From laboratories to globally competitive
Addressing South Africa’s Innovation Chasm
Context

Innovation

Invention

+ 

Market
THE INNOVATION CHASM
The innovation chasm - the strategic challenge continued

THE IDEAS, RESEARCH AND DEVELOPMENT

COMMERCIAL INDUSTRIES AND MANUFACTURING

VALLEY OF DEATH
Some world class scientists and innovators out of South Africa

- **Max Theiler** (January 30, 1899 – August 11, 1972) was a South African/American virologist. He was awarded the Nobel Prize in Physiology or Medicine in 1951 for developing a vaccine against yellow fever. Theiler studied at Rhodes University.

- **Allan MacLeod Cormack** (February 23, 1924 – May 7, 1998) was a South African-born American physicist who won the 1979 Nobel Prize in Physiology or Medicine (along with Godfrey Hounsfield) for his work on x-ray computed tomography. Cormack was born in Johannesburg AND received his B.Sc. in physics in 1944 and his M.Sc. in crystallography from UCT in 1945.

- **Sydney Brenner** (born January 13, 1927) is a South African biologist and a 2002 Nobel prize in Physiology or Medicine laureate, shared with H. Robert Horvitz and John Sulston. Brenner was born in Germiston and graduated from Wits University.

- Elon Musk (28 June 1971), a South African born physicist attended Bryanston High and Pretoria Boys High School is the multibillionaire founder of PayPal, SpaceX and Telsa.
THE TIA MANDATE

“BRIDGING THE INNOVATION CHASM”
| **Mandate** | “To support the State in stimulating and intensifying technological innovation in order to improve economic growth and the quality of life of all South Africans by [supporting*] the development and exploitation of technological innovations” |
| **Vision** | To be a world class innovation agency that supports and enables technological innovation to achieve socio-economic benefits for South Africa. |
| **Mission** | To support technology innovators to unlock South Africa’s global competitiveness and deliver socio-economic value. |
Bridging the innovation chasm
TIA Strategic Objectives

• To stimulate the development and demonstration of technology based products, processes and services
• To support the commercialisation of technology innovations
• To develop an enabling environment for technology innovation and commercialization in South Africa

Underpinned by:
• The development of an enabling internal environment within TIA to successfully execute its strategy
• Facilitation of the development of innovation skills to support technology innovation and commercialisation
• Becoming a schedule 3B entity in terms of the PFMA
Who is a TIA customer?

- Technology Innovators

Where do you find them?

- HEI
- Science Councils
- State Owned Entities
- Private Companies
- Community
Stakeholder needs (1)

The Innovator - Higher Education Institutions; Science Councils; State Owned Entities & Private companies

- Commercial & technical expertise
- Responsiveness and reliability
- Customer centric products & services
- Supporting infrastructure
- Access to technology innovation eco-system
- Sound advice
Stakeholder needs (2)

Investor - DST, Government Departments and Agencies; Provincial and Local Government & Industry

- Technical acumen
- Commercial acumen
- Sound governance
- Risk mitigation
- Return on investment
- Rigorous ongoing monitoring & evaluation
Stakeholder needs (3)

Communities

- Technology solutions to humanity’s problems
- Security
- Education
- Employment opportunities
- Systems level planning
- Improved quality of life
TIA Offerings

1. Funding Instruments
2. Business Support & Strategic Partnerships
3. Technology Development Infrastructure
4. Innovation Skills Development
Funding Instruments

The six funding instruments of TIA

- Royalty-grants
- Loans, Equity
- Technology Development
- Youth Technology Innovation
- Industry Matching
- Venture Capital

CUSTOMER CENTRIC SOLUTIONS ALONG THE INNOVATION VALUE CHAIN
A modest royalty instrument to enable innovators to protect their Intellectual Property

CUSTOMER CENTRIC SOLUTIONS ALONG THE INNOVATION VALUE CHAIN
1. A fund from which HEIs and Science Councils can access initial funding to enable them to develop their ideas into fundable applications.
2. R25 million in the first year
Seed Fund

- It intended to expedite funding to projects that require less than R200 000 in funding and grow the TIA investments pipeline.

- The approval committee will be based at the University and will comprise both University and TIA members.

