed projects	3	5	10	18
other community projects	10	20	40	70

During the first years, most of the projects and activities will still be at the planning stage, and thus the benefits will be realised later on. During the first three years the operations should stabilise at a certain level, and the new operational modes and activities should remain under consideration.

The cost described earlier is based on the minimal organisation plan for the Living Lab. This kind of concept can be feasible in the beginning of the operations, but in the long term the extent of the operation should be reconsidered. It is, of course, possible to start with a more extensive organisational structure and more extensive operations, and also thereby have the potential for reaching greater volumes. But as the Living Lab represents a new type of operation in the Province, our recommendation is to start small and prepare for growth.

6.3. Cost-Benefit

As mentioned above the organisational structure presented provides minimal organisation for the Living Lab. Thus the benefits reaped can be regarded as being limited if the size of the province and its potential are taken into account. However, our recommendation is to start small and learn from experience before expanding the volume of the operations.

If one looks at core areas of the concept and the benefit provided in these areas (i.e. the number of companies, the number of new innovative solutions, the number of test-bed community projects and the number of educated young persons), the numbers can be seen as modest. The modesty in numbers can, however, be justified by the newness of many of these

operations. For example, the incubation activities targeted at knowledge-intensive growth companies are fairly new. Also, the networked nature of the undertaking that is necessary for results, typically takes years to be before becoming fully operational.

From the point of view of the objectives of the Limpopo Living Lab, the benefits presented in relation to the costs involved can be seen as fairly reasonable. The fact that similar types of projects already exist and that there is experience related to some of the aspects of LLL, offers potential for reaping greater results from these areas and provides opportunities for developing new areas.

7. LIGHT SWOT ANALYSIS

In this chapter, a light analysis of strengths, weaknesses, opportunities and threats related to the proposed Limpopo Living Lab concept are presented.

<p>STRENGTHS</p> <ul style="list-style-type: none"> ▪ Government commitment to the Limpopo Living Lab through the LGDS ▪ University commitment to the concept of the Living Lab ▪ Limpopo's strong mining sector and potential for tourism and agriculture ▪ Limpopo's unique geographical location among the provinces ▪ Experience with similar activities (e.g. HP i-Community Center, Wireless Village, Digital Doorways) ▪ Large pool of matriculation graduates in science and maths, hence potential ▪ Huge development potential in key economic clusters and ICT ▪ Enabling combination of developed areas and developing rural areas ▪ Number of already existing projects and activities in the area 	<p>WEAKNESSES</p> <ul style="list-style-type: none"> ▪ Limited experience in many-party development activities and the kind of networked modes of cooperation that cross boundaries and seek mutual benefits between public, private and third sector ▪ Poor ICT infrastructure ▪ Low level of educated work force and brain drain out of the province ▪ Almost non-existent ICT sector ▪ Low value added to the province by key clusters ▪ Number of already existing projects and activities in the area ▪ Relative inexperience in cluster-based regional development
<p>OPPORTUNITIES</p> <ul style="list-style-type: none"> ▪ Creation of a unique concept and model that benefits not only the province, but the whole country ▪ Development of the key economic clusters up to the next level ▪ Increased cooperation between BUG-C parties ▪ Brain drain stopped and reversed ▪ Increased skills level for the benefit of the companies and the people ▪ Accelerated development and poverty reduction in rural communities 	<p>THREATS</p> <ul style="list-style-type: none"> • Slow ICT infrastructure development hinders activities • The networked mode of operations between public, private and the third sector will be slow in developing • Commitment of businesses will be low • Bureaucracy slows the development activities, and motivation of key stakeholders decreases • No long term funding available

As a short analysis of the above, it can be said that the strengths and the opportunities are greater than the weaknesses and threats. The threats and weaknesses can, however, hinder or slow the development and success of the concept if they are neglected. For example, if the ICT infrastructure is not improved, many of the potential opportunities will not be harnessed. Another major issue is the success of the networked mode of operation between public, private

and third (NGO) sectors, and subsequent generation of social capital in the networks. All in all it can be argued that if the weaknesses remain and the threats materialise, the effects of the concept cannot be harnessed to the extent expected.

The number of already existing projects and activities (e.g. community projects, training and education programs) in the area was mentioned under both the strengths and in weaknesses headings. This can be a strength, as there clearly is experience of similar types of activities, but it can also be a weakness if the projects stay separate and no real interaction is created between them.

The slow ICT-infrastructure development can create difficulties in executing some of the activities of the Living Lab (e.g. community projects), but it can turn the motivation for development and change into de-motivation. Thus, it is of utmost importance for these development processes to be parallel processes supporting each other.

Limited experience with knowledge-economy-based operation modes was mentioned as a weakness. By this we mean that as with the knowledge economy, the key issues are centered around networks of trust and knowledge sharing, and this should also be taken as a guiding principles, in the operations. If not, it can be difficult to reach all the potential benefits the concept could bring with it.

