



Technology & Innovation in South Africa

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UC MBA South Africa Trip

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Introduction

Grassy plains speckled with giraffes, antelope, cheetahs, and lions. Wooded hillsides lined with gorillas and monkeys. Water buffalo crossing muddy rivers filled with hippos and crocodiles. Natives carry baskets on their heads as they move about the huts in their villages. These were the images of Africa that filled my head as a kid – images from stories like *The Jungle Book* and *Tarzan*.

Even until recently, I had never really considered the diversity of the natural, cultural, and political landscapes of this vast continent. In March of 2003, some classmates and I had the opportunity to experience a few of these diverse landscapes first-hand when we joined a few faculty members on a trip to South Africa for spring break.

Background

In a cover letter for our grant application to the Institute for Global Studies & Affairs at the University of Cincinnati¹, Professor Stephen Salter explained the background for our trip to South Africa.

For 5 years, the University of Cincinnati's College of Business Administration (CBA) has offered a series of MBA short courses in a variety of countries servicing an average of 100 MBA students per annum. In a recent federally funded grant application, CBA proposed a Community Development Program in South Africa, one of Greater Cincinnati's most under-served potential markets. The objective was to raise Greater Cincinnati's ability to compete in the global

¹ Professor Stephen Salter, January 2003, "CBA March 2003 program in South Africa" (cover letter for IGSA grant application)

market by increasing international trade activities for small and minority businesses and to give students practical international trade experience in South Africa. This program was developed by CBA, the Greater Cincinnati Chamber of Commerce and Professor Johan Venter of Stellenbosch University.

While the purpose of the trip was to learn about international trade and business in South Africa, a broader understanding of the natural, cultural, and political landscape of the country helped to lay the foundation. We learned about these and other topics through a mixture of tours, interactive field trips, and academic discussion. Indeed, we packed a lot of learning into our one-week trip that stretched from Cape Town – the rapidly growing center for IT, agriculture, and tourism to Johannesburg – the industrial heartland.

One of the areas that I didn't have much of an opportunity to explore during the trip was technology. Given that I am considering a concentration in Management of Advanced Technology & Innovation (MATI), I decided to research this topic in depth upon our return. As I began to gather information, I realized that my findings could be categorized into two main groups – governmental and other agencies/organizations. Both will be discussed. However, in order to understand each of these, one must first understand the demographics that underscore them both.

Demographics

If you consider that the monthly income of the average South African is about \$500 US (double the number of only 8 years earlier), 25% are without tap water, and

17% don't even have access to electricity², you might not expect technology to be high on the priorities of South Africans, especially not advanced technologies. While it is true that most South Africans do not enjoy the same leisures that you and I enjoy, such as cars, computers, and high quality health care, there are some unique technological and innovational opportunities that exist in South Africa as a direct result of its developing nature.

One such opportunity is the cell phone market. While we would no longer consider the telephone to be advanced technology, cell phones do fit this category. Interestingly, while only 27.3% (and dropping) of South African households have access to a fixed landline telephone³, cell phone access is on the rise. Over 24% have access to a cell phone and this number is growing steadily. This is one area where South Africa, as a developing country, has an advantage even over some developed countries. With very little previously existing landline services, many phone companies are heading straight for mobile technology, rather than try to build a complex and expensive wire infrastructure from scratch. It hardly even makes sense to install landline service, especially in lowest-income areas.

Another opportunity is in the computer industry. While highly functional hand-me-down computers are not hard to come by, software licensing fees become the prohibitive factor, especially with the unpredictable and ever-changing exchange rates. However, in their discussion document titled Open Standards and Open Source Software

² South Africa in transition, October 1999, <http://www4.worldbank.org/afr/poverty/pdf/docnav/03297.pdf>

³ SAARF 2002B, <http://www.saarf.co.za/ppt/2002Bamps.pdf>

in South Africa⁴, the National Advisory Council on Innovation (NACI) points out that a huge opportunity exists for the use of Open Source Software (software that is free to the public). Such software would not only bypass the hurdle of licensing costs, but it could also spawn an entire industry of job opportunities for South Africans, ranging from software development to software support. Most open source software that exists today would need local translations and support would be necessary almost everywhere that the software would be used. These and other related opportunities could result in tens of thousands of new jobs.

Of course, if the software is free, how could anyone make money on it? How could it make a contribution to the South African economy? Although the software support industry could probably sustain itself, development of free software would not generate income in and of itself. Thus, it would be difficult to pay software developers. However, there are many opportunities for funding types of work like this – work that could be so beneficial and have such far reaching effects for the entire country. This is where I will spend the bulk of my paper – discussing the background, mission, and structure of governmental and other agencies/organizations that fund such endeavors in South Africa.

