Conference on 'Futures Intelligence Capacity'

FIC & Sustainable Economic Development
Issues for Innovation and Growth

Michael Kahn
HSRC Centre for Science , Technology and Innovation Indicators

HSRC
Human Sciences
Research Council

Innovation and Economic Growth

Technological innovation is critical to long-term economic growth. Most technological innovation consists of incremental change in existing industries. …. Sustained growth can occur only with the continuous introduction of truly new goods and services—radical technological innovations that disrupt markets and create new industries. The capacity to turn science-based inventions into commercially viable innovations is critical to radical technological innovation.'

(Branscomb and Auerswald, 2002)

Questions, damn questions and statistics

Do we know where we want to go?

Do we know where we (and others) are now?

Do we know where we (and others) were?

Is there life after breakfast?

“As I said back in 1997, there's a tendency to overestimate how much things will change in two years and underestimate how much change will occur over 10 years”

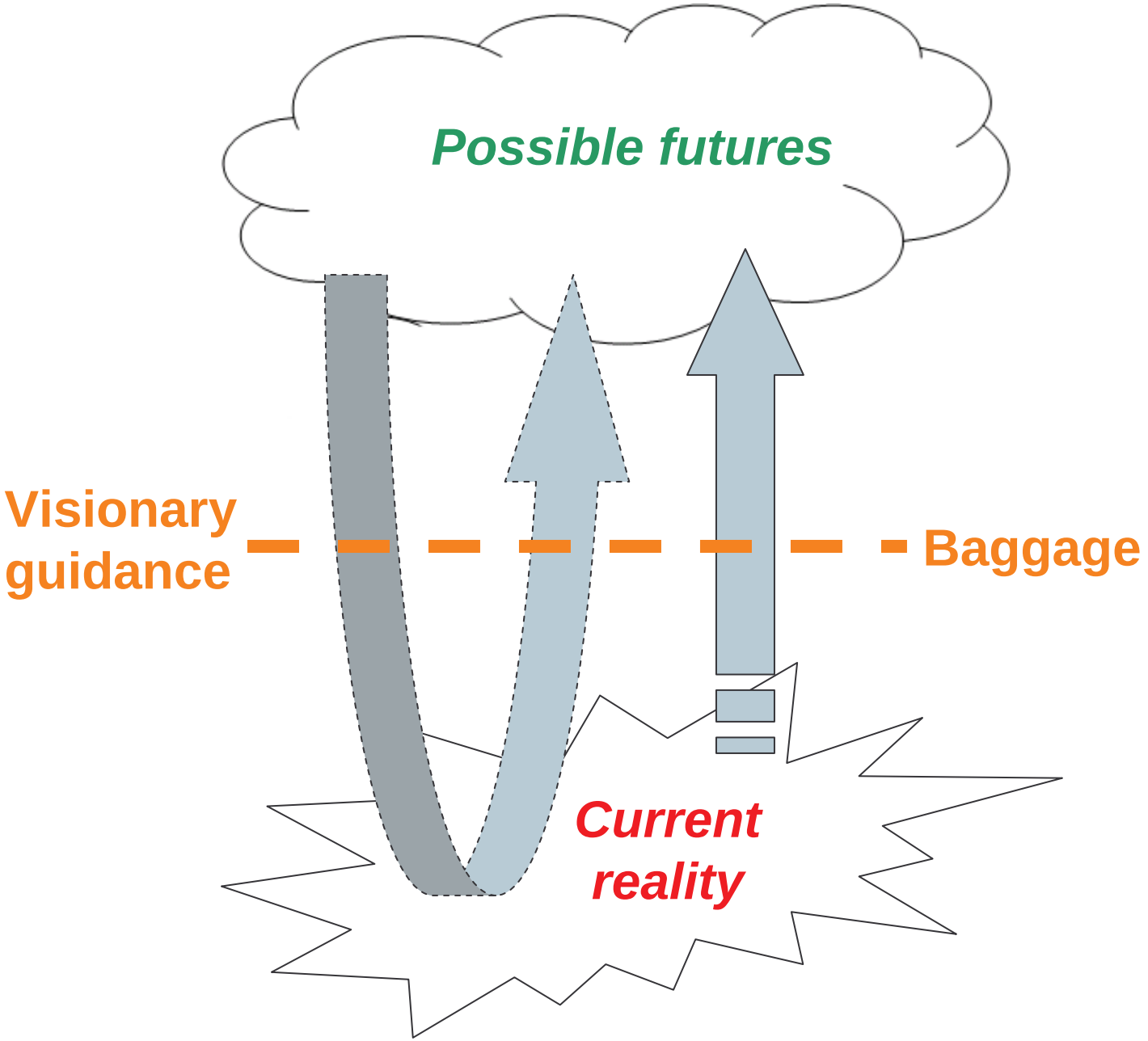
Bill Gates, 2006.

Past imperfect

“Who controls the past controls the future.

Who controls the present controls the past.”

