



Science, Technology and Innovation for Africa's Economic Growth

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Research and Innovation: New Partnership
for Sustainable Development'
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Science, Technology and Innovation **for Africa's Economic Growth**



- Understanding of the importance of STI for Economic Growth
- Clear commitment of the leadership,
- Policy of science and technology
- Strategic plan indicating national resources
- Establishment of laws on science and technology,
- Establishment of funding mechanism for STR,
- Capability building in Science, Technology and Research,
- Promotion of R&D in the private sector through tax incentives,
- Promotion of partnerships between Academia, Industry and Government,
- International co-operation in technology transfer and support from partnerships,



The importance of STI for Economic Growth

- **Robert Solow, 1957:**

- Economic Growth USA 1909 – 1949: 87.5% of output attributed to the applications of science and technology, while capital alone without technology attributes a mere 12.5%.

- **Sunil Mani:**

- “Technology is central to many of the changes now taking place in the manufacturing and service sectors of countries across the world.”



The importance of STI for Economic Growth

Mariko:

□ “Compounded over generations, a 1 or 2 percent reduction in the overall growth rate could be the difference between the standard of living.. doubling or ... five-fold over a hundred-year period.

□ e.g, Argentina and the US had .. similar levels of economic performance during the 1860s,

□ The United States managed to launch itself on a high-growth while Argentina became mired in low growth.”



(Mariko, Silver, “Science, Technology, and Economic Growth - An Overview”, Mariko Silver, Office of University Initiatives, Arizona State University.)



Bill Gates - “How to keep America Competitive”

- “For centuries people assumed that economic growth resulted from the interplay between capital and labour. Today we know that these elements are outweighed by a single critical factor, Innovation.
- Innovation is the source of US economic leadership and the foundation for our competitiveness in the global economy.
- Government investment in research, strong intellectual property laws and efficient capital markets are among the reasons that America has for decades been transforming new ideas into successful businesses.
- We should also encourage foreign students to stay here after they graduate. Half of this country's doctoral candidates in computer science come from abroad. It's not in our national interest to educate them here but send them home when they've completed their studies.”

(Washington Post)



The words of Rwanda's President, His Excellency Paul Kagame



“The application of science and technology is fundamental, and indeed indispensable, to the social and economic transformation of our countries...

...It is about applying science and technology holistically – in all levels of education and training,

...in commercializing ideas, in developing business and quickening the pace of wealth-creation and employment-generation, in enabling government to provide better services,

...and indeed in providing basic tools to society at large for self- and collective betterment.”

(Quotations from Speech to Royal Society UK September 2006 and AU Summit Addis Ababa January 2007)



Rwanda's Vision



- The vision for Rwanda's future is enshrined in the Vision 2020 for Rwanda which looks towards the achievement of “a modern and Prosperous Nation, strong and united, worthy and proud of its fundamental principals”
- Science and technology has a key role to play and the target is to strengthen and integrate into the countries strategies and policies to underpin the Vision



Rwanda's National Science, Technology and Innovation Policy

Specific Policy Objectives

- **Knowledge Acquisition and Deepening** – to reinforce Science and Technology teaching and resources at all levels of education
- **Knowledge Creation** – Develop Research Capability in all priority sectors of the economy
- **Knowledge Transfer** – To reinforce Science and Technology Capability in all priority sectors of the economy
- **Innovation Culture** – To encourage Innovation at all levels to help stimulate economic growth



Human Capacity Building in Knowledge Acquisition, and Deepening

- The principal areas for knowledge acquisition start at Primary level and move up through Secondary to Vocational, Technical, and Higher Institutions of learning.
- At primary level a project is ongoing to equip all 2,200 primary schools in Rwanda with a science corner. This will display fundamental information about science with particular relevance to the world around the school including the cycle of life, fundamentals of energy, the environment, and a computer with internet connection.
- The proposed interventions at secondary level will include the provision of a high quality science and technology education, in schools equipped to also undertake practical lessons.

