Science, technology and Innovation in the 2030 development Agenda

by

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Before coming to the slides....

• Thank you for your participation. It was a pleasure interacting with you.
• You are most welcome to send me a publication brief. Please see https://site4society.wordpress.com/ and https://www.facebook.com/SITE4Society/
• I would love to have material on the Middle East and Latin America.
• The format of the brief is given here https://site4society.wordpress.com/to-submit-a-brief/
• Other research and training programs of UNU-MERIT is given here https://www.merit.unu.edu/training/training-overview/
• All feedback is welcome. My email is ramani@merit.unu.edu
Self Introduction

Specialisation and Focus

Economics of innovation (micro) → Industrial Organization

Development Economics (micro) → Role and impact of technology and innovations on firms, markets and society
I don’t need to explain to you that science, technology and innovation are crucial for SDGs attainment...

1. We need to have knowledge

2. We need to be able to apply them

3. We need to make an impact

But..
1. For this STI capabilities are favourable and important but not sufficient

We need appropriate and efficient...

Industrial capabilities + Regulatory capabilities

Incentive Systems + Financial capabilities

Scientific, tech, innovation capabilities

And...
2. And we need many E’s along with STI capabilities to attain the SDGs

\[ \text{E} = \{\text{Engagement, Ethics, Entrepreneurship}\} \]
Myth 1: Lack of resources are the main the problem. More is always better.

Myth 2: Invest funds in a science park and the triple helix model will come to life.

Myth 3: Build Industrial capabilities and watch development happen

Myth 4: Lack of private finance is the main cause of slow catch-up.

Myth 5: Have a clear STI architecture and see STI based solutions emerge
4. Let’s start with Science
Some countries might lack scientists........

But in almost all emerging countries there is a lack of the right incentives...

- to make scientists perform;
- to develop poles of excellence;
- to be able to control the quality and the quantity of science production.
Chapter 2: The University as a Catalyst of Innovation, Entrepreneurship, and New Markets in the Indian System of Innovation

“Firms in emerging and developed economies are collaborating more with academic institutions in terms of R&D and knowledge exchange due to heightened competition, abbreviated product life cycles, and rising costs together with increased connectivity. “

“Improving the Indian system of innovation in terms of transforming scientific knowledge into technology with commercial potential requires that institutions become more meritocratic and collaborative, less political and foster higher order thinking skills and the social capabilities of graduates.”
5. Let’s go from Science to Technology and Industry
Thinking Technology or rather than Technology paradigm is myopic

Technology paradigm = A vector with components from four spaces
## 5.2 STInd

### Different Technology Paradigms in Agriculture have different systemic impact

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution package</th>
<th>Science Base</th>
<th>Delivery Platform</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Revolution</td>
<td>Genetically modified crops</td>
<td></td>
<td></td>
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<tr>
<td>HYVs/hybrids + synthetic fertilizers + pesticides + practices</td>
<td>GM seeds + practices</td>
<td></td>
<td></td>
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<tr>
<td>Plant breeding = Plant Sciences + Chemistry</td>
<td>Genetic Engineering + plant breeding = Molecular Biology + Genetics</td>
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<td>International Public Sector Cooperation</td>
<td>Multinational Companies and Private companies</td>
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**Productivity – Food security**

**Productivity – Livelihoods**
Chapter 8: Energy innovation (sub)systems in India

“There is a wide range of technologies that are involved in the extraction/capture, conversion, and utilization of energy across disparate application areas. The development and commercialization of these technologies often involve very different innovation processes, yet there is very little examination of these, despite the undisputed importance of energy innovation for any country.”

Vipula and Mahesh Chaturvedi Professor of Policy Studies and the Dean of Alumni Affairs & International Programs at the Indian Institute of Technology (IIT) Delhi, India.

Energy needs in India would be met better today if we had examined tech paradigms rather than technologies.
State

Industry

Academia

Triple Helix

5.4 STInd
Not only resources but efficient STI Institutions matter – see Latin America

Chapter 9: Nanotech after Biotech in Emerging economies: Déjà vu or a new form of catching up?

"After nearly 30 years of engagement, the diffusion of biotechnology among the emerging countries, including those in the Latin American region remains highly uneven."

"Even if scientific capabilities are built, there is no magic bullet to get the private sector to move, though efficient science-technology-innovation (STI) institutions may be helpful."
Chapter 3: How is a regional technology cluster created? Insight from the construction of the nanotech cluster in Grenoble

"The case study clearly confirms that interactions between the state, industry, and academia are necessary for a technology cluster to emerge in an endogenous fashion."