- This deployment will reduce evaluation costs for TIA while speeding up the application process for HEIs and SCs.
Technology Development Fund

Royalty/ grant funding to Platforms and Technology Stations, Consortia of HEI’s and Science Councils

CUSTOMER CENTRIC SOLUTIONS ALONG THE INNOVATION VALUE CHAIN
Youth Technology Innovation Fund

1. Applicants 18-30 years
2. Assistance is in the form of vouchers to access services/ resources e.g. SABS testing, incubation, etc

CUSTOMER CENTRIC SOLUTIONS ALONG THE INNOVATION VALUE CHAIN
Industry Matching Fund

1. Match funding to companies where partnership with small companies, HEIs and Science councils is incentivised
2. Royalties & loan structures on a ratchet scale

CUSTOMER CENTRIC SOLUTIONS
ALONG THE INNOVATION VALUE CHAIN
Venture Capital Fund

1. Co-invest with privately managed VC Funds
2. R100 million per annum over 5 years
3. Targeted at 2^{nd} and 3^{rd} round funding needs
Venture Capital Fund

- The intention is to:
  - Attract other funders who will invest in projects in the TIA portfolio and other technology innovation projects missed by the TIA process previously but remain in the innovation chasm.
  - Meet TIA’s mandate of facilitating a thriving Venture Capital Industry.

- The fund will be deployed from selected VCs and not within TIA for a rapid response.

- The aim is to leverage on VC skills.

- The VCs will provide business management leadership to investee companies and also find markets for their products.
Business Support

- IP Management
- Financial management
- Legal Services
- Marketing
- Business Plan Development
- Governance
- Networking
- Internationalisation
Strategic Partnerships

- To leverage local and international partnerships
- To develop “Strategic Capital” to enhance the organization’s capacity to execute its mandate and meet its strategic objectives
- To generate stakeholder buy-in and support for TIA’s strategy
Technology Development Infrastructure

To provide biotechnology equipment and expertise to SMMEs e.g.
- Analysis
- Experiment Design
- Manufacturing
- Product testing

To provide technology solutions and expertise to SMMEs e.g.
- Analysis
- Design
- Manufacturing
- Prototyping
- Product testing

To coordinate technology development through collaboration to promote easy access to
- Capital
- Knowledge
- Markets
Innovation Skills Development

Enhancing Education Through Technology

Promoting Employability & Sustainable Livelihoods through Innovation Skills Development

Stimulating Economic Growth through Entrepreneurial Innovation Skills

Increasing the Capacity and Skill within the Innovation System
Purpose

- To inspire a culture of innovation and create entrepreneurial mindsets.
- Introducing E Learning Platforms Increase and enhance the capability of educators/learners in Maths and Science through the use of new and emerging technologies.

Influence design of the programme:

- The Technology Innovation Challenge learners will be skilled on innovation, entrepreneurship, use of technology, etc.
- Career Guidance Spread across various touch points.
- Virtual Learning and M Learning
- Excellence in online resource learning using the latest technology for collaboration and social learning. (TIA Lounge)
- International Summer Programme (foundational engineering skills)

Target:

Primary and Secondary school learners from quintile 1, 2 and 3 schools FET
Promoting Employability and Sustainable Livelihoods through ISD

Purpose
• To build a strong platform for stimulating and bridging the gap between the primary producers of knowledge (GET/FET/HET) and the socio-economic (Industry) needs within the NSI space.

Influence the design of the Programme
• Sector specific skills gaps within the NSI.
• Work-integrated learning, apprenticeships, learnerships, internships, skills programmes, and work experience placements.
• International exchange programmes to enhance existing skills.
• Online system for M&E lifelong learning to measure impact

Target
RSA citizens, from age 18 years learners with grade 12; undergraduates P1/P2, national diploma, degree or post graduate certificates in the SETI fields and unemployed graduates across other disciplines of interest
Stimulating Economic Growth through Techno Entrepreneurial Innovation Skills

Purpose:
• To invest in the growth of entrepreneurial innovation skills to meet the needs of TIA and the National System of Innovation

Influence the design of the programme:
• Technology Innovation Entrepreneurship Competition identifying new and existing technology innovations that can potentially be enabled, supported or assisted through TIA, and which have the potential to scale up nationally or internationally
• Industry Specific /Generic Professional Development Programmes linked to entrepreneurship
• International Best Practice Methods.

Target
• The target group for the programme is aspiring entrepreneurs and MSc, PhD and Post-Doc students from all the HEIs in South Africa with potential or concrete venture projects.
Stimulating Economic Growth through Techno Entrepreneurial Innovation Skills

The Wilburforce Community College Summer School
Annual Performance Plan 2013/14

TIA SECTORS

TIA support cuts across all technologies and sectors of the economy indiscriminately
The choice of sectors is influenced by drivers and hurdles that are encountered economically, socially and environmentally.