⁴ Open Standards and Open Source Software in South Africa, NACI, January 2002, <http://www.naci.org.za/docs/opensource.pdf>

Government

Government funding is one of the primary keys to developing technology and fostering innovation in developing countries such as South Africa. In fact, entire governmental departments and programs have been created in order to support technology and innovation in South Africa – departments such as the Department of Arts, Culture, Science and Technology and the National Advisory Council on Innovation. Even the provincial governments, such as the Gauteng Provincial Government, have programs aimed at developing technology and fostering innovation.

Department of Arts, Culture, Science and Technology

The Department of Arts, Culture, Science and Technology (DACST) is headed by Dr. BS Ngubane, Minister of the DACST, who reports directly to President Mbeki. In recent years, the department has been split in half. Both halves are still administered by Dr. Ngubane, but the split allows more resources and attention to be focused solely on Science and Technology. The DACST represents the highest level of governmental participation by the South African government in the areas of technology and innovation. Most notably, it finances the Innovation Fund, discussed later.

The Department of Science and Technology web site describes its vision, strategic direction, objectives, mission, and corporate values in detail.⁵ Some of the highlights are as follows:

⁵ DST, http://www.dst.gov.za/about_us/mission/mission_corp_values.htm

VISION

The Department of Science and Technology strives towards introducing measures that put science and technology to work to make an impact on growth and development in a sustainable manner, in areas that matter to all the people of South Africa. This includes focused interventions, networking and acting as a catalyst for change in terms of both productive components of our economy, making it competitive in a globally competitive liberalized environment, and also in respect of the huge development backlog existing among the poorest components of our society.

OBJECTIVES

- Maximizing the contribution of Science, Engineering and Technology institutions to the achievement of the goals encompassed by the adoption of a National System of Innovation strategy for development
- Promoting public awareness, appreciation, critical evaluation and understanding of Science, Engineering and Technology through systemic, coherent and coordinated projects
- Promoting engagement by South Africa's research community with strategic partners/collaborations within the international science and technology community
- Internationalizing/branding South Africa's Science, Engineering and Technology capabilities
- Improving the quality and depth of Science, Engineering and Technology statistical information to support development and investment decision making as well as to drive improvements in the quality of Science, Engineering and Technology activities against the backdrop of internationally recognized benchmarks

National Advisory Council on Innovation

Dr. Roy Marcus, Chairperson of the National Advisory Council on Innovation (NACI), is appointed by and reports directly to the Minister of DACST. The NACI advises the Minister of the DACST (and through him, the Ministers Committee and the Cabinet) on the role and contribution of innovation (including science and technology) in promoting and achieving national objectives. These objectives are to improve and sustain the quality of life of all South Africans, to develop human resources for science and technology, to build the economy, and to strengthen the country's competitiveness in the international sphere.⁶ Some selected functions of the NACI include advising the Minister on:⁷

- Coordination and stimulation of the National System of Innovation (NSI)
- Promotion of cooperation within the NSI
- Structuring, governance and coordination of the science and technology (S&T) system
- Continuous revision of S&T policy
- Strategies for the promotion of all aspects of technology innovation
- Funding of the S&T system

Recent activities in the NACI include studies on national competitiveness, tax incentives, a statistical overview of the innovation field in South Africa, an audit to determine the extent to and success with which the White Paper on S & T: Preparing for the 21st Century has been implemented. The NACI has also recently completed projects

⁶ NACI, <http://www.naci.org.za/a01.cfm>

⁷ NACI Pamphlet, http://www.naci.org.za/docs/naci_pamphlet.pdf

such as the aforementioned Open Source Software study, an internal audit, a facts and figures booklet on selected key information about the science and technology system of South Africa, as well as projects in advanced manufacturing and also in design strategy.

Gauteng Provincial Government

Although Gauteng is South Africa's smallest province, it generates 38% of the nation's economic activity and represents 70% of total formal employment in the country. Industries in Gauteng currently employ over 80% of South Africa's high-tech workers, creating the highest demand for IT and electronic expertise in Africa. The province produces 40% of science graduates and 44% of engineering postgraduates. It also hosts the biggest concentration of research activities in the country, including science councils and industrial R&D facilities.⁸

Thus, it is not surprising that the Gauteng Provincial Government has been so active in the support of technology and innovation in South Africa. Its own multi-billion Rand initiative, Blue IQ, is charged with “investing in economic infrastructure development in identified mega projects in tourism, smart industries and high value-added manufacturing, to create a truly "smart" province”⁹. The most notable product of the BlueIQ initiative, in our context, is the Innovation Hub, the only one of the 10 BlueIQ projects with a designated technology focus.