"Collective conversations are necessary for the transformation of expectations into tangible infrastructure."
Government can help to only to some extent – there must be private sector enthusiasm.

Chapter 5: Sure Bet or Mirage? On the Chinese Trajectory in Nanotechnology

"China has performed well in areas such as strengthening basic research, constructing nanotechnology-related databases, and developing national standards; in establishing national key laboratories and research centers in the field with substantial government investment. However, China has encountered enormous difficulty in commercializing new technology and upgrading traditional industries through nanotechnology."
STI4SDGs?
3. Let’s debunk the common myths...

Myth 1: Lack of resources are the main the problem. More is always better.

Myth 2: Invest funds in a science park and the triple helix model will come to life.

Myth 3: Create incentives for firm innovation and watch industrial capabilities happen. Build Industrial capabilities and watch development happen

Myth 4: Lack of private finance is the main cause of slow catch-up.

Myth 5: Have a clear STI architecture and see STI based solutions emerge
6. Let’s go to Innovation Now
Mirror Mirror on the wall – which is the best innovation of them all? Ps- for the SDGs?

Thinking only incremental or radical is myopic

6.1 Innovation

- Incremental innovations
- Radical technological innovations
- Radical second generation or reengineered technological innovations
- Disruptive innovations
- Frugal/Grassroots innovations
- BoP & Pro-poor Innovations
- Social Innovations
What goes into the making of a drug?

Active pharmaceutical ingredient (API)

With additives = forms a bulk drug - powder

Formulation – tablet, syrup, injection etc.

Most complex

Least complex
Figure. Local pharmaceutical production capacity among countries
Source: WHO, 2004
Ensuring access to drugs and health care

**Common objective**

**INDIA**

Private sector fulfills objective with public sector help

**Market logic – max profit**

- Cooperation with MNCs;
- Penetrate Western regulated markets;
- What about local needs?

**1950-2005**

**BRAZIL**

Private sector does not fulfill objective and so Public sector fills in

**Health Policy logic – max access**

- Regulation to assure quality improves capabilities;
- Private actors come in finally

2005 ----

Now more similar because tech retard And lack of funds pose similar problems.
Dynamics of catch-up at meso level

- Initial state of Industrial capabilities
- Change in NSI or SSI
- Creation of windows of opportunity
- Perception of windows of opportunity
- Responses of leading firms
- Inter-firm learning and mimicry

CATCH-UP PROCESS

New State of Industrial capabilities

Guennif and Ramani, 2012
Do industrial capabilities build-up always reduce Poverty?

Traditional View – Inter-linkages, Employment, Income Generation & Trickle down to the poor

And there will be growth and the poor will be better off

Shyama V. Ramani
Question for a champion: Are BoP innovations and Pro-poor innovations the same thing?

6.3 Innovation

Scratch cards for mobiles

Beauty saloon with shampoos
Pro-poor Innovations need not always be produced by the public labs and universities
7. Let’s go to Engagement Now
Chapter 6: Panorama of Nanoscience and Nanotechnology in Brazil

"Scientists were able to introduce the NST in the priority investment portfolio of the Brazilian government, but the lack of arguments in favor of NST- as a differentiated technology - did not ensure exclusivity in relation to other strategic technologies such as biotechnology."
Chapter 2: Learning From Solyndra: Changing Paradigms in the US Innovation System

"The 'early-stage public subsidy,' model presides over the U.S. innovation system and its intellectual foundation is sometimes called the linear model—a model that has been much criticized in theory, but remains operative in practice. We propose a general shift from a linear innovation model to our social innovation model, which we call the Social Innovation of Technology (SIT)."

US lost out in solar energy because of linear model of innovation in a market driven system

7. 1 Engagement between scientists and technocrats
Sometimes cooperation is better than cut-throat competition for everybody.
Chapter 8: On India’s plunge into Nanotechnology: What are good ways to catch up?