**ECONOMIC**
Drivers - Productivity and competitiveness
Hurdles encountered - Technology development, investment and ISD

**SOCIAL**
Drivers - Knowledge base
Hurdles encountered - poor quality public education

**ENVIRONMENTAL**
Drivers - Resource optimisation
Hurdles encountered - Technology development
TIA Sectors

Cross-Cutting Technology Sectors

- Industrial Biotech
- Advanced Manufacturing
- ICT
- Special Projects

Industry/Economic Sectors

- Agri Sector
- Health Sector
- Energy Sector
- Mining Sector
THE GLOBAL ENVIRONMENT
(WITHIN THE CONTEXT OF AFRICA AND BRICS)
Background Information & Key Indicators

- 55 Countries
- African Population: app 1 billion; ~12% of the world population
- South Africa is the biggest economy in Africa
- South Africa is a member of BRICS
- South Africa is a member of G20 countries
- South Africa is a leading member of SADC.
- South Africa has taken over Chairmanship of African Union Commission
- Amongst the most stable banking systems in the world
- A leading nation on Mobile Operators
- 23 Higher Education Institutions
- A stable democracy

By Dr. S. Ngozwana
THE BRICS CONTEXT

CHINA

COMPETITION AND OPPORTUNITY

1. IT IS THE SECOND BIGGEST ECONOMY IN THE WORLD, AFTER THE US.
2. IT HAS 2.5 TRILLION US DOLLARS CASH RESERVES
3. IT HAS A GDP OF 7.3 TRILLION US DOLLARS (18 TIMES THAT OF SA AT 408 BILLION)
4. IT BUILDS A NEW COAL FIRED POWER STATION EVERY OTHER MONTH
5. IT HAS AN ADDITIONAL 300 MILLION PEOPLE THAN THE ENTIRE CONTINENT OF AFRICA.
6. IT MANUFACTURES 60% OF THE WORLD’S MICROWAVE OVENS, SHOES, DVDs AND PHOTOCOPIERS.
7. IT HAS THE SECOND BIGGEST ARMY ON EARTH!!
8. IT IS NOT A DEMOCRACY (I.E, THE POPULATION THAT DOES NOT ELECT THEIR LEADER).
9. CHINA HAS MORE PHDs IN SCIENCE, ENGINEERING AND TECHNOLOGY THAN THE ENTIRE AFRICAN CONTINENT
SOME PROJECTS HIGHLIGHTS
Investment highlight

• **Easing the burden of disease** – Altis Biologics novel osteogenic products containing Bone Morphogenetic Proteins

FIGURE 3a. Non-union in a patient after attempts to treat defect conventionally had failed.

FIGURE 3b. Same patient treated with the composite hBMP material and internal nail. Complete healing and visible new bone evidenced at 16 weeks post operatively.
• **Opening new market opportunities in Citrus production – Xsit** environmentally friendly technology for the control of False Codling Moth in citrus fruit
• **Stimulating the rural beef industry** – TIA/ARC assisted reproductive technologies (ART) to address the Nguni bull shortage through artificial insemination and embryo transfer in rural areas
Car for the disabled

- The client is a disabled entrepreneur/innovator who is supported by TIA/TSP in the design and development of a Car for the disabled.
- The Technology Station at CUT in Bloemfontein conducted a Product Design and Technology Development with the objective to reduce the current cost of making disabled individuals mobile without assistance.
- Graduates from university are exposed to design & fabrication technologies. The local manufacture of car will result in job creation/employments.

No. graduates involved: 25
The Free State station at CUT

Bed for bedridden patients to reduce bed sores
Automatic Pill Press Machine

- Scientific SUPER-KILL is a local enterprise in the pest control and scientific health care sector that was supported by CUT technology station to automate their products range manufacturing process for Rat poison pill
- Benefits to enterprise:
  - improved unit cost of production
  - and increased volumes
  - To be competitive in pricing for international markets
CPUT UAV
Client: OUCH Pty Ltd

Service Offered:
• Manufacturing /Prototyping
• Applied Engineering, Design and Development
• Product or Process Development

Description of Work: Cast Moulds and Manufacture few parts
Hydroponic Irrigation system

Client: Moosa Sedibe

Service Offered: Applied engineering, design and development

Description of Work: Design and manufacture a Hydroponic Irrigation test bed
Client: Tswellang School

Service Offered:
• Manufacturing / Prototyping
• Applied Engineering, Design and Development