Computers in Primary Schools

Training of Teachers



Primary School students experiencing computers for the first time





Knowledge Creation: Infrastructure and Human Capacity Building in Research

- Post doctoral training for our PHD holder lecturers in universities,
- The establishment of a. S&T trust fund,
- Research Fellowships
- Industrial Attachments in all major projects,
- Specific Research in Commodities with potential for Economic Growth,
- The establishment and reinforcement of high quality laboratories, including all health districts and a state of the art reference laboratory,
- To establish S&T Centres of Excellence in HLIs,
- Science and Technology Conferences
- Reinforce the capacity of Industries to conduct research by establishing R&D Units.



National Reference Laboratory

CD4 DNA Analysis: genes to cells to proteins





Knowledge Transfer: STI Capacity for Economic Growth, Poverty Reduction and Meeting MDGs

- Using STI Capacity Building in Rwanda as a Tool for Improving the Lives of the Rural Poor, Reducing Poverty, and Achieving the MDGs
 - Agriculture Productivity -Research and Extension
 - Geothermal Energy / Geosciences
 - Food Processing and Food Technology
 - Clean Drinking Water and Sanitation
 - Biofuels
 - Vocational and Technical Education and Training
- Using STI Capacity Building in Rwanda as a Tool for Generating Wealth and Diversifying the Economy
 - Crops / commodities developed or under development include:
 - Coffee, Silk
 - Horticulture (flowers, vegetables, fruits)
 - Aquaculture, Herbs and Essential



Innovation Culture

- Innovation needs to be encouraged at all levels to help stimulate economic growth.
- The strategy includes the establishment of business enterprise centres nationally, especially within technological institutions.
- Also includes the establishment of District Innovation Centres and encouragement of private sector partnership as a key part of every sector



John McEleney – CEO of SolidWorks: Innovation is Imperative



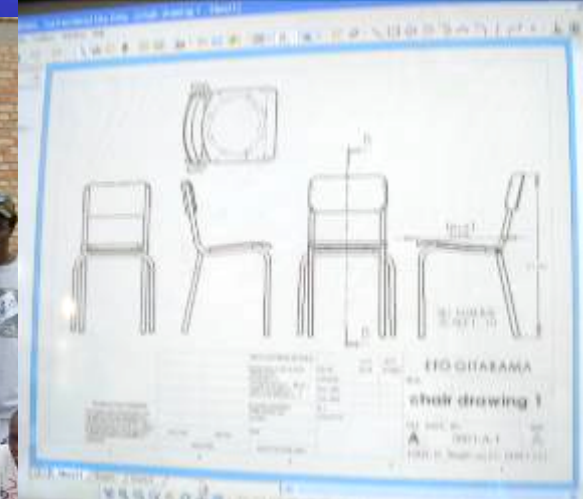
In a world of commoditized low-cost manufacturing: **Innovation is Key**

- **Innovation** - creates new markets
 - Scaled Composites – SpaceShipOne
- **Innovation** - allows success in “commodity” markets
 - InFocus
- **Innovation** - allows for price premium
 - Trek Bikes





SolidWorks at ETO Gitarama





International Cooperation and Partnerships in Science and Technology

- In addition to its own resources, building scientific and technological capacity for a country like Rwanda needs international co-operation.
- The Government of Rwanda, starting with His Excellency President Paul Kagame, has aggressively engaged in progressing S&T partnerships with more technologically advanced nations and world technology leaders including major corporations.
- The overall effect has resulted in several corporations and countries accepting to establish collaboration with Rwanda. These collaborations have taken several different forms, at:
 - Corporate Level
 - Bilateral
 - Multilateral



Corporate Level

Examples of ongoing partnerships at a corporate level include:

- SolidWorks Corporation:** There is a developing relationship between the Government of Rwanda and SolidWorks that was initiated by His Excellency the President when he visited SolidWorks Corporation in April 2005. Following numerous engagements between the Executives of SolidWorks Corporation and Rwandan representatives a business concept is currently being developed with SolidWorks to establish a company, to convert 2D legacy drawings to 3D Models.