George Orwell in ‘1984’


Possible futures
Visionary guidance
Baggage
Current reality

Perez' model of technological Great Surges

i. Five 'Great surges' since 18th. C.
ii. Location specific; global diffusion over 50+ yrs
iii. Living through and shaping Information & Telecommunications Revolution
iv. Each exhibits distinct techno-economic paradigm
v. Technology as factor of production; endogenous growth theory;systems model
vi. Economic growth interrupted by bubble-bust phenomenon
vii. Society and politics essential aspect of local technological evolution

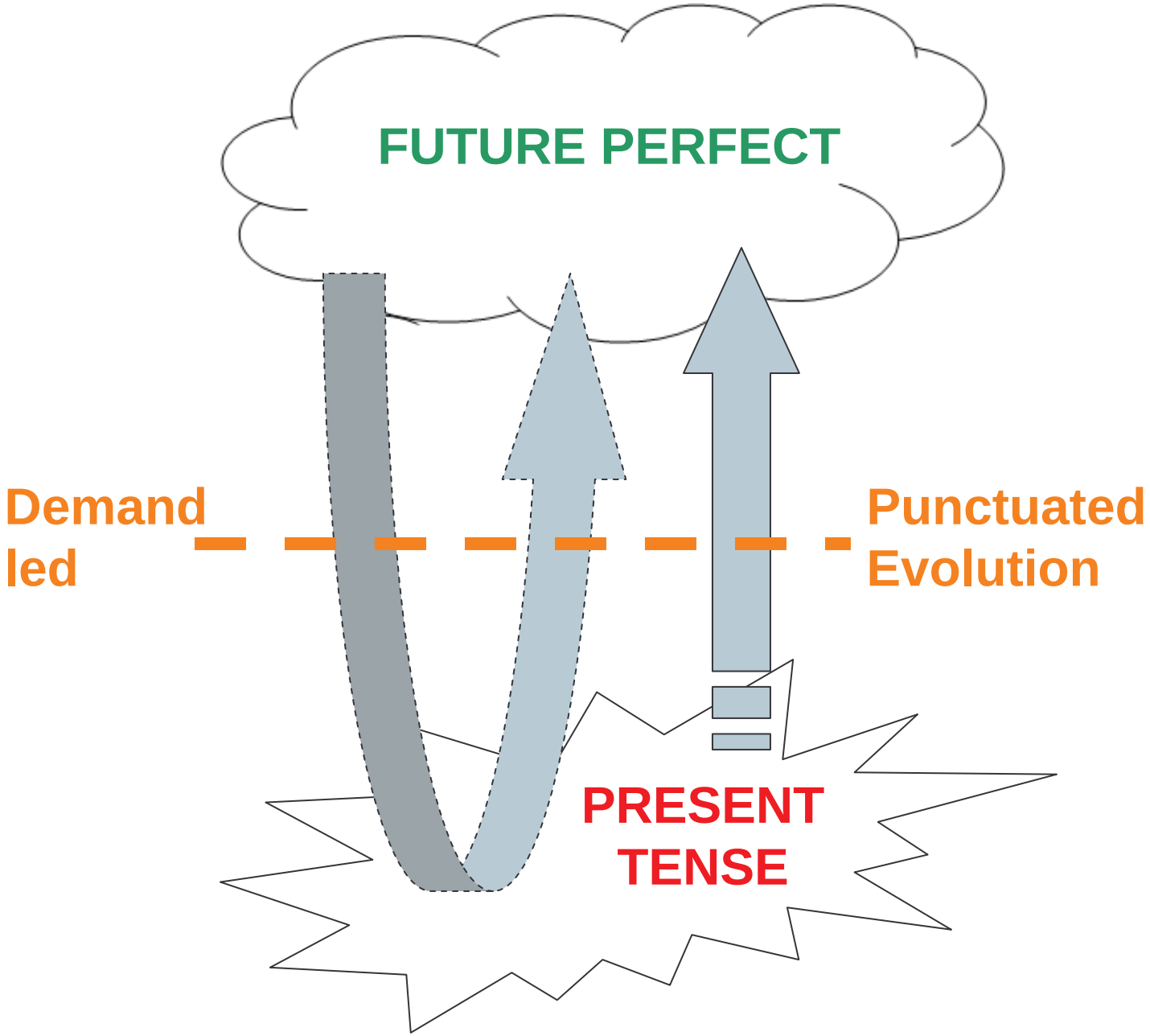
Five Great Surges

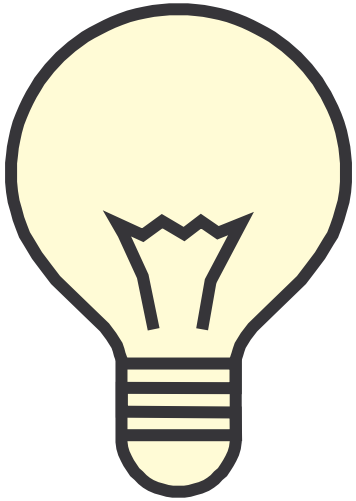
i. Industrial revolution (machines; factories; canals)
ii. The Age of Steam (coal, iron, rail)
iii. Age of steel and heavy engineering (electrical, chemical, civil and naval)
iv. Age of automobile (mass production, petrochemicals)
v. Age of Information Technology and Communications
vi. Age of ? Bio/nano/cogno?