⁸ Innovation Hub, <http://www.theinnovationhub.com/what>

⁹ BlueIQ, <http://www.blueiq.co.za>

The Innovation Hub is a partnership between the Blue IQ initiative and the Southern Education and Research Alliance (SERA) – a partnership between the University of Pretoria and the Council for Scientific and Industrial Research (CSIR). The vision of The Innovation Hub is two-fold¹⁰:

- Create a unique space where high-tech entrepreneurs, world-class business, education, research and venture capital will meet, network and prosper.
- Enhance the innovative capacity and economic development of South Africa and Gauteng by catalyzing and facilitating this interface and optimizing the synergy with the University of Pretoria and the CSIR.

The Innovation Hub has been quite successful to date. Some of the project progress has been posted to the BlueIQ web site and includes¹¹:

- A pilot Business Incubator is operational in the temporary site, with 5 resident companies currently employing 20 people.
- The Master Plan for the development of the site has been completed and evaluation of all aspects of the infrastructure development by The Innovation Hub Management is ongoing.
- Entrepreneur/Innovator development programs have been launched. They include the CoachLabT concept where a pilot IT CoachLab is operating with students working on industry projects under expert mentorship of Epi-Use [Pty] Ltd, a company that develops IT programs
- The procurement process for the development of the infrastructure started with a Request for Information (RFI) process in July 2002 and a call for tenders for the critical work packages in national media.

¹⁰ Innovation Hub Vision, http://www.theinnovationhub.com/about/vision_values/guiding_vision.cfm

¹¹ Innovation Hub Progress, http://www.blueiq.co.za/project_view.asp?id=17

National Funding

Of course, projects like the Innovation Fund could not even get off the ground without proper funding and/or partnerships. There are three prominent sources of national funding in South Africa that support scientific research, technology development, and technology diffusion: the Innovation Fund, THRIP, and SPII¹². While these are three of the most prominent sources of national funding in South Africa, there are many more. For a more comprehensive and up-to-date guide to funding, visit the NACI website.¹³

Innovation Fund

The Innovation Fund is backed by the National Department of Science and Technology and is managed by the National Research Foundation (NRF). It accepts research proposals in the areas of Biotechnology, Information and Communication Technology, Value Addition: Fauna and Flora, and Value Addition: New Materials and Advanced Manufacturing. The Innovation Fund provides grants to fund the end-stage research process where research knowledge can be translated into new and improved products, processes or services. The driving force of the initiative is to meet the following national objectives: improve and sustain the quality of life of all South Africans, develop human resources for science and technology, strengthen the country's competitiveness in the international sphere, and encourage economic growth. The Innovation Fund is one of the largest, most popular sources of funding for technology & innovation in South Africa.

¹² DST Funding, http://www.dst.gov.za/programmes/research_funding/research_funding.htm

¹³ NACI, <http://www.naci.org.za/c01b.cfm?llev1=3&llev2=1&llev3=1>

The Innovation Fund invests in novel research ideas with vast potential for commercial success, and seeks technological solutions in the identified focus areas that will yield significant national benefits. The fund assists in the conversion of the research idea into a commercially useful end-product by funding items such as equipment, research and development expertise, managerial skills, securing of Intellectual Property Rights and construction of a prototype.¹⁴

Technology and Human Resource for Industry Program

Another major source of funding is the Technology and Human Resource for Industry Program (THRIP), which is also managed by the NRF, in coordination with the Department of Trade and Industry (DTI). THRIP aims to improve the competitiveness of South African industry by supporting scientific research, technology development and technology diffusion activities and enhancing the quality and quantity of appropriately skilled people. The program is also designed to foster collaboration among industry, higher education institutions and the government science, engineering and technology institutions as a means of contributing to the removal of past inhibitions to joint activity among these three sectors. Grants that match contributions by industry to project activities that qualify for THRIP support, are provided by the DTI/NRF. Such an approach is aimed at mutual leveraging of government and private sector funding for joint projects.¹⁵

¹⁴ Innovation Fund, <http://www.nrf.ac.za/innovationfund>

¹⁵ THRIP, <http://www.nrf.ac.za/thrip/about.asp>

Since issuing its first grant in 1994, THRIP has allocated over R1 billion combined government and industry funds to program categories such as manufacturing, mining, and electricity. The topics of projects for 2001/2 in the technology and innovation areas included decision technologies, battery technology, artificial intelligence, data mining, smart sensors, and distributed information systems. One exciting project, partially funded by THRIP, was conducted on the International Space Station by African cosmonaut Mark Shuttleworth. Its goal was to assess the impact of zero-gravity on the development of stem cells and embryos – a world first.¹⁶

Support Program for Industrial Innovation

The Support Program for Industrial Innovation (SPII) is backed by the National Department of Trade and Industry and managed by the Industrial Development Corporation of South Africa (also a primary sponsor of NEPAD, discussed later). The SPII fund is designed to promote technology development in manufacturing industries in South Africa through support for innovation of competitive products and/or processes. The SPII Program offers three schemes of support – the Matching Scheme, the Feasibility Scheme and the Partnership Scheme.