Various other initiatives are ongoing such as with:

- Qualcom:** to establish a CDMA university,
- Positrust:** for developing a high level ICT service industry,
- Sun Microsystems, Microsoft, and HP:** for infrastructure capability building at all levels of ICT,
- Google:** for establishing a regional centre,
- ESRI:** in Geographic Information Systems



Mark Biasotti of SolidWorks Conducting training to students at ETO Gitarama



Corporate Partnerships in Building Science and Technology Capability
**Jack Dangermond, Founder and President of Environmental Systems Research
Institute (ESRI) being received by President Paul Kagame**





Bilateral

- Even where there is a very clear commitment within countries in the developing world they are in need of support from the international community in both physical and human resources.
- Examples of developing bilateral partnerships within Rwanda include:
- **UK:** As a result of the progress and commitment of the Government of Rwanda a partnership is developing with DFID who are designing a project for “Science, Technology and Innovation for Results (STIR)” This project will assist the Government of Rwanda with the design of the legal and institutional structures to support science, technology and Innovation in Rwanda
- **US:** An agreement has been signed between the US and the Government of Rwanda for collaboration in the area of Science and Technology
- Various other bilateral agreements and cooperation are also ongoing or being developed such as with: Netherlands (through NUFFIC), Japan (through JICA), Sweden (through SIDA SAREC), Germany (through GTZ), South Africa, India, Vietnam and China



Visit of Sir David King, UK Chief Scientific Advisor to KIST



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Partnership Between GoR and NETHERLAND NUFFIC

Masters course in Agro-Forestry and Soil Science



Farmlands Degradation due to Erosion Contour Cultivation for erosion control



Run-off Plots for measuring Soil Loss



Agroforestry Practices in Radical Terracing



Partnership Between GoR and Government of Japan, Visiting ETO Gitarama





Partnership Between GoR and Sweden SIDA SAREC: Masters course in Information and Communications Technology



ICT Masters
students in the ICT
Lab at the National
University of
Rwanda





Multilateral



- Through leveraging support through both their member nations and science and technology programmes ongoing in countries internationally, multilateral donors can provide significant support.
- Examples of developing multilateral partnerships within Rwanda include:
- **World Bank:** A partnership has been established with the World Bank which has resulted in an Aide Memoire between the Government of Rwanda and the World Bank “Developing a Needs Assessment and Action Plan for Science, Technology and Innovation Capacity Building for Sustainable Development and Poverty Reduction in Rwanda.” this includes:
 - baseline studies (Technical and Vocational Education, Agricultural Productivity and Extension, Industry Capabilities, Research Institutions etc.) and
 - Programme Design, Needs Assessment and Action Plan
- **African Development Bank:** The African Development Bank has signed an agreement with the Government of Rwanda providing more than a third of the needed financing for developing Science and Technology across all levels of education over the next five years.

