Building Innovation Systems

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Innovation

- "Carrying out of new combinations, such as the introduction of a new good, the introduction of a new methods of production, the opening of a new market, the opening of a new source of supply, or the reorganization of any industry."*
- The process by which new products or new methods of production are introduced, including all the steps from invention to development to pilot production to marketing to production.

*J. Schumpeter, *The Theory of Economic Development,* 1934

National Innovation System (NIS)

A system that supports the ability/capacity of a country to innovate – especially to adapt and create science and technologies for economic and societal use.

Objectives of NIS

- Value added in general, especially raw materials, natural products, exports
- Diversify domestic and export economies
- Greater technological sovereignty for agriculture, public health, civil infrastructure (water, communications, construction), SME's

and above all,

- Generate economic growth

- Economic improvement is largely a result of the application of knowledge in productive activities and the associated adjustments in social institutions
- Innovation and technology are also needed to transform countries from reliance on the exploitation of natural resources to technological innovation as the basis for development.

(from Calestous Juma & Lee Yee-Cheong, "***Innovation: applying knowledge in development,"*** UN Millennium Project, Task Force on Science, Technology, and Innovation, 2005)

Ingredients in a NIS

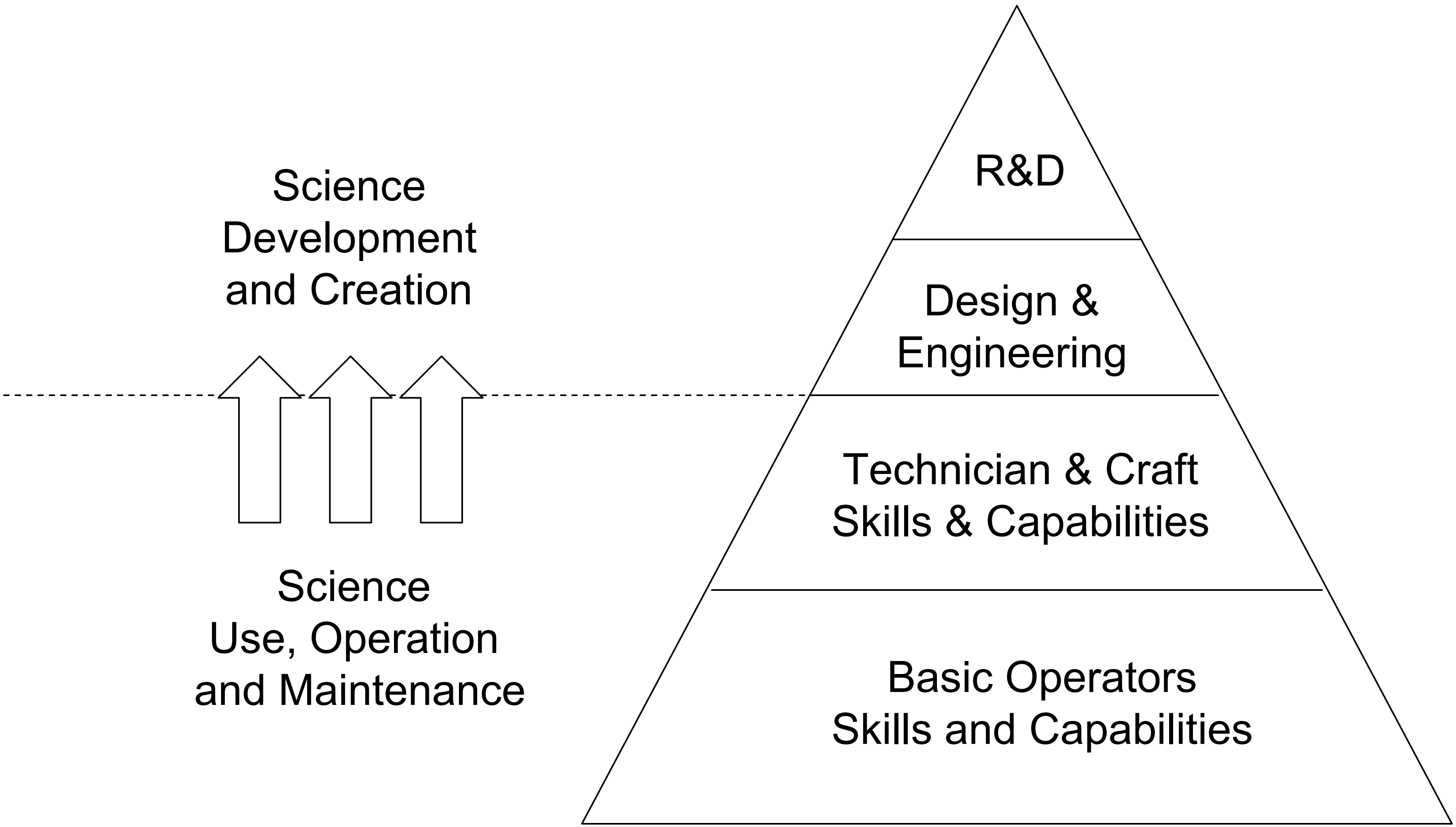
- People
- Policy Environment
- Infrastructure
- Institutions