Description of Work: Design Keyboard cover for Disabled persons and manufacture 5 off
Vaseline Pot

Client: Connie Bonokwane

Service Offered:
- Applied Engineering, Design and Development

Description of Work:
Design and manufacture of a Gas Pot for vaseline and floor polish
Profile Roller

Client: M Steyn

Service Offered: Manufacturing/Prototyping

Description of Work: Design and manufacture of a machine which is able to form a sheet of metal into a certain profile
Kneeling Chair

Client: Carlo Luus

Service Offered:
• Product or Process Development
• Applied Engineering, Design and Development

Description of Work: Chair concept developments, renderings in 3D, material source and selection, manufacture of chair with adjustable mechanisms.
Design of prosthetic knee (community project)

**Client:** DUT Dental dept

**Summary:** This project is a major project to assist in the design of a prosthetic knee for SA patients.
Client: Denel Aerospace Systems

Summary: The TS was contracted by Denel Aerospace Systems to machine plugs and manufacture glass-fibre tooling and manufacture a model of the Ingwe using carbon fibre for radar signature testing.
Chair Ladder

Client: Terrence Miles

Service Offered: Cad design and prototype

Short Description: Client requested the IAT to design and develop the idea of a chair ladder
Client:

Service offered: Digital sculpting and 3D milling of former Mozambican President Samora Machel

Short description: Samora Machel was sculptured from photos and then milled out of foam. The foam sculpture was used to make a bronze casting by loop foundries in Mpumalanga.
Client: Emonate Food

Service Offered: Product development and Improvement.

Short Description: Atchaar Manufacturing
Cosmetic Products

Client: Authentica Beauty Paurlor

Service Offered: Development of Cosmetics Products

Short Description: The Client requested TSC to develop 9 cosmetics products for maternity range; namely: Stretch Mark & massage Oil; Anti-cellulite Gel; Shower Gel; Pedicure Milk Soak(pre-pedicure); Foot Cream (post-pedicure); Pigmentation Control Cream; Body butter; Body Toning Lotion & Body Wrap Musk.
Technology Innovation Clusters and Programmes
Cluster Definition

By definition a cluster is “a geographic concentration of interconnected companies, specialized suppliers, services providers, firms in related industries and associated institutions in particular fields that competes but also co-operate where, the “value of the system as a whole is greater than the sum of its parts”.

• The key drivers of the biotechnology clusters are:
  • Biotechnology research base (research organizations, human capital, adequacy of funding for basic and applied research)
  • Biotechnology industry base (existence of SMEs, large companies, industry associations)
Clusters: Unlocking PFR&D

- In 2012/13 TIA launched Tshwane Animal Health Cluster
- Received 63 applications from ARC, UP, CSIR & OBP (R130 million) during 2012/13FY
- Currently 42 have been approved for funding at R59 million

- In 2013-2015 TIA will launch KZN Bio-processing and Limpopo Agro-processing Cluster

Remarks by Prof DelaRay of University of Pretoria
THE LAUNCH OF THE CLUSTER
What are the expected outcomes?

• Development and commercialisation of new products for animal disease control
• Creation of viable start ups to commercialise new products
• Uptake of products by existing companies
• Address diseases that are unique to South Africa and SADC region
• Create an world class cluster in animal health and contribution to regional economic growth
Uyilo eMobility Programme

- The aim is to co-ordinate in a single place efforts from various isolated pockets of excellence that exist in South Africa to take advantage of the emerging EV market and position South African innovative products to enter and compete in this global market.
- National innovation facilities to be established at the Nelson Mandela Metropolitan University (NMMU) in Port Elizabeth, where strong relationships exist with automotive sector.
- Official launch of the programme and initiatives planned for the 13th March 2013.
- Partners:
  - **Industrial players** on board Eskom, Siemens, ABB, Nissan, Altech (Willard) & BMW
  - **Government departments/agencies**: DoT, DTi, DST and IDC
  - **Research institutions collaborations**: UWC (battery development research), CSIR, Univ. of Limpopo, Univ. of Stellenbosch
Joule Electric Car
eMobility Programme Opportunities for South Africa

• South Africa’s IP is scattered across the value chain
• This program will serve to bring all expertise, research outputs and ideas to develop a sustainable infrastructure support for the emerging electric vehicle market
Mining and Minerals Technology Innovation Programme
TIA Mining Sector Objectives

• Support technology development for:
  – Efficient, Safe and Competitive Production
  – Environmental and Health Management
  – Minerals upgrading and value addition
  – Lateral migration
  – Innovation skills for technology innovation and commercialisation
Mining and Minerals as a Sector…

Input Sectors
(technical services, capital goods, chemicals, etc)

- Exploration
- Mine Design and Development
- Mining
- Minerals Processing
- Minerals Upgrading and Value Addition
- Rehabilitation and Closure
- Post-closure Social and Labour Plans

Environmental Management & Health and Safety

Technology Lateral Migration
South African Mining Technology Innovation Programme (MTIP)
• Research gathered from interviews with sector role players supports a widely held perception that South Africa has underinvested in mining technologies over the past decades.