•On 6 September 1970 hijackers commandeered 4 airliners and forced the pilots to fly them to Jordan

•On 11 September 2001 hijackers commandeered 4 airliners and programmed them to fly into targets in the US

9/11 was enabled by the Information and Telecommunications Revolution


FUTURE PERFECT
Demand led
Punctuated Evolution
PRESENT TENSE

How many  **does it take to**

change Eskom **?**

Technology is about meeting demand

INNOVATION


Sanlam
Steinhoff International Holdings Ltd
WesBank
Put us to the test
BusinessTimes 23
ABSA
Fund Managers
Inspired. Motivated.
Standard Bank
medscheme
Eskom
Pick'n Pay
MUTUAL&FEDERAL
METROPOLITAN
AECI
MTN
ASTRAPAK
LIMITED
FOORD
UNIT TRUSTS
PBMR
eBucks

Evolution of the SA system of innovation

Pre 1945

- 3 wars; agriculture → mining → industrialisation

1945 to 1994

- Military-industrial complex
- Constructed Crisis I: **APARTHEID**

1994 onward

- Constructed Crisis II: **INCLUSION**
- Globalization; Commodities boom; Services
- Energy security/climate change

Bokamoso 1997

Innovation Hub

- Regionalization
- All things to all people

Our Way is the Way

- South-South
- Isolation
- Self-reliance

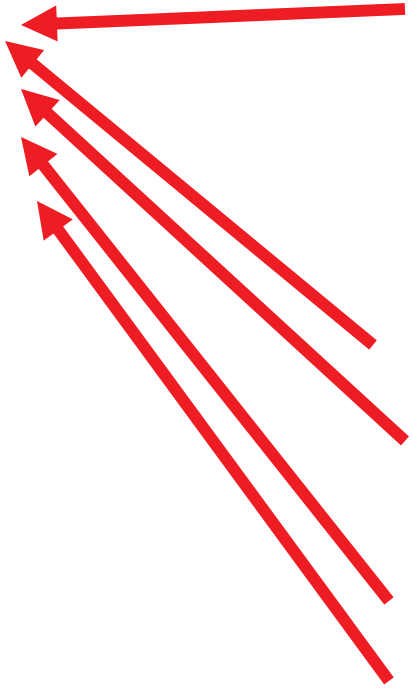
Frozen revolution

- Policy failures; rising inequality
- Hobby horse projects

Global Home

- Open for business
- Economic growth

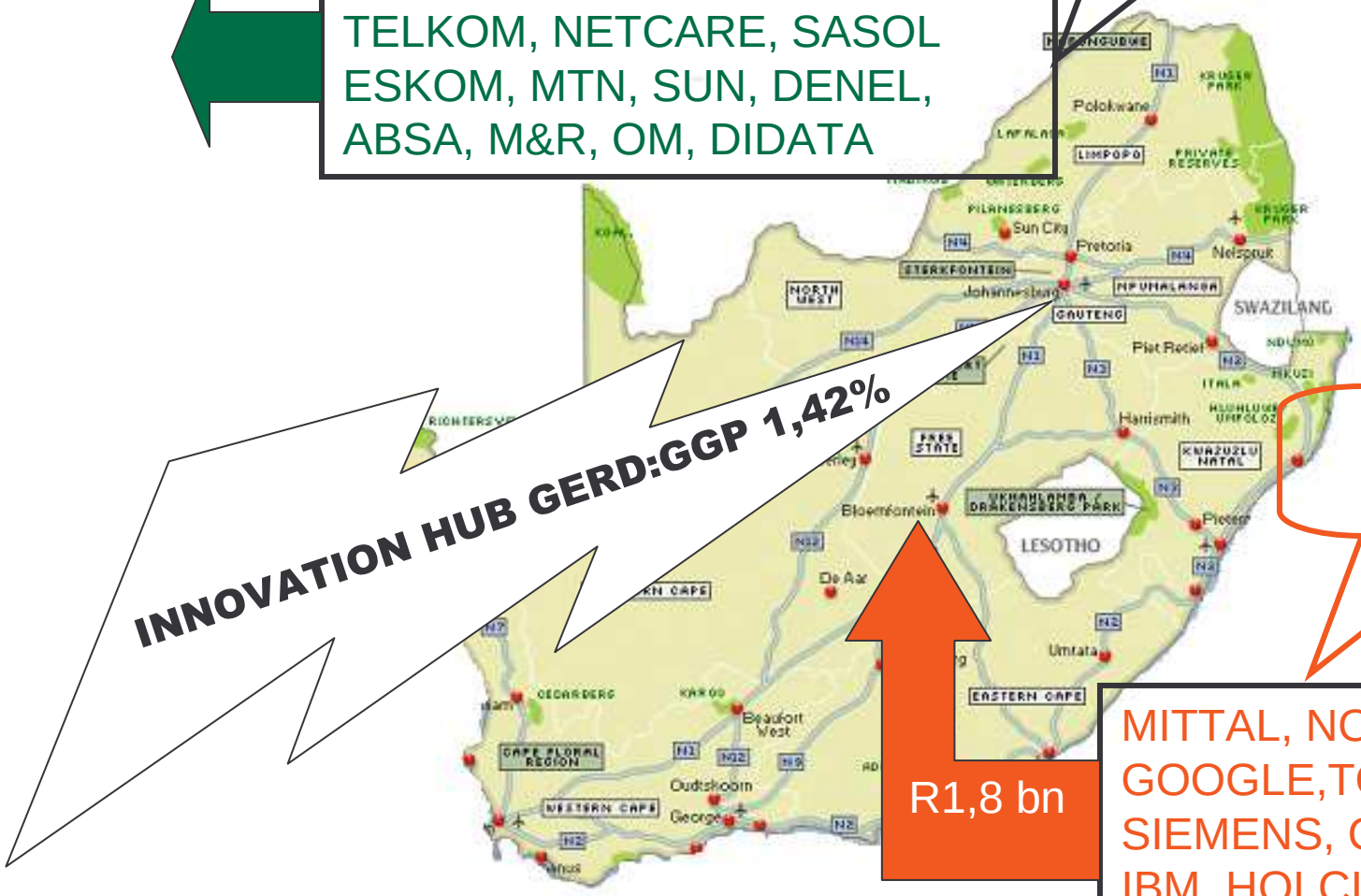
2007



Open economy 2007

Home base augmenting exploiting?

AAC, SAB, LIBERTY, SAPPI
TELKOM, NETCARE, SASOL
ESKOM, MTN, SUN, DENEL,