The commitment of all the BUG-C parties is a relevant prerequisite for the success of the concept. The commitment is clear from the government side, and the universities have expressed their interest in the concept. One concern we have is related to the commitment of the businesses. It seems to be that for the time being the commitment from the business side is somewhat unclear.

If successful, the concept will not only benefit businesses and advance economic development in the province, it can also produce benefits that help the society at large, and can even boost the social development of the whole province. In addition, it can create business opportunities for the province, if the concept is productized and exported to other regions.

Table 14. Risk analysis.

Risk Priority	Risk Description	Occurrence probability (small, fair, probable)	Risk Impact	Mitigation Action to Prevent Occurrence	Action to be Taken to Minimize Effects	Risk Owner
1.	Low commitment of businesses and industry	Fair -to- probable	Major if not fatal both to the initiative as well as for development of the province	Finalization of the plan carried out in close collaboration with businesses with careful attention paid to their concerns and suggestions	Somehow try to gain the confidence and support of businesses; restructure the plan	Office of the Premier now, later management of Living Lab
2.	Networked mode of operation between businesses, universities and government fails	Fair -to- probable	Fatal to one quarter of the activities of the initiative.	Endless motivation, walking, talking, networking between relevant parties to build the trust and social capital needed for success.	Same as the mitigation action	Now Office of the Premier, later management of Limpopo Living Lab

3.	Communities and citizens fail to benefit from LLL	Fair -to-probable	Major for the inclusion and capacity building functions	Finalization of the initiative with citizen input; designing the offering to be attractive	Same as the mitigation action	Now Office of the Premier, later management of Limpopo Living Lab
4.	Slow ICT infrastructure development hinders the development of LLL	Fair -to-probable	Major for the internal functions and inclusion	Collaborating with actions related to ICT infrastructure development	Same as the mitigation action	Office of the Premier
5.	Necessary funding not available	Small	No mon', no fun	Money	Money	Office of the Premier

8. CONCLUSIONS

The purpose of this study was to assess the feasibility of constructing a technology center or hub in the province of Limpopo. A parallel study was completed to examine the feasibility of starting an ICT institute. While independent in form, these two studies are intertwined in content.

A concept of Limpopo Living Lab is presented. It has its base in the Provincial Growth and Development Strategy, the objectives of which the Living Lab plans to reach through a comprehensive business development concept including not only starting and existing companies but also the wells of new knowledge - the universities - in addition to the civil society and communities. The purpose of the Living Lab is to

- retain the educated workforce in Limpopo,
- attract investment,
- develop key clusters through knowledge creation, transfer and exploitation, and
- enhance collaboration among businesses, universities, government and the civil society

The study was conducted by engaging a large number of public sector stakeholders in a workshop as well as in individual discussions to explore the potential for, commitment to and interest in a science park/technology center type of concept. These interviews were arranged by TIL and conducted in August-September 2006 among experts from universities, the provincial government and its departments, parastatals and government agencies, both at the provincial level and at the national level.

A random selection of private sector representatives was also interviewed. However, it was decided by the contractor that the business core is to be approached after this initial feasibility study in a workshop to discuss the results of the feasibility study and to further enhance and (re)direct the proposed further actions.

It was evident from the interviews that there is a substantiated collective need for, interest in and commitment to something like a technology center or hub type concept.

It was clear from the very beginning that the traditional concept of a science park or technology center would neither fulfil the potential of the province nor would it have a large enough research base to operate from and into. The concept was thus expanded and subsequently renamed "Limpopo Living Lab" to better illustrate the inclusion not only of academia and industry but also the civil society.

When entering knowledge-based growth, a paradigm shift in public sector investments from financial capital to human capital will take place. The best way to enhance this transformation for the benefit of the society is to bring businesses closer to universities and research institutes in order to exploit the newly generated knowledge and thus exploit the public investments in human capital.

The proposed Limpopo Living Lab model includes the traditional elements of science park and technology centers, such as business incubation and innovative business solutions based on the interplay and collaboration between businesses, universities and the public sector. This triple helix type of approach, however, was extended to encompass a full living lab concept by including two additional elements.

There is a clear need for training, education and capacity building in the province. Because human resources in the province are limited, the approach suggested is to carry out this section of the project by complementing the work of existing institutions such as FETIs and universities and carrying out further initiatives together with them. It is proposed that this activity be included in the ICT Institute.

The other element missing in traditional technology centers is the inclusion of the civil society. There is an abundance of community projects in various sectors addressing different needs. We propose that there be a business development angle to these community projects that could develop them further in order to sustain small local business by engaging proper competencies in the process.