Visit of World Bank President Paul Wolfowitz to KIST





Partnership Between GoR and African Development Bank ISAE BUSOGO CAMPUS



Micro Biology Laboratory



Animal Health



Students in Library



President of the AfDB Dr Donald Kaberuka visiting ET Gitarama



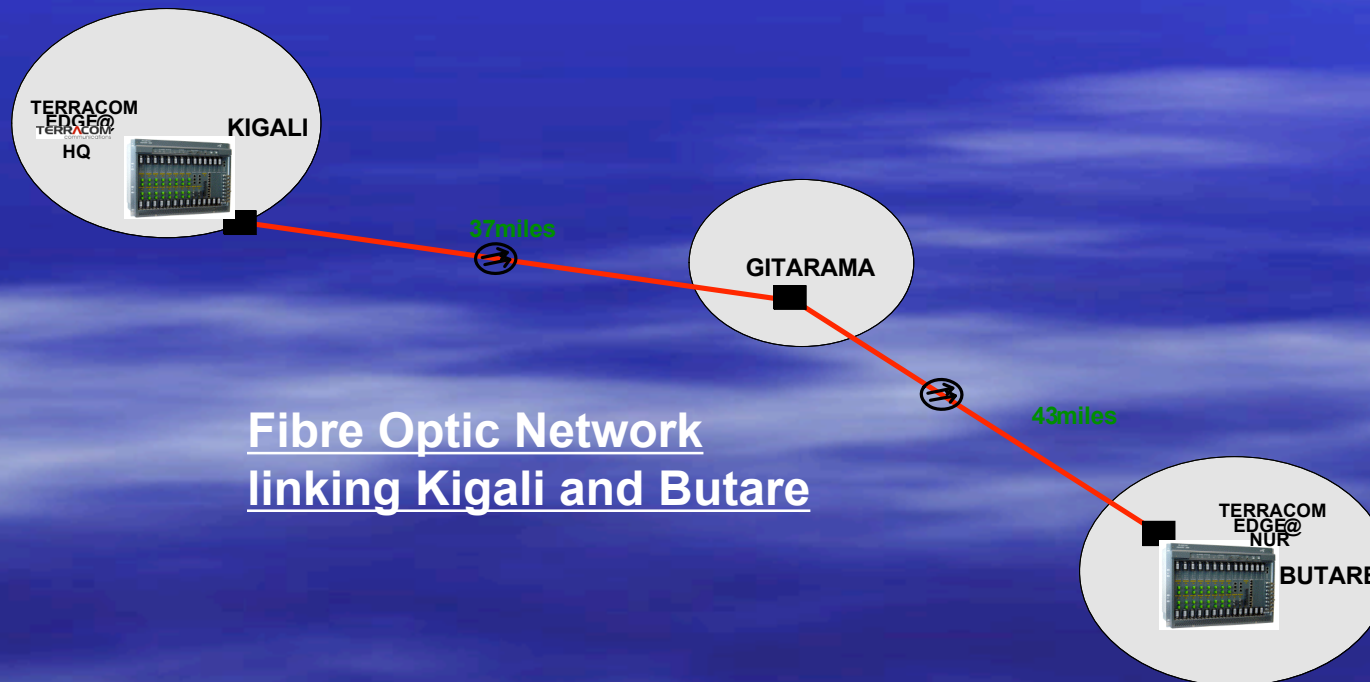


Examples of the Science & Technology Vision in Action in Rwanda



Fibre Backbone Network

- Initially connect all government agencies and ministries
- Use wireless broadband for last mile solution where fibre can not be laid or not feasible
- Will serve both public and private sector



Karisimbi Inc.

Alt. 4,507m

- 40m Antenna installed at the summit
 - Fiber optic cable to the crater and onwards to the summit
 - Power to the crater and the summit
-
- Air traffic control opportunities – high and low altitude management
 - Television and radio transmission
 - Internet broadcast via DVB-x platform
 - Telephony opportunities
 - Etc. Etc.



Sample of other Major Projects under Development



- ▶ **Nyabarongo/Rukara Hydro Power**
- ▶ **Rural Energy Programme**
- ▶ **Bugesera Airport**
- ▶ **Umutara Electrification**
- ▶ **Export Free Zone**
- ▶ **Railway Project**
- ▶ **Mobile Phone Assembly Plant**
- ▶ **Kigali ICT Park**



CONCLUSION



- The importance of technological and scientific capacity for long term sustained economic growth is already an accepted fact.
- **Professor Abdus Salam:**
 - Scientific and Technological knowledge is a “Human Kind Heritage.”
 - The rapid growth of modern science started about 300 years ago in 17th Century Europe. Since then science has built up a substantial body of knowledge both about the world as it now is and about the history of man, the earth, the solar system and the universe. Through modern science, technology and medicine, hundreds of millions of people are alive today who would previously have died in infancy or childhood.
- Therefore any country pre-occupied with changing the livelihood of their people from poverty to better conditions of living must appropriately invest in science, technology, and innovation.