ABSA, M&R, OM, DIDATA



INNOVATION HUB GERD:GGP 1,42%

R1,8 bn

Home base augmenting/ exploiting?

MITTAL, NOVARTIS,
GOOGLE,TOYOTA, GM,
SIEMENS, CISCO, CIPLA,
IBM, HOLCIM, DAIMLER,
PARMALAT, SAAB, BAE,
BHP, FLEXTRON, PAREXEL

- **Research and experimental development** (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of humanity, culture and society, and the use of this stock of knowledge to devise new applications.

- **Innovation** is the dissemination of a new good or service in an organization or market. The innovation may be new to the firm, the local market or the world.

- **Capacity** to conduct R&D and innovation speaks to the ability to absorb and generate new knowledge

- **FIC may inform** what to research, how to research it, emergent modes of innovation and possible consequences of innovation

Playing in the World Top 20

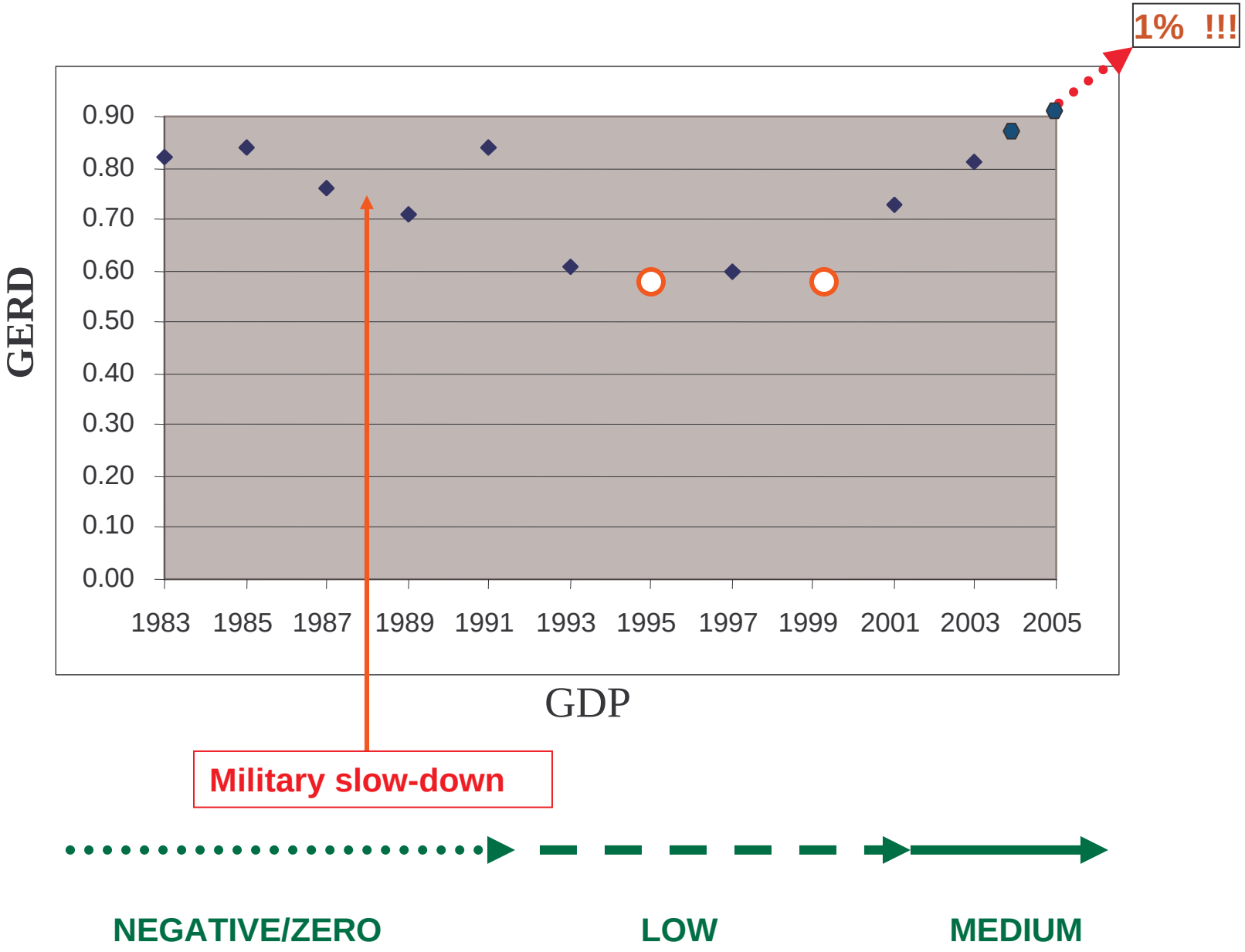
- 4th: patents “Chemistry: Fischer-Tropsch Processes”
- 12th: patents “Specialized Metallurgical Processes”
- 17th: patents “ Liquid Purification or Separation compositions”
- 18th: patents “Conveyors: Power Driven”
- 20th: patents Chemistry of Inorganic Compounds”
- 5th: Plant Breeder’s Rights
- 6th: Number of scientific publications/GDP/Capita
- 6 Universities generate scientific citations in the world top 1% by volume in: clinical medicine, biology and biochemistry, chemistry, engineering, environment/ecology, geosciences, materials science, plant & animal science, and social science