The Matching Scheme gives a grant of 50% of the actual direct cost incurred in development activity, up to a maximum grant amount of R1.5 million per project. The Partnership Scheme gives a grant of 50% of the actual direct cost incurred in development activity, with no maximum grant amount and with a repayment mechanism

¹⁶ THRIP Annual Report, <http://www.nrf.ac.za/thrip/AnnualReport2002/index.htm>

in the form of a levy on sales. The Feasibility Scheme supports the preparation of a feasibility study for potentially innovative projects by means of a grant of 50% of the costs of a consultant.¹⁷

Projects supported by the SPII fund include a smart camera inspection system, a maritime steerable antenna, a search and rescue transponder, and even a multiplayer gaming machine. The total value of all grants supporting projects in 2001 totaled over R100 million.¹⁸

Other Agencies & Organizations

In addition to government organizations and funding, there are other key players in technology and innovation that are worth mentioning (some also have strong ties to government bodies). Four such key players are The National Research Foundation, the National Science & Technology Forum, the South African Association of Science & Technology Centers, and the Industrial Development Corporation.

National Research Foundation

Established in 1999, the objective of the National Research Foundation (NRF) is to carry out the government's promotion and support of research and innovation "through funding, human resource development, and the provision of the necessary research

¹⁷ SPII Overview, <http://www.spii.co.za>

¹⁸ SPII Annual Report, <http://www.spii.co.za/spiiaar2002.pdf>

facilities”.¹⁹ As is common in most of the organizations mentioned in this paper, the foundation is meant to contribute to the improvement of the quality of life of all South Africans.

Funding from the NRF, through such programs as the Innovation Fund and THRIP, is largely directed towards academic research, developing high-level human resources, and supporting national research facilities. Local and international partnerships allow it to help provide resources that researchers need in order to foster and expand South Africa's research capabilities. One of the more unique aspects of the NRF is that it attempts to “foster strategic partnerships and knowledge networks to make South Africa **globally** relevant and competitive”.

In addition to the Innovation Fund and THRIP, the NRF also sponsors other initiatives such as the Foundation for Education, Science and Technology (FEST), the South African Environmental Observatory Network (SAEON), the Square Kilometer Array (SKA), the Traveling Institute for Music Research (TIMR), and the Pan South African Language Board (PanSALB). The NRF also has many national research facilities scattered across the country.

National Science & Technology Forum

The National Science & Technology Forum (NSTF) is collaboration of 98 organizations ranging from universities to governmental departments and was chartered

¹⁹ NRF Profile, <http://www.nrf.ac.za/profile>

in 1995 to be the “constructive watchdog” of science and technology in South Africa. It was established to oversee the restructuring of South Africa’s national science system and to ensure an integrated approach to science and technology (S&T). Dr. Ngubane, Minister of the DACST, recognized the NSTF as a forum “for purposes of consultation and addressing S&T issues within the broad S&T community”.²⁰

The NSTF projects include the Science, Technology, Engineering and Mathematics Education Strategy (an education project), Ethics in Science & Technology in South Africa, SET Awareness – Growth and Innovation Study, and Science & Technology Awards. It is also involved with other projects such as the National System of Innovation and the African Renaissance.

The NSFT web site describes its vision, mission, and objectives in detail.²¹ Some of the highlights are as follows:

MISSION

The mission of the National Science & Technology Forum is to contribute, through SET related initiatives, activities and projects, to national reconstruction, and to the economic, human and social development needs of South Africa – bearing in mind our environmental needs – with the commitment of making a significant difference in the lives of all South Africans through the passion, determination and compassion of its stakeholders.