• Consequently, South Africa lost the pre-eminent position it used to hold as a developer of new mining technology.

• The situation is unacceptable in a country where mining represents a significant fraction of GDP, with unique mining challenges.
  – Unprecedented depths
  – Narrow reefs
MTIP Goals

- Redress the relative lack of investment in the development of mining technology
- Fund technology development projects through the Centre
- Create an environment where mining companies and suppliers collaborate on the development of technologies
- Through technology innovation assist mining companies and suppliers to be competitive on a global scale
- Become a virtual platform to link and strengthen mining technology innovation in South Africa through collaboration
- Own the Intellectual Property (IP) developed through the centre
- Develop and commercialise a range of new technologies with industry partners
This suggested model is based loosely on the successful Cooperative Research Centres Program in Australia, and specifically on CRCMining.

- The Centre’s Mission is to develop “game-changing” mining technologies.
- Its measure-of-success is to have these technologies adopted and used routinely by industry.
  - This requires that at least as much effort and attention be devoted to technology development, demonstration and commercialisation as is given to research.
- Centre should be incorporated as a not-for-profit research company.
  - The incorporated entity helps resolve potential conflicts between the research providers - the researchers are typically employed through one of the providers and seconded (on a full or part-time basis to the Centre).
Proposed Organisational Model…

- R&D Entities
- MTIP
- TIA
- Mining Companies
- Suppliers
Proposed Organisational Model

MTIP

Research Entity 1

CEO
Research Director
Commercialisation Director
Education Director

Project

Research Entity 2

Research Entity 3

Secondary
Proposed Organisational Model...
Commercialisation of Technologies

- CTI Funding
- License
- Equity in spin-off company
- Industry Funding

Diagram showing the commercialisation process with timelines and funding stages.
Proposed Centre Model...

- **Suggested period of funding - 10 years**
  - Realistically this is the minimum timeframe for substantial, game-changing technologies to be developed, commercialised and adopted in the capital-intensive, and therefore conservative, mining industry

- **Suggested funding annual quantum**
  - from TIA = R12 million
  - membership fees = R3 million per company
    - BUT half of this, R1.5M can be provided as in-kind, therefore cash membership fee = R1.5M/yr
  - Additionally companies would fund projects in the development and demonstration phases in which they had a particular interest (see next slide - the red and green boxes)
    - In return for this project funding companies might buy ownership in the IP
Envisaged benefits for participants

• Specific to the *mining company* members are the following benefits:
  – Gain financially through the development of technologies that will enable them to profitably mine deposits which today are uneconomic
  – The collaborative nature of MTIP means that the cost of developing new technologies will be shared
  – The industry-driven nature of the engagement with the universities and research organisations will ensure that projects stay on track and on budget
Envisaged benefits for participants

• The OEMs and other suppliers to the mining industry will gain the benefits as outlined below:
  – Be first in line with the opportunity to commercialise the research outputs from the MTIP
  – Interact with many of their major mining customers on at least a quarterly basis in the Technical Committee meetings
  – Learn first-hand about the technological challenges faced by different sectors of the mining industry
  – If a technology seems attractive they can apply through the CEO to the board for the right to commercialise that technology
Envisaged benefits for participants

• The benefits to *universities and other research organisations* include:
  – Obtain funding allowing them to hire new research staff and build new laboratories and other research facilities
  – MTIP encourages publication of research results that emerge from the work subject to the proviso that publications must be vetted by the CEO (or designate) prior to submission to ensure that potentially valuable IP is not disclosed
  – MTIP will be recognised internationally as a world-class research organisation and publication of high quality papers in top-rated journals and at prestigious conferences
  – Additional funding will allow the universities to significantly increase numbers of highly qualified graduates produced
Thoughts as we go along

Two themes:

1. Technology Enabler
2. Technology Commercialisation
Thank You!