But

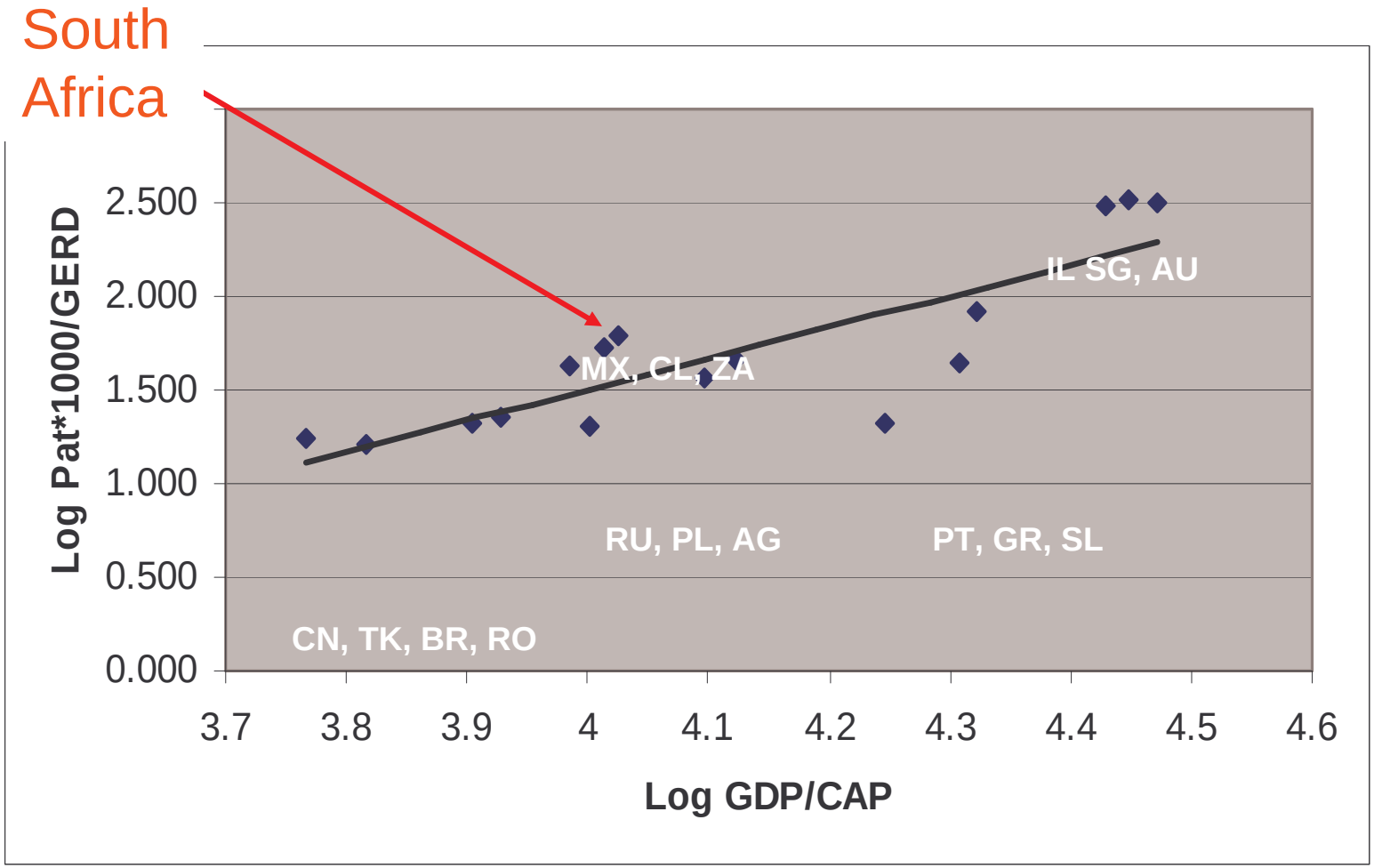
- ♠ The number of full-time equivalent researchers in the Universities has been virtually static at around 3 500 over the decade.
- ♠ The number of ISI-indexed scientific publications produced by South Africa has been virtually static at around 3 500 p.a.
- ♠ The two phenomena are linked: researchers conduct research; they publish; they teach the next generation of researchers (and professionals)
- ♠ No South African (or African) university in Shanghai UIE top 200: UBA #168; NAUM #176;