²⁰ NSTF Overview, http://www.nstf.org.za/Historical/Historical_overview.htm

²¹ NSTF Mission, http://www.nstf.org.za/Strategic/Vision_Mission.htm

OBJECTIVES

- To develop a process that initiates and develops participation by SET stakeholders
- To be a communication channel to and from the State President, Parliament, and any other legislative or administrative body or commission, on science and technology matters
- To act as a sounding board for the SET Community
- To seek common understanding on short-term SET issues, transitional SET issues and issues involving the reconstruction of the SET system
- To support the development of an integrated science and technology system that reflects the principles inherent in a free and democratic South Africa

South African Association of Science & Technology Centers

The South African Association of Science & Technology Centers (SAASTEC) is a collaboration of 35 organizations ranging from museums to colleges. The SAASTEC was chartered to “facilitate in creating a technologically-based Southern African society, ensuring a competitive edge in the global economy”.²²

The SAASTEC web site goes on to describe its vision, mission, and objectives in detail. Some of the highlights are as follows:

MISSION

It is the mission of the SAASTEC to contribute to the improvement of life of Southern African nations by improving scientific knowledge and skills through

²² SAASTEC, <http://www.saastec.co.za/about.html>

the utilization of interactive living science and technology discovery centers (S&T centers). Furthermore, to disseminate knowledge in science and technology to the public in general and the youth in particular through imaginative and enjoyable hands-on exhibits, displays and programs, so that they can appreciate the relevance of science and technology in their daily lives.

OBJECTIVES

- To stimulate interest in S&T centers
- To establish more S&T centers in rural areas
- To evaluate the impact of S&T centers
- To establish contact with industry
- To establish links with international bodies
- To address the issue of funding
- To provide training in the management of S&T centers
- To encourage the sharing of resources
- To provide a national network of information interchange between S&T centers

New Partnership for African Development

In October 2001, a vision and program of action for the redevelopment of the African continent was conceived and developed by African leaders. Dubbed the New Partnership for African Development (NEPAD), it is a “comprehensive integrated

development plan that addresses key social, economic and political priorities in a coherent and balanced manner”.²³ It is self-described as:

- A commitment that African leaders are making to African people and to the international community, to place Africa on a path of sustainable growth
- A commitment that African leaders are making to accelerate the integration of the African continent into the global economy
- A framework for a new partnership with the rest of the world
- A call to the rest of the world to partner Africa in her own development on the basis of her own agenda and program of action

The goals of NEPAD are to promote accelerated growth and sustainable development, to eradicate widespread and severe poverty, and to halt the marginalization of Africa in the globalization process. Most notably, NEPAD points out the need to “fast-track”, an information and communications technology program.²⁴ In another document, *Bridging the Infrastructure Gap – Bridging the Digital Divide*²⁵, NEPAD points out many advantages to such a strategy and sets forth some objectives and action items.

²³ NEPAD Overview, http://www.avmedia.at/cgi-script/csNews/news_upload/NEPAD_2dCORE_2dDOCUMENTS_2edb.AA0010102.pdf

²⁴ NEPAD Programs, http://www.avmedia.at/cgi-script/csNews/news_upload/NEPAD_2dPROJECTS_2edb.AA0050201.pdf

²⁵ NEPAD – Bridging the Digital Divide, http://www.avmedia.at/cgi-script/csNews/news_upload/NEPAD_2dINFRASTRUCTURE_2edb.AA0402301.pdf

Conclusion

Hopefully I have imparted a robust understanding of the current state of technology and innovation in South Africa, as well as the organizations and programs that are driving progress in these vital areas. While South Africa is an emerging market with many needs, the infrastructure is in place to address these needs. The next 10 years will yield many exciting opportunities for international business relations with South Africa.

Our program, the University of Cincinnati College of Business MBA program, is fortunate to have made such a trip to South Africa. The students and faculty alike learned a great deal on the trip and in doing research for these papers after the trip. Hopefully, over the next few years, as the program matures, we can help open some doors for international trade and business between South African and Cincinnati businesses.

Summary of Online Resources

Department of Arts, Culture, Science, and Technology (<http://www.dst.gov.za>)

National Advisory Council on Innovation (<http://www.naci.org.za>)

Gauteng Provincial Government (<http://www.gpg.gov.za>)

Blue IQ (<http://www.BlueIQ.co.za>)

The Innovation Hub (<http://www.InnovationHub.co.za>)

The Innovation Fund (<http://www.nrf.ac.za/innovationfund>)

Technology and Human Resource for Industry Program (<http://www.nrf.ac.za/thrip>)

Support Program for Industrial Innovation (<http://www.spii.co.za>)

National Research Foundation (<http://www.nrf.ac.za>)

National Science & Technology Forum (<http://www.NSTF.org.za>)

South African Association of Science & Technology Centers (<http://www.SAASTECCo.za>)

Industrial Development Corporation (<http://www.idc.co.za>)

New Partnership for African Development (<http://www.NEPAD.org>)