and especially

- Political will

Human Dimension

- Knowledge creation/utilization
- Education
- Training and workforce support
- Excellence in science & engineering *plus* entrepreneurship
- Feeling for what is technically possible *and* is needed / demanded



(These all need human capacity.)

Policy Steps

1. Platform (generic) technologies
2. Improving infrastructure services as a foundation for technology
3. Improving higher education in science and engineering
4. Linking universities with private sector activities
5. Breaking down compartmentalization at universities
6. Promoting business activities in science, technology, and innovation
7. Improving the policy environment for innovation (e.g. patent laws, IPR)
8. Focusing on areas of underfunded research for development
9. Process of *technological learning* associated with *technological competence building* that forms the basis of this report

(from Juma / Yee-Cheong report)

Implementation

- Innovation and technology: needed to transform countries from reliance on natural resources to technological innovation as the basis for development. Emphasis on *implementation*.
- Requirements for Implementation
  – Desire and participation of government
  – Macroeconomic policy and conditions including incentives for risk taking and for long term investment
  – Infrastructure
  – Entrepreneurs in both private and public sector

Our Responsibility in the Implementation Process

- Stimulate political will
- Specifically, provide economic arguments to finance ministers and the private sector
- Engage the scientific/engineering communities in development

- The implementation process will *not* be furthered by just
  - Seeking more money for science
  - Seeking more money for education
  - Macroeconomic reform
  - Many traditional development approaches