In line with the all-encompassing approach already adopted in the PGDS, the proposed broader concept of the Living Lab will be based on a more holistic business development approach. It will be established on the four cornerstones described above and listed below:

- Community Projects
- Training and Education (as part of the ICT Institute)
- Business Incubator
- Innovative Solutions

It is argued that the Limpopo Living Lab based on these four cornerstones will have possibilities for a sustainable operation in the province for the foreseeable future. While the concept is somewhat novel, it is deeply rooted in two tested elements: the traditional technology center or science park approach combined with the strengths of the civil society in its quest for improved quality of life. The combined approach is further supported by evidence and experience from science parks that often fail to reach beyond major cities. It is further corroborated by experience from various grass-root-level community projects from various continents that reveal the importance of reducing poverty as a precondition for sustainable growth. It is the ambitious goal of the hub to create an environment where both these elements could contribute to the growth and well-being of the province.

If successful, the concept lends itself to creating a business opportunity. The proposed kind of Limpopo Living Lab is potentially a concept that can serve as a model for other rural development initiatives in the country and abroad. There is a potential for exporting it to other regions and nations through consultancy. This could provide a revenue stream for the Living Lab itself.

The Limpopo Living Lab fits well into both national and provincial policy frameworks. By combining the high-tech nature with non-high-tech innovations stemming from communities and their needs and transforming both of these approaches into viable business opportunities for either growth-driven firms or SMMEs serving basically local and regional needs, the Living Lab concept can be found in a range of policies.

The incubator is where business ideas are transformed into new companies. The inputs to it originate from various sources, the main ones being business spin-offs, universities, and the innovative solutions activity. Training and education together with community projects also generate business ideas, but a majority of those ideas can be handled by existing organizations (like LIBSA). Financial and funding institutions, like venture capital companies, banks and LimDev are important partners for the incubator. As a result, companies are generated which have potential for growth.

New companies, together with existing companies, generate needs for training and education, especially in the fields of business management, ICT skills and project management. Inputs are

also needed from educational institutions and companies in the form of expertise. Much of the actual training and education is carried out by existing training and education institutions, with the Living Lab acting mainly as an initiator, catalyst and coordinator. As the output of this activity, local companies and the business environment in general have access to a more qualified and skilled labour force.

Training and education needs together with other requirements generate community projects. Community projects are also central in the Limpopo Living Lab concept, with business development resulting in new jobs in new, local SMMEs.

Innovative solutions need the expertise from companies and universities as input for joint, mutually beneficial undertakings between companies and universities. As output, applications and solutions for the benefit of the local economy and companies are generated.

The Living Lab concept will also include high-quality facilities and support services for companies in order to complete the platform for the activities. The support services include catering, security, secretarial services, accounting and advertising, and are mostly provided by external companies. The facilities and support services have a role in attracting investments, and thus their importance cannot be neglected.

Organization

The proposed organizational structure of the Limpopo Living Lab reflects both the objectives of the LLL as well as of the stakeholders. A lean administration model for the Living Lab is recommended.

One of the key strategic questions in planning and developing a new entity or operation is the question of who or what is to be the process owner. Considering the discussions held with various stakeholders, we propose that the process owner be the provincial government. While arguments can be found to support several of the departments and parastatals within the government as the process owner, we found most arguments favour the Office of the Premier. It is the obvious office to be in charge of such an undertaking involving several departments, parastatals, universities, companies and other stakeholders. Further, it is neutral in respect to the departments, and it also has the executive powers vested in it.

For the strategic aspects of the Living Lab, an advisory board is to be formed from the key stakeholders to carry out the strategy work for the Limpopo Living Lab, the evaluation of the operations and to serve in an advisory capacity the Office of the Premier in questions related to the continued operation and funding of the Living Lab.

The light management approach means that in addition to the Office of the Premier as the process owner and to the board, a managing director is to be appointed. The personal qualities of the managing director of the Limpopo Living Lab are crucial and the selection of the director is the most important single decision to be made.

All of the four sectors will have working groups as sub-advisory boards and there will be a sectoral director responsible for the activities in each respective field of operation. The working groups for each sector will consist of persons from relevant organizations and companies.

In addition to the five directors mentioned above four assistants will be needed.

Our recommendation is that the Living Lab start its operations under one of the existing parastatals to minimize the structural costs, at least in the beginning. The ideal parastatal

organization would have operations that are in parallel and possibly even overlapping with the planned operations of the Living Lab. This would enable synergies between the parastatal and the Living Lab, thus enhancing mutual commitment to and interest in it. For governing purposes, the parastatals should be chosen so that the provincial government has a certain level of decision-making power also within the parastatal. The Living Lab would also report directly to the Office of the Premier in addition to reporting to the parastatal.

For the location of the Limpopo Living Lab, we suggest that the Edupark complex be considered, at least as an initial location. It has established itself already as a hub for out-of-province universities, and serves companies as well. Further, its logistic location is very good. The governing structure tied to a university is an added benefit.

Funding and Benefits

The basic funding for the Living Lab and the ICT Institute will come from the provincial government. Each sector with projects and programs will have parts of its funding gathered from multiple external sources, including both public and private funding.

The basic government funding should cover the costs of the managing director, the sectoral directors, their assistants and managers, administration and other overhead costs, marketing costs (including Web pages) and costs related to premises. This basic funding should be secured at least for five years. Whether or not the Living Lab will be self supporting in the long run will depend on whether or not it enters the real estate business.