"Strategically speaking, the improvement of linkage between the actors involved in public research funding, technology development and technology transfer, and risk regulation is critical to the future success of nanotechnology in India."
Sources of Controversy

Innovation System

- Economic outcome
- Ecological outcome

Outcomes

Productivity Problem

- Public Labs
- State
- Other Economic actors
- Firms
- Farmers
- Nature

Activities

- Technology Search
- Technology Selection
- Technology Adoption

Locus of Controversy

{ Belief, Strategy }
7.2 Engagement between systemic stakeholders

Diarrhoea is a major health burden in many emerging countries
Need for safe, long lasting toilets and toilet usage

They Pay Rs.700 every month to clean up the septic tank in Panangudi.
7.2 Engagement between systemic stakeholders

Intended beneficiaries

Social Enterprises

Volunteers

Other Financiers

Firms

Public agencies

State

Financiers

Resource providers

Catalysers

Users

Ramani et al. (2017)
NSI – Product and Systemic Challenges from Supply and Demand Sides

- Inappropriate product design
- Unaffordable price
- Incompatible with local resources, capabilities and culture

7.2 Engagement between systemic stakeholders

Returns to Financiers in the form of Social Impact

Investment in Social Enterprise by Financiers

Social Impact of Actions by Social Enterprises

Ramani et al. (2017)
7.3 Of Government to People: Multiple and Parallel Discourses – Impacting Same Outcomes

Systemic Risk: Climate NOT embedded efficiently in development process

Lower the development level = More Complex the Governance Architecture
"Three lessons are worth noting from the Mexican experience. First, people matter. Second, history matters. Third, continuity matters and this is the weakest point of the Mexican innovation system."
What’s the price to pay of progress along one direction? What are the externalities generated? Via market? Outside of market?
Last Thoughts:

We need to think more "Indian".

The country is ridiculously imitative in policy.

We have to figure out politically how to move forward together, not a technocratic innovation policy that does not recognise Indian reality. (i.e. not run by techno-bureaucrats and politicos alone).
All of you can be change makers at home, work and/or community!
Our Motivation - Gandhi: “Be the change that you want to see”
New Role: Universities as pivotal societal connectors for positive change
Homo Economicus Academicus of the Social Scientificus Tribe

**Inputs**
- Study secondary data
- Compile and analyze primary data

**Outputs**
- Teach and Train youth to enter labour markets
- Produce scientific Knowledge = Publications
- Engage in contract Research for public agencies

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Other Problems being addressed

- Post-Truth World, Post-Trust World
- Knowledge Divide
The activities of SITE4Society

Designed conversations in workshops

Publication Briefs

Outreach via Facebook & Twitter

Workshops: Conversations between economic actors changing the world and academics studying change

Next one on circular economy June 13-15
How SITE4Society Publication Briefs Work

1. Researcher publishes article

2. Researcher converts it into brief according to SITE4Society format

3. SITE4Society team works to edit if/as necessary and publishes brief

4. SITE4Society team works to publicize brief via Facebook and Twitter
Myth Truth

By Dr. Arijita Dutta, Department of Economics, University of Calcutta, dutta.arijita@gmail.com

Gitanjali Hajra, PhD research scholar, Department of Economics, University of Calcutta, gitu.hajra@gmail.com
Who is willing to write a Publication brief for ‘SITE4Society’
Conclusions..
Why do we need to attain the SDGs?

- Because it’s not fair that people should live without basics?
- ...No, this is just a little bit of the explanation......
- It is because we all have a LOT to gain from changing the present reality ...
- It is the SMARTEST way to fight polarization, targeted hatred against groups, distress emigration, terrorism and climate change...
- It is the ONLY WAY to restore the position of women in society after thousands of years as a partner of man with equivalent opportunities for development.
- We can achieve a good quality of life for all
- We can get a warm glow from doing good and we can all learn from serving society
At the micro-level - for mobilizing science, technology and innovation for any solution - Think - SAAAARS - for the SOLUTION

- **S**ustainability – over time and for environment = Quality
- **A**vailability – over space in sufficient quantity;
- **A**ffordability – within their budget;
- **A**spirational – it should symbolize catching-up and not being ....poor;
- **A**ttractive – things for the poor are too often ugly;
- **R**epairability – **R**ecylability – to reduce global waste;
- **S**afe – things for the poor are usually low in quality.
At the macro-level - for Sustainable Development for all - Think PIIPLE

- **P**olicy – there is a need to rewrite policies, regulatory frames, public programs; enabling environments.
- **I**ndustrial capabilities – keep in mind technology paradigms – problem, technology solution, scientific base, delivery platform
- **I**ncentives – via Industrial policy, Competition policy, S&T policy; Education policy; Management of edu. institutions
- **P**artnership – Need for creative partnerships;
- **L**eaders – Leaders among firms, among bureaucrats, among scientists and among social enterprises must emerge.
- **E**ntrepreneurship – of all kinds – institutional, techno, business, scientific is needed.
Thank you!

Merci!

شكرا لكم!

All feedback welcome:
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