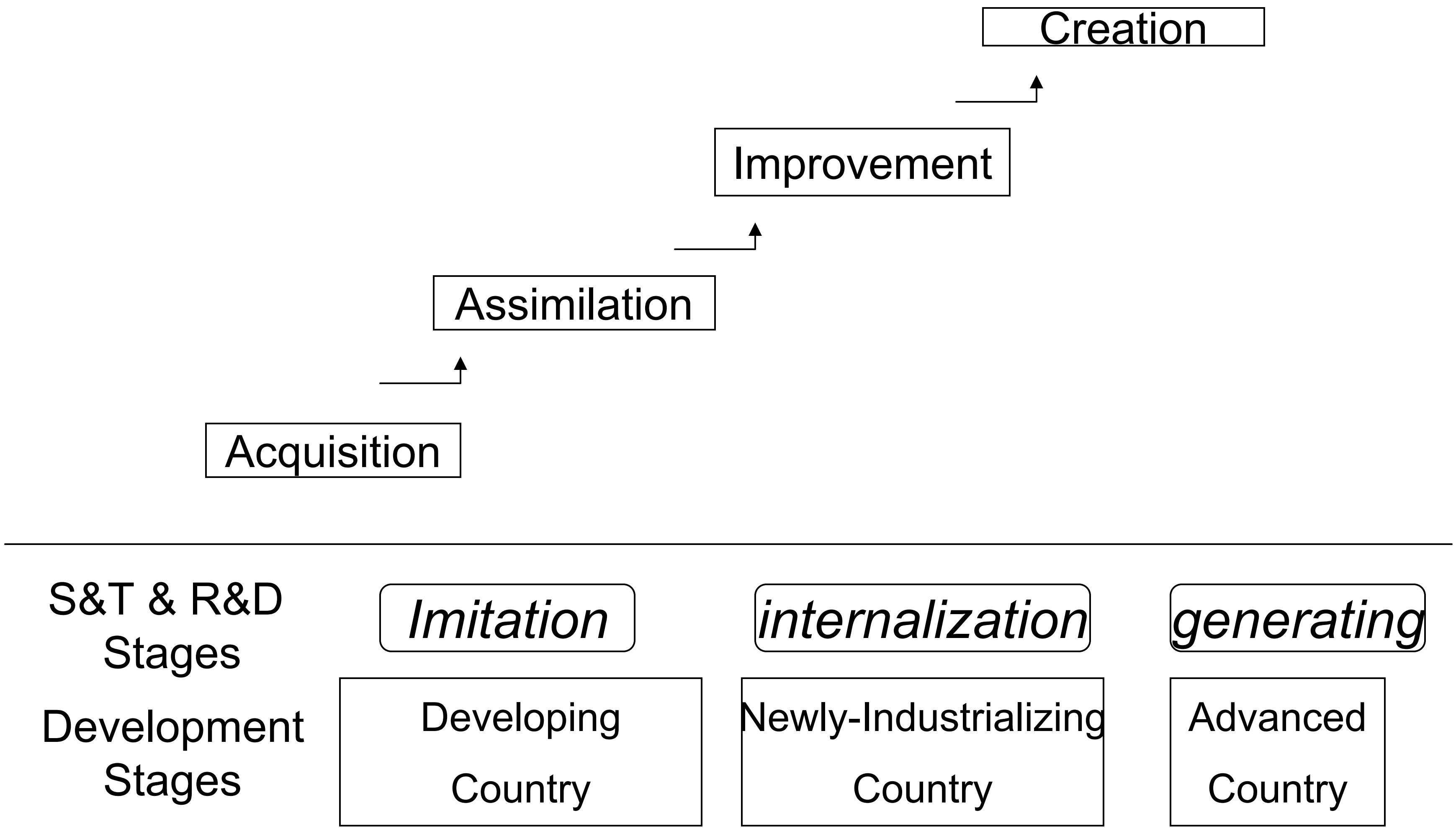
“Push” and “Pull”

In many countries, especially developing countries, both pull (demand from the private sector) and push (desire from the S&T community to link research and industry and the knowledge of how to do this) are insufficient. Governments can play the catalytic role.

Role of Government

- Promoter
  - Tax incentives
  - Financial incentives
  - IP protection
  - Commercial law
- Producer
  - Governmental R&D
  - Public research institutes
- User
  - Procurement

Traditional Innovation System Development Model



With the globalization of S&E / R&D and, especially, with ICT, these stages can be compressed and partially done in parallel.

Adding Value to Products

- High-tech activity does not always add value; however…
- Modern high-yield seeds are high-tech.
- Remote sensing is an essential tool for agriculture and environment.
- The capacity to acquire / analyze / utilize remote sensing data is high tech.