The evaluation and monitoring systems for the operations are essential for a publicly funded exercise and they should be in place as the operations start.

In addition to the basic funding, it is proposed that the Living Lab have a project fund (or funds available) for the projects and programs. This fund provides funding for the preparatory phases of the projects and programs. During these preparatory phases many if not all the projects and programmes are expected to ensure funding for themselves from external sources such as various provincial and national government departments, development banks and international programmes.

As the Limpopo Living Lab concept fits well with the science, technology, economic and social development policies of South Africa, national funding should be available for both the pilot operation and on a project basis. The provincial government can also fund individual projects and programs, but that should be separate from the basic funding. As for donor funding, our recommendation is that donor funding be channelled into actual activities, i.e. projects and programs.

The cost-benefit analysis is based on the minimal organisational structure for the Living Lab. This kind of concept can be feasible in the beginning of operations, but in the long term the extent of the operation should be reconsidered. Due to the newness of many of the operations our recommendation is to start small and learn from experience before expanding the volume of the operations.

The SWOT analysis shows that the strengths and opportunities prevail over the weaknesses and threats. The threats and weaknesses, especially those related to successful networked modes of operation between the public, private and third sector (NGOs) and to the development of ICT infrastructure, can, however, hinder or slow the development and success of the concept if they are neglected. And if the weaknesses remain and the threats materialise, the effects of the concept cannot be harnessed to the extent expected.

To conclude, the province has good prospects for realizing a development concept that will allow for a comprehensive development of the province. The next steps to be taken include the realization of a detailed business plan for the Limpopo Living Lab.

9. ON THE NEXT STEPS FORWARD

This final chapter is the same for both concepts, the Limpopo Living Lab and the ICT Institute. The reason for this is that the feasibility has shown the initial assumption to be accurate, namely that the concepts for Limpopo Living Lab and the ICT Institute are indeed inseparable. Therefore, we argue that the implementation plan for these two concepts should be a united one.

The feasibility study has shown the feasibility of and sketched a path to the realization of the Limpopo Living Lab/ICT institute concepts as vehicles to enhance the economic development for the benefit of the Limpopo people. This vehicle has been named the Limpopo Living Lab (which propose to host the ICT Institute as well) to illustrate better its all encompassing nature and differences from traditional science and technology park concepts.

While the report in itself provides a framework, it is yet a consultancy report that needs to be rooted and grounded properly to the social, economic and educational fabric of the Limpopo province. Further, it needs to be evaluated for its merits and faults from a provincial perspective and required changes need to be made.

In the following, we are outlining a set of measures that should be considered as next steps forward if the feasibility report is seen to be solid enough, and procedure into the execution phase could begin.

Policy context

When initiating the next steps forward, the first assessment that needs to be done is to evaluate how well the presented concepts fit within the existing policy framework of the province. The concepts have been devised to fulfill the aims and goals of the Provincial Growth and Development Strategy. All actions and initiatives proposed realize the PGDS. The provincial information society strategy work that will partially be executed under the joint program INSPIRE of Limpopo and Finnish governments will be another guiding framework for the concepts proposed.

In the INSPIRE program there is a strong emphasis on capacity building and strategic initiatives related to the development of the information society in Limpopo. Thus, this joint framework program will provide not only a strategic frame for the concepts at hand but also a powerful financial co-funding instrument to implement and realize the concepts developed in these two reports.

Further, there is a joint concerted action by the South African and Finnish governments on developing the regional innovations systems in South Africa known as COFISA program. While Limpopo is not a target of this program, some elements such as rural innovations (termed "community projects" in this concept document) could be very well attached to developments in Limpopo.

There is an issue related to the further development of the policy framework, namely a consideration of drafting a provincial innovation strategy document. This document would encompass all the relevant policies, actions and initiatives and provide a comprehensive framework for innovation and knowledge based economic development. While these issues are partially touched in the PGDS and other policy documents, a thorough yet light strategic framework for the innovation based development of the province should be considered. This work would fall under the above mentioned COFISA innovation program. As Limpopo is ahead of many other provinces, it should take advantage of its forerunner position in a national framework as well.

The measures discussed below are not to be executed in a sequential fashion one after the other but should rather be rolled out in parallel as they are not dependent on each other in a serial sense. This parallel execution would also speed up actions and shorten the time span needed for the preparation of the implementation phase. While the feasibility report gives certain recommendations, we note that there are many possibilities to choose from beyond our recommendations. Some of these issues are discussed below.

The policy compatibility of the concepts should be addressed by entertaining the concepts with relevant policy stakeholders.

Organizational structure

To select a proper organizational structure for the execution of the various functions of the Living Lab is crucial. It should be noted that while a lean structure as part of a parastatal was recommended in both studies, there are several other options available. We will discuss them briefly below.

The lean structure, as a part of the existing parastatal, that was recommended in the reports is based on two main arguments. The first argument is to enable focus on the essential, i.e. the content and to avoid any divergences from it. The second is more practical and is related to maintaining the costs in the initial - and the riskiest - phase minimal.

We acknowledge that dependency on the parastatal maybe an issue at hand, especially when taking account the current discussions on the roles and restructuring of parastatals in the province. Thus, another alternative - the Living Lab being established as an independent parastatal - needs to wait the outcomes of the same discussion. An independent parastatal would be mostly an issue of branding. It manifests the Living Lab as an independent unit and therefore also provides a quick deliverable. The backsides naturally include higher initial investment costs and diverting the focus partially on secondary issues such as administration in the beginning.

When looking further ahead in the future of the Living Lab, a crucial prerequisite for the success is the role and commitment of the businesses. One way to enhance this commitment is the involvement of businesses in the ownership and governing structures of the Living Lab. There are several possibilities how to engage companies into this. The minimum is that firms are actively involved not only in the activities of the Living Lab but also in the governing of the same as board members with substantial influence. This could be taken further to public-private partnerships and shared ownership. Another alternative might be a governing according to "Government owned - company operated" -principle, where the government would contract the operation of the Living Lab from a private enterprise.

As the concept of the Living Lab is novel to the province and as there are series of issues related to the operational plan, financing and networks of the entity, it is crucial that the Living Lab get a powerful backing and champion within the provincial government. The optimal place to

incubate and grow the Living Lab to be fully operational would be the Office of the Premier with its neutrality and the executive powers vested in it. Another possible location within the government to nurture the concept would be the Department of Economic Affairs, Tourism and Environment with its extensive experience on not only economic development but also on parastatals. While the Living Lab may well start as a project within the government, it should be an intermediate phase and have a clear path from the beginning to be set up in some kind of company format once operational. To our experience, all technology hubs even if owned by a city or a government, are set up in the form of a company to allow needed flexibility. In addition, existing but currently not used government (owned) structures or vehicles (e.g. idle companies or trusts) should be looked at to enable a quick start for the concept implementation.

The issue of physical location - own building or part of an existing environment - should also be addressed at this point. Clearly this is a question of investment but also of branding and of delivering something concrete. We have proposed a very lean administrative model and thus also no own building has been proposed. However, it ought to be considered that a building can be also considered an achievement in its own right. It also is something very concrete. Further, there is no abundance of high quality office space in the province and thus it could also fill a market need. If a building were to be erected, one should carefully consider whether to separate the development activities and the real estate business or keep them within the same company. There are good arguments for both cases.

While these are important decisions, they can be made once the concept has been introduced to the decision makers, and should be made prior to or in the beginning of the implementation phase.

The indirect implications of these decisions are many, mostly related to the branding and marketing of the Living Lab. The direct impact of these decisions will be financial and more concretely the initial investments required.

Commitment of the private sector

The views and insights of firms and businesses of the province are included in the report via their representatives like ICT Forum, SACOB, NAFCOC, LEAC and the like. As the impact of the private sector commitment is crucial to the success of the whole concept, the private sector should have a possibility to affect the content of the concept also later in the process.

Above we already discussed the role of businesses as equity owners and/or board members in the Living Lab. The issue of identifying key anchor firms that would be interested in building a long term relationship with the Living Lab is closely related to the ownership issue.

By anchor companies, we mean few, well-known companies that are strategic partners to the province and would be willing to contribute to the concept either financially or in-kind. These may be provincial, national or international companies. Negotiations on how they perceive their role in the further development of the Living Lab should be conducted by a party with a mandate from the Premier.

Another issue is an open workshop (with invitations sent to secure participation by relevant firms but also open access to all interested) on the further development of the Living Lab concept. This should be arranged to collect the views of local companies in the province on this concept so that it could meet their needs optimally.

Both of these actions could - and should - be started as soon as the decision to further develop and implement the concept has been made.

It should be noted that one cannot underestimate the importance the commitment of companies will have on the successful realization of the concept.

Business plan

An important issue to be addressed is the drafting of the implementation plans of the Living Lab and of the ICT Institute.

The first step towards these are further and more detailed consultations with the key stakeholders such as government departments, parastatals and other government agencies. The concepts need to be presented to these organizations and detailed discussions to be held with each of these in order to be able to draft a functional operational plan for the concepts. It should be noted that many organizations already carry out some of the activities described in these two reports. It is not the purpose to duplicate these activities but rather to augment and amend them by introducing an approach that is based on innovation.

Further, the networked mode of operations is a virtue that all existing operations will benefit from. By bringing together various stakeholders in mutually beneficial projects and environments a potential for future actions and growth is planted.

As pointed out earlier, we strongly argue that the operations of both the Limpopo Living Lab and the ICT Institute be executed together and thus one unified business plan ought to be sufficient.

The purpose of the business plan is to concretize the relevant issues of the feasibility study and to set a way forward to the implementation and execution of the concepts. One may have one joint business plan or one for each concept. However, we would strongly argue for one single joint business plan for practical and also for strategic purposes.

The business plan will give detailed answers to issues like (but not limited to):

- What is the vision? Where the LLL/ICTI will be in 2012?
- What is the purpose and function of LLL/ICTI? The mission?
- What are the concrete steps to realize the concepts?
- What kind of interplay and networking will take place between the concept and the existing activities and actions currently underway?
- What parts of the concept are realizable and in what time span?
- What will be the funding structure for the LLL/ICTI?
- What are the key networks and how will they be formed?
- What is the composition of the key team? Who are the key directors?
- What are the roles of various stakeholders
- What is the content of the communication or marketing plan?
- What are the execution plans for each of the four pillars?

One may engage external consultants to collaborate on this task but there should be a clear shift from solely relying on foreign/out-of-province consultants to having consultants and/or individuals that would be knowledgeable of the local and provincial terrain in more detail. One should note that a key individual is more valuable than a mediocre consultant, even if the individual is engaged elsewhere permanently.

The work should be started immediately after a go decision is made by the Premier. Estimated time for this will depend on the capability of the parties involved. The local party will need probably about 2-3 months to complete the BP.

Finally, it should be pointed out that both provincial, national and international funding agencies, investors and financiers use the business plan to evaluate the feasibility of the concept and whether to fund it or not

Recruitment of key individuals

The success of the LLL/ICTI concept implementation and execution is crucially dependent on the personal qualities of the first executive managing director and his/her team of executive directors.

The managing director should be an outstanding person with unequivocal credibility in several directions: the government, the businesses and the academia. He/she should be a senior person with sufficient business or equivalent experience to run a complex operation. A paramount deciding factor will also be the social, people and communication skills as well as the extent and nature of networks of this individual. As the role of the director and other key personnel is crucial for the success of the concepts, one should reserve enough time, effort and money in engaging the desired individuals.

The head-hunting for the director and/or other key personnel should start as soon as possible. The ideal would be that the director(s) be involved already in the business plan drafting process. This would be important both to the commitment of the team and the execution of the plan.

Issues related to marketing and branding

The creation of the LLL/ICTI concept has up until now been the task of a small group (the LISSCC) within the provincial government. Once it is getting into the execution phase, it will become more real and concrete while also more political. Thus, marketing, public relations and branding issues enter. It is important that the key message to stakeholders and wider audiences be simple and clear. The details of the message may vary from one audience to other but the underlying message should be unified.

The key message and the plan how to communicate it should be ready when the announcement to go forward is being made. It is also needed before starting on with the business plan as various stakeholders are to be engaged into this activity.

Issues such as being an independent organization or having own physical building are also issues that will have much impact on how the Living Lab is perceived by the public. These issues also provide a quick and concrete deliverable.

The name is another issue that ought to be touched. While "Limpopo Living Lab" nicely conveys the broader meaning of the concept than that of a traditional technology park, it hardly is more than a working name. The name should either reveal (something of) the content of the concept or then be something that many features of the concepts can be related to (e.g. a baobab tree contains the concepts of sustainability, community, indigenous, foundation etc and thus Baobab Hub could be considered).

As is common in the current world, things are not judged by their content but by their appearance; the LLL/ICTI should appear compelling.

Appendix 1: List of interviewed people

The Department of Science and Tehcnology DST

Dr Nawaz Mahomed, Local Innovation Manager

The Department: Trade and Industry DTI

Mr Charles J. Mills, Deputy Director

Ms Gcina Hlabisa, Researcher, Strategic Competitiveness Unit

Ms Daphney Mhlanga, Director, Innovation & Technology

Dr. Johannes F.A. Potgieter, Chief Director, Innovation & Technology

The Meraka Institute

Ms Kagiso Chikane, Strategic Relations Manager

Mr Sherrin John Isaac, Engineer

Mr Kobus Roux, Competence Area Manager, Wireless and Access Technologies

The Innovation Hub Management Company (Pty) Ltd

Ms Jeanette Morwane, Assistant, Corporate Affairs

Mr Tsietsi Maleho, Corporate Affairs Manager

Universal Service Access Agency of South Africa (USAASA)

Ms Motlanalo Mmako, Co-ordinator, Limpopo Province

LimDev

Mr Sam Maloka, Planner

Premier's Advisory Council on Technology PACT

Mr Zeth Malele, CEO, Avria.com

Mr Igbal Hassim, Executive director, Technology Corporate Management

Mr Makono Mosidi, CSIR

Mr Nhlanhla Mabaso, Managing Director, Relational Database Consulting

The Limpopo Provincial Government

Mr Molaku John Petje, Provincial Government IT Officer, Office of the Premier, Limpopo

Mr Duke Modjadji, Senior Manager, Economic Planning, Research and Information Management,
Dept of Economic Development, Environment & Tourism

Ms M L Maja, Senior Manager, Mining Cluster, Dept of Economic Development, Environment & Tourism

Ms J Shibambu, Head of Department, Department of Economic Development, Environmena and Tourism

Mr Michale Rakgabyane, Office of the Premier, PGITO

Trade & Investment Limpopo

Mr Amos Shiburi, General Manager, Business Development

Mr Freddy Chaba, Sector Manager, Mining

Mr Thapelo Matlala, Sector Manager, Capacity Building

Ms Fulufhelo B Mavhandu, Business Advisor, Agri-Business

Mr Stan Rakumako, General Manager, Investment Services

The University of Limpopo

Prof L G Buberwa, Acting Executive Dean, Management and Law

Prof Phuti E Ngoepe, Director, Materials Modelling Centre
Prof Peter E. Franks, Interim Campus Principal and Deputy Vice-Chancellor
Professor S P Mashike, Interim Deputy Principal

The University of Venda

Mr N. J. Vele, Director: Information Technology Services
Prof M.D.R. Ralebipi-Simela, Executive Dean, Faculty of Humanities, Management Sciences and Law
Prof Armstrong Kadyamatimba, Executive Director of Institute of Information and Communication Technology Systems

The Tshwane University of Technology

Prof M I Mphahlele, Head of Department, Department of Computer Networks, Faculty of Information and Communication Technology

Pro Con Sol

Mr Matsebe Phasha, Managing Member

ABSA Bank

Mr Hans Jacobs, Area Manager, Limpopo Province

National African Chamber of Commerce NAFCO

Mr Nathaniel Mudau, Managing Director, Thavhariba Business Enterprise/NAFCOC Venda Chapter
Ms Nomsa Bvuma

South African Chamber of Business SACOB

Mr. Hans Jacobs, chairman, area manager, ABSA Bank

South African Black Technical and Allied Career Organization SABTACO

Mr. Kedi Mabotja, CEO

South African Council of Churches SACC

The Rev. M Pakati

Mr S Mashilo

ICT Industry Forum

Mr Tinyiko

Mr Godfrey

Limpopo Export Advisory Council LEAC

Mr. M.R. Phalo, TIL, Manager

Foundation of African Business and Consumer Services

Mr Elvis Mhlongo

State Information Technology Agency (SITA)

Mr Baldwin Ramasobane, Regional Manager, Limpopo

Embassy of Finland, Pretoria

Mr. Ilari Lindy, Councillor

Ms. Helena Tapper, Councillor

Appendix 2 Review of some foreign concepts

It is well over 50 years since the first research park⁶ was established in Stanford (Why 2001). Research parks became more common in Europe during the 1980's. However, the majority of the currently existing science parks in the world were created during the 1990's. It is interesting to note that 18% of the existing science parks have been launched in this century, which confirms that Science Parks are a growing phenomenon (IASP 2003).

During the last 10 years science parks have also entered the developing countries. India, China and Malaysia were among the first developing countries to build their own science parks. Many of the science parks in the developing countries can be regarded as almost identical copies of those in Europe and the USA.

Concepts

Science park concepts can be divided for the purposes of this study into different typologies, according to the main driver of the concept, in the following manner:

- if the concept is business-driven, the main emphasis is on high quality facilities for companies
- if the concept is government driven, the development projects are highlighted
- if the concept is university-driven, the cooperation between researchers and companies is highlighted.

In the first format, the activities are in many cases limited to facility management and support services for start-up and technology companies. This concept is very close to the business park concept which offers office space and support services to the companies.

In India most of the science parks are business-based concepts, so that they offer high-quality office space for IT companies. Many of the parks are quite large and owned by big Indian companies. An example could be the **Dhirubhai Ambani Knowledge City**, which is a technopark located in Mumbai. It has an area of 560 000 m² and it is owned by one of India's largest private conglomerates, Reliance ADA group. Another example could be the **Hyderabad Information Technology Engineering Consultancy City (HITEC City)**, which is a major technology city in Hyderabad. It is owned by the Indian engineering giant Larsen & Toubro Ltd (89%) and the Andhra Pradesh Industrial Infrastructure Corporation Ltd (11%).

In the government-driven concepts, the emphasis is often on various regional and other development projects. Thus, the activities rather than the facilities are highlighted. An example of this kind of concept is the Hermia Technology Park located in Tampere, Finland. It facilitates the growth and development of the key economic sectors in the Tampere Region by strengthening the existing key competence areas and supporting the growth and development of the emerging areas. The expertise in the key competence areas can be found both in universities and in companies in the region. The key role of the technology park is in creating collaborative platforms for the key areas. The basic funding for the science park comes from the national and local government.

In developing countries examples of government-driven concepts can also be found. For example in Malaysia there is a government designated zone called the **Multimedia Super Corridor (MSC)**. The Corridor was established in 1996 with the aim of leapfrogging Malaysia into the information

⁶ There is no uniformly accepted definition of science park and there are several terms used to describe similar development, such as Research Park, Innovation Centre, Innovation Hub, Industrial Park, Science park, Technopole, etc.

and knowledge age. It includes an area of approximately 15x50 km² which includes, for example, the Kuala Lumpur International Airport. The concept includes the physical facilities and development projects related, for example, to eGovernment, eBusiness, science and technology, telehealth and business development. Although the concept is government driven and financed, companies and universities are included in the concept. Within 10 years of operation the Multimedia Super Corridor has grown into an internationally recognized center which attracts companies from all over the world. It should be noted that this center was built within the capital city area, and the government of Malaysia has invested heavily in the concept.

One example of a government led science park concept where the university also has a central role is the Mozambique Information and Communication Technology Institute (MICTI) which aims at building ICT skills and capacity in Mozambique. From the science park concepts studied for this report the MICTI concept seems to be the best benchmark as it stemmed from a similar kind of background and environment as in Limpopo. The MICTI concept is based on three pillars: ICT education, technology incubation and the science and technology park approach. The concept emphasises the ICT learning aspect together with high-quality facilities for attracting foreign investors. The funding model for MICTI combines government funding with donor funding and company sponsorship funding.

In India examples of the government-driven concepts can also be found. One example is the **Kerala Industrial Infrastructure Development Company - Kinfra**, which is owned by the government of Kerala. As in many other parks in India, the emphasis here is not on the development activities themselves, but on building the infrastructure for the development activities.

Another example can be found in Thailand. The **Thailand Science Park (TSP)** is the country's first science and technology park under the management of the National Science and Technology Development Agency (NSTDA) operating under the aegis of the Ministry of Science and Technology. With an investment of about Baht 7,000 million, the Park is being established as a service center for scientific and technological research and development activities. The park aims to accelerate local human resource development to be on a par with global counterparts and to become a hub for specialists and researchers from the various fields of industry.

The University-driven concept often emphasises knowledge transfer from universities to businesses and the collaboration between researchers and companies. Incubator activities and other forms of commercialisation of research results usually form the core of the activities in this kind of science park.

University-driven science park concepts can also be found in the less developed countries. One example of this is the Pontifical University Catholic of the Rio Grande Do Sul (PUCRS) in Brazil which had as an objective the development of an environment and physical infrastructure for education, research and different events. The university developed such an environment with companies and established a 5,4 ha park called the Scientific and Technological Park of PUCRS - **Tecnopuc**. The mission of the Technopuc is to create a community of research and innovation which incorporates academia, companies and government.

Content

All of the above-mentioned science parks focus on ICT. Many examples of biotechnology-related parks exist in less-developed countries, however. One example is the Polo Bio Rio Park located in Rio de Janeiro, Brazil. This park aims at promoting R&D in the biotech business through transfer of technology and research expertise to the private sector. It was the first biotech industry park

established, over a decade and half ago in Latin America. It is overseen by the Brazilian Biotech Industry Association with support from the Brazilian Association of Science Parks and Institutes.

A different kind of concept can be found in Brazil in the Santa Catarina region. A science park called Sapiens Parque, concentrates not only on technology, but also on the well-being of nature and citizens. The concept is built on the basis of technology and innovation, creativity and diversity, talent, and nature and quality of life. Due to the location of the park, tourism and services play a central role in the concept. Sapiens Parque was initiated by the government, but it has attracted many partners from universities and the business sector.

Conclusion

It can consequently be argued that most of the science park concepts in the developing countries are almost identical copies of those in the western countries. The local environment and conditions are discernible only in a limited fashion in the concepts. Concepts that were based on local competences and capabilities were particularly hard to find. It was almost surprising that most of the concepts were related either to ICT or biotechnology. This does not mean that it is not wise or that it would be impossible to build a multidisciplinary technopark concept. There are examples in other countries of such concepts (e.g. Finland). In building such concepts, the starting point has in many cases been regional development, instead of enhancement of science or technology. In the case of regional development, the aim is to strengthen the already strong economic sectors and support the growth of new ones. Thus the science park concepts that are developed for supporting the achievement of these objectives are often multidisciplinary.

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Tshwane University of Technology	www.tut.ac.za
State Information Technology Agency - SITA	www.sita.co.za
University of Limpopo	www.unorth.ac.za
Meraka	www.meraka.org.za
CSIR - Council for Scientific and Industrial Research	www.csir.co.za
Department of Communication	www.doc.gov.za
Department of Education	http://education.pwv.gov.za/
Department of Trade and Industry	www.thedti.gov.za
Department of Science and Technology	www.dst.gov.za
ICASA, Communications Authority of South Africa	www.icasa.org.za
Information Technology and Social Change in Africa	http://digitalafrica.blogspot.com/
NEMISA an educational institute for bridging the digital divide in South Africa	www.nemisa.co.za
PNC on ISAD	www.pnc.gov.za
Telkom	www.telkom.ca.za
The Small Enterprise Development Agency	www.seda.org.za
Western Cape Provincial Government Portal	www.capegateway.gov.za
WSIS - World Summit on Information Society	www.smsitunis2005.org