12:35 LONDON
12:20 FLIGHT
12:25 OF THE
12:40 FLAMINGOS

GERD:GDP (PPP$ 7 billion)

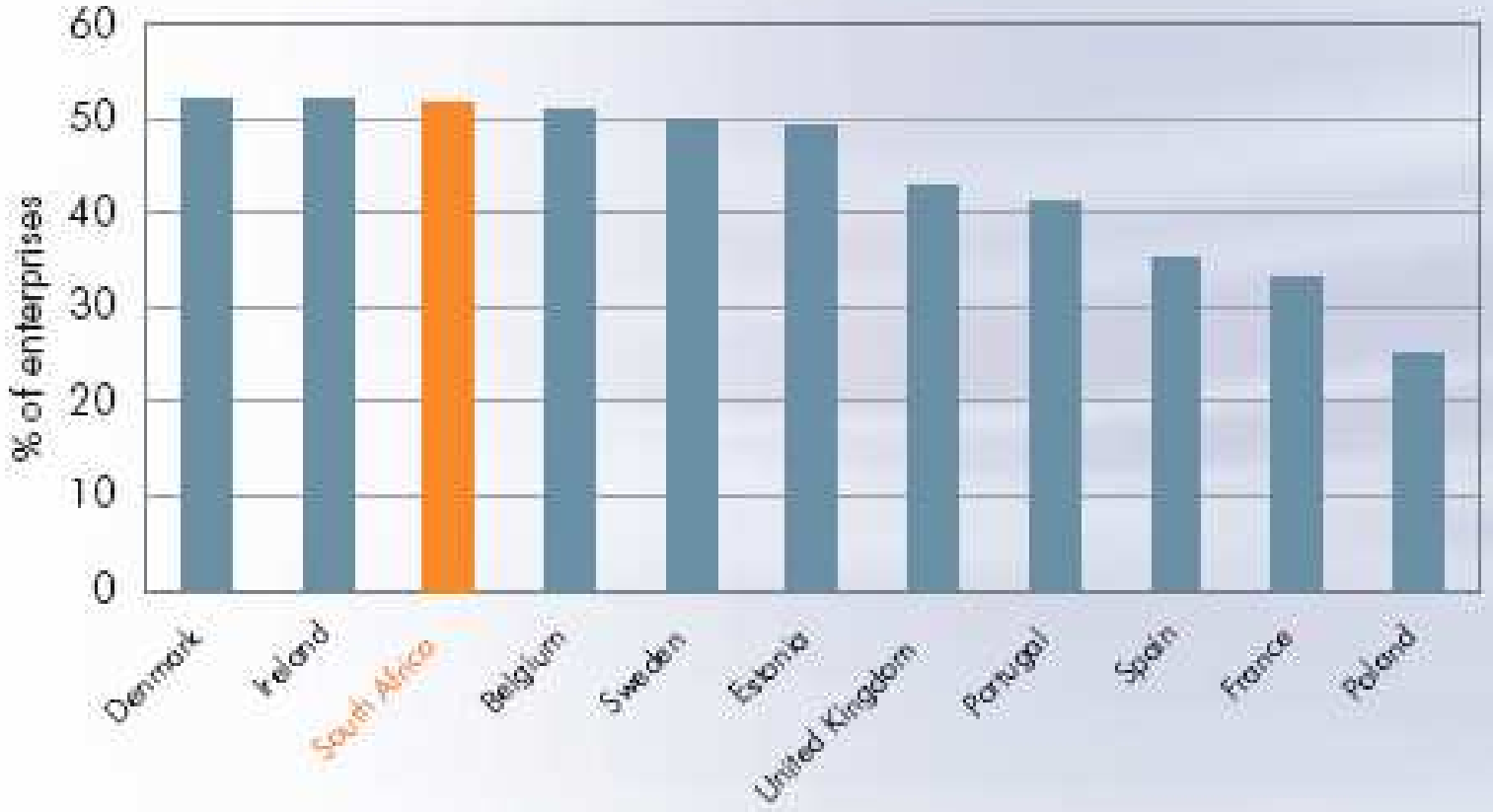


US Patents filed vs. Wealth

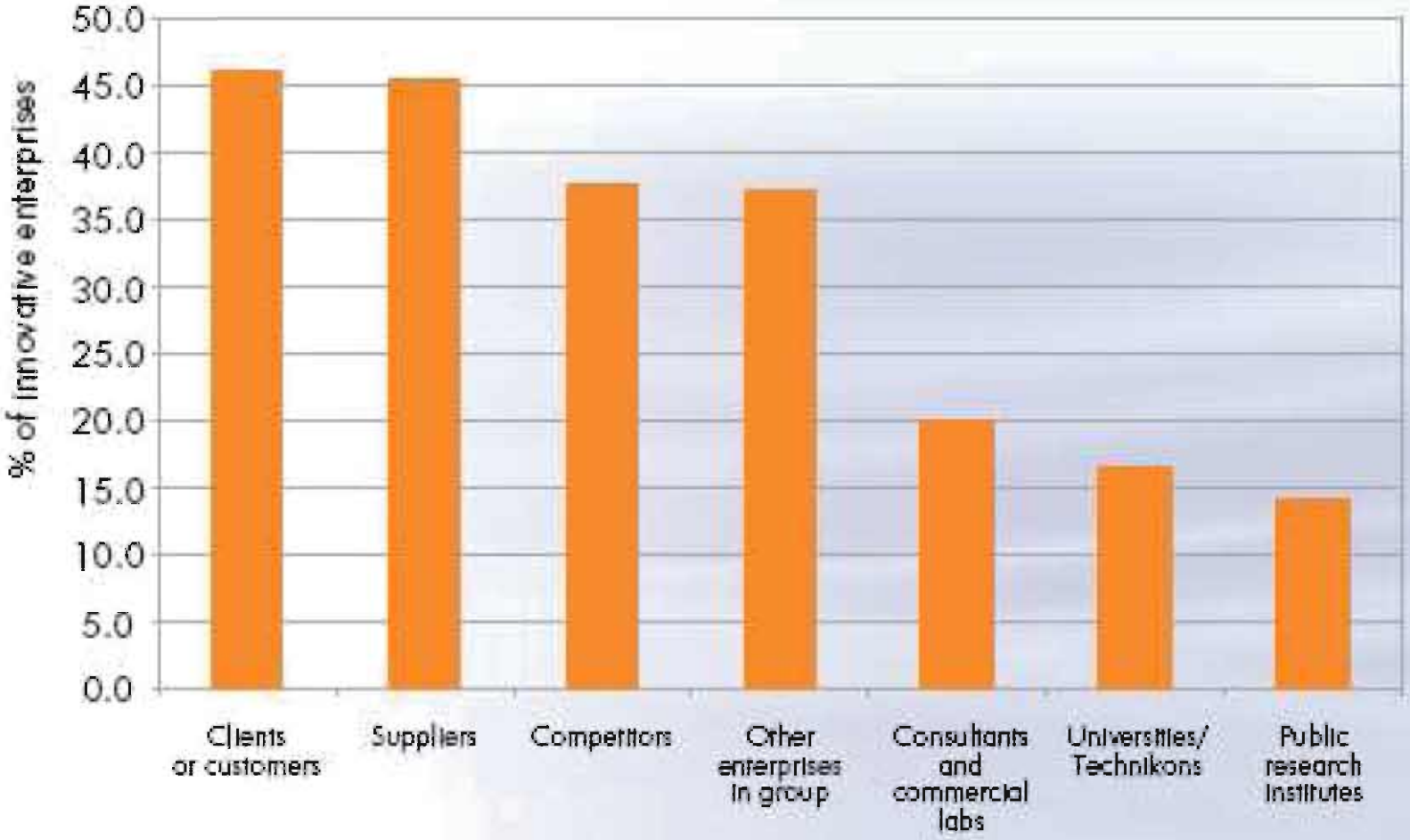


Commensurate with wealth and structure of exports

Share of enterprises with innovation activities (%), 2002-2004



Collaborative partnerships for innovation activities by type of partner, 2002-2004



Some pointers

- Business R&D and Innovation parameters similar to EU 15:
  - Low use of IP
  - Mainly imitative; some adaptive & incremental
- Public sector R&D expenditure/GDP
  - Similar to EU Southern Europe & NMS
- Low absolute outputs
- Break the stagflation

Backcast

- Create a desirable (sustainable) future vision or normative scenario, followed by
- Looking back on how this desirable future could be achieved,
- Defining and planning follow-up activities and strategies leading towards that desirable future.