Examples

- Korea
- Chile
- Uganda
- Kazakhstan

Korea (I): Legacy

- Unbalanced Industrial Development
- Unbalanced National Innovation System
- Lack of Infrastructures for creative innovation

Korea (II): Innovation Strategy

Promote Balanced National Innovation System

- Vitalization of University Research
- Networking among Industry, Academia, and GRI's

From Demand Pull to Supply Push

- Mission-Oriented Governmental R&D Programs
- Technology Targeting

Build Infrastructure for Creative Innovation

- Increased Investment for Basic Science
- Increased Protection for Intellectual Property Rights
- Promotion of Venture Companies

Evolution of Korean R&D System

unit: %

	1970	1975	1980	1985	1990	2001
Public Institutes	84	66	49	24	22	13
Universities	4	5	12	10	7	10
Corporates	13	29	38	65	71	76
Total	100	100	100	100	100	100

Chile: Emergence of a National Innovation System

- NIS should be a system containing S&E as an *embedded* subsystem.
- In Chile, a NIS is under development – without formal planning the MSI has developed as an S &E embedded subsystem.

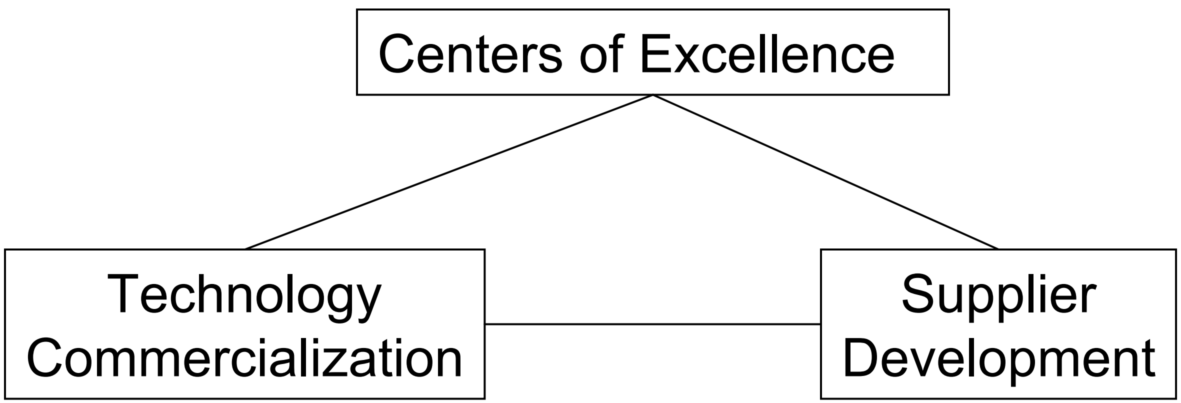
Uganda

- The government desires “innovation-led growth”
- Its Poverty Eradication Action Plan requires increased capacity in S&T
  – Growth and Diversification of the Economy
  – Transforming Agriculture
  – Health Care Quality and Availability of Health Professionals

Kazakhstan (I)

- Unbalanced Industrial Development
- Unbalanced National Innovation System
- Lack of Infrastructure for Creative Innovation
- Objective: To create the necessary prerequisites for forming a competitive economy, based on knowledge
- Requirements

Kazakhstan (II): Instruments



Summary I: How did the international donor and scientific communities support S&T in the past?

- Donors primarily channeled S&T support to specific scientific research capability.
- Lesson: research support alone unlikely to contribute much to economic growth and poverty reduction.
- Evidence
  - Asian tigers
  - Latin America
- Result: Much excellent science, but little contribution to economic development.

Summary II: How can we best support innovation in the future?

- Recognize recent changes
  - Globalization
  - New understandings about how knowledge is created and used
  - New public-private partnerships
- Recommended response: An "innovation" approach rather than purely "research" approach to fight poverty. Features include:
  - Predicate investments in S&T on industrial strategies aimed at demand-led economic growth
  - Policy instruments that seek to differentiate the best ways to create and use knowledge
  - Emphasize research networks in the developing world that include partners in the developed world and have sustainable funding.

(from Keith Bezanson and Geoff Oldham, "Rethinking Science Aid," SciDevNet, 10 January 2005)