Understand the demand and get there

Energy

- Power engineering (PBMR; Koeberg x 4)
- Thin film semiconductors & polymers at nano scales
- Nuclear chemistry
- High temperature alloys and ceramics
- Computational fluid dynamics
- High speed distributed computing

Ensure critical mass

Environment

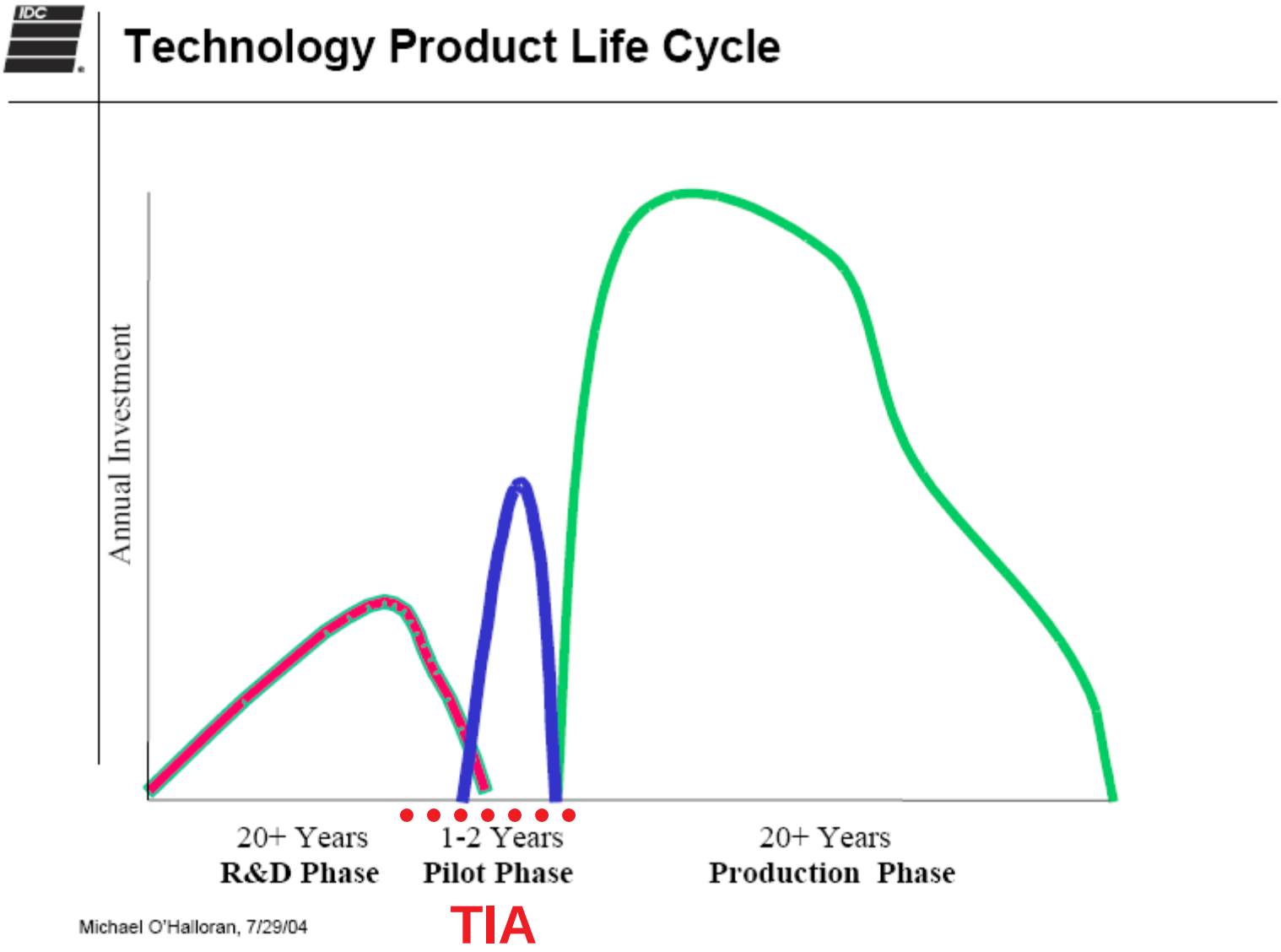
- Zero emission
- Municipal biomass for energy
- SASECO, not corn
- Recycling legislation 2012
- Carbon emission halved by 2030
- Reticulated water and desalination
- Drought resistant GMOs deployed
- Coastal and inland fish farming

The last tungsten light bulb is switched off ….

Health

- Men→molecules→mice→men → successes
- Aaaaaaaah!

The first innovation chasm



The second innovation chasm

5.3 million

South Africa finds itself out of step with major countries -- including China -- internationally that are banning the energy-sucking light bulb in a bid to promote energy efficiency. Although the energy-inefficient incandescent light bulb adds at least 10% to our annual energy bills, about R2,8-billion a year, South Africa charges a 15% import tariff on energy-efficient CFL (compact flourescent lamp) light bulbs.

http://www.mg.co.za/articlePage.aspx?articleid=321367&area=/insight/insight